



# Green and Golden Bell Frog Monitoring, Arncliffe, Sep – Nov 2022

Prepared by AMBS Ecology & Heritage Pty Ltd  
for Transport for NSW

Final Report

AMBS Reference: 17499

## Document Information

<b>Citation:</b>	AMBS Ecology & Heritage 2023, <i>Green and Golden Bell Frog Monitoring, Arncliffe, September - November 2022</i> . Consultancy report to Transport for NSW.
<b>AMBS Reference:</b>	17499
<b>Versions:</b>	Version 1: Draft Report issued 17 April 2023 Version 2: Final Report issued 8 May 2023
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# 1 Introduction

## 1.1 Background

AMBS Ecology & Heritage Pty Ltd (AMBS) was commissioned by Transport for NSW to undertake monitoring of the Green and Golden Bell Frog (*Litoria aurea*) (GGBF) at Arncliffe. This quarterly report presents the results of monitoring and other GGBF management actions undertaken by AMBS for the three-month period September to November 2022.

## 1.2 Study Area

The Study Area includes the following locations (Figure 1.1):

- M8 Marsh Street habitat area (previously known as the “New M5 Marsh Street habitat area”) – an area set aside for the establishment of potential GGBF habitat, including three ponds and surrounding terrestrial habitat, located south of the M5 between Marsh Street and Eve Street;
- the “Creek” area – a drainage line near the M8 Marsh Street habitat area, which runs eastwards from a stormwater outlet below Marsh Street to the Eve Street Wetland Reserve;
- the RTA Ponds – two ponds constructed as replacement habitat for the GGBF when the M5 was built (late 1990’s to early 2000’s), by the then NSW Roads and Traffic Authority (RTA), located near the Marsh Street/M5 intersection and adjacent to the Kogarah Golf Course;
- the Enhancement Area – six small ponds located near a drainage line that runs along the southern boundary of the Kogarah Golf Course, east of the RTA ponds;
- Kogarah Golf Course – a golf course located between Marsh Street and the Cooks River, which contains a number of water features, including some ponds where GGBFs have been recorded;
- Riverine Park and surrounds – parts of the area between the M5 and the Spring Street canal, where GGBFs have been recorded or potentially suitable habitat occurs;
- Barton Park – parts of the area in the northern section of Barton Park;
- Underpass – a passageway below the M5 East, which contains a pedestrian/bicycle path and a fenced-off containment pond.

## 1.3 Scope and Methodology

Monitoring and management of the GGBF at Arncliffe included:

- tadpole surveys and water quality measurements in the M8 Marsh Street habitat area, RTA Ponds, Enhancement Area, Kogarah Golf Course, Riverine Park and surrounds and Barton Park;
- nocturnal frog surveys in the M8 Marsh Street habitat area, RTA Ponds, Enhancement Area, Kogarah Golf Course, Creek, Underpass, Riverine Park and surrounds and Barton Park;
- removal of Striped Marsh Frogs (*Limnodynastes peronii*) from the M8 Marsh Street habitat area (under Office of Environment and Heritage [OEH] Licence);
- release of captive-bred tadpoles into the M8 Marsh Street habitat area;
- regular checks and support feeding of tadpoles in the M8 Marsh Street habitat area;
- inspections of the M8 Marsh Street habitat area, RTA Ponds and Enhancement Area;
- vegetation management in the M8 Marsh Street habitat area (undertaken by Total Earth Care [TEC]).

Tadpole surveys were undertaken in all areas on 30 September 2022 (Dr Arthur White and Glenn Muir), 3 November 2022 (Dr Arthur White and Santiago Cuartas-Villa) and 28 November 2022 (Dr Arthur White and Glenn Muir). Survey techniques included dip net sweeps and watching for tadpole activity and identification and staging of any tadpoles captured. Water quality surveys were undertaken on 30 September 2022, 3 November 2022 and 2 December 2022 (due to a malfunction of the water quality probe during the tadpole survey on 28 November, the water quality measurements were taken a few days later i.e., on 2 December, by Yang Hu and Lisa Albino).

Nocturnal frog surveys were undertaken on:

- 11 October 2022 in the M8 Marsh Street habitat area by Glenn Muir, Henry Cook and Carl Corden;
- 12 October 2022 in the Creek, Underpass, RTA Ponds, Kogarah Golf Course and Enhancement Area by Henry Cook, Carl Corden and Chris Jolly; and
- 2 November 2022 in the Riverine Park and surrounds and Barton Park by Henry Cook and Alana de Laive.

Inspections of the M8 Marsh Street habitat area, RTA Ponds and the Enhancement Area were undertaken concurrently with the surveys.

GGBF tadpoles were transported from Symbio Wildlife Park on 12 October, 27 October, 17 November and 25 November 2023 and released into the ponds in the M8 Marsh Street habitat area.

#### **1.4 Security and Habitat**

Two matters of concern occurred at the M8 Marsh Street habitat area prior to the release of tadpoles in 2022 – 23. These were:

- a contractor entering the site and slashing vegetation; and
- an attempted break-in.

This is discussed further in Section 2.7.

Outside of the M8 Marsh Street habitat area, Bayside Council commenced construction work on the upgrade of Barton Park, which will create several playing fields and associated facilities in the area to the south of the Landing Lights wetland. These works are occurring very close to the Landing Lights East pond and access to that site was not permitted after October.



Figure 1.1: Study area.

## 2 Results

### 2.1 Water Quality Monitoring

Results of the water quality measurements in comparison with threshold values indicated by Mahony and Beranak are summarised in Table 2.1. Raw data are provided in Appendix 1. All water quality variables were within the overall GGBF tadpole survival thresholds described by Mahony and Beranak, in all ponds holding water, except for salinity in the Mangrove Pond on Kogarah Golf Course in October and November and Pond 6 of the Enhancement Area in November. Turbidity was acceptable in all ponds.

**Table 2.1: Summary of water quality results.**

Location	Pond	Temperature			Salinity			Dissolved O2			pH		
		Sep	Oct	Nov	Sep	Oct	Nov	Sep	Oct	Nov	Sep	Oct	Nov
M8 Marsh Street habitat area	A	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*	Pass*
	B	Pass*	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass*	Pass*
	C	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*	Pass*
RTA	Western	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*
	Eastern	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*	Pass*
Enhancement Area	1	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	2	Pass*	Dry	Dry	Pass	Dry	Dry	Pass	Dry	Dry	Pass	Dry	Dry
	3	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	4	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*	Pass*
	5	Pass*	Pass*	Dry	Pass	Pass	Dry	Pass	Pass	Dry	Pass	Pass*	Dry
	6	Pass*	Pass*	Pass*	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass
Kogarah Golf Course	Circular	Pass*	Pass*	Pass*	Pass	Pass	Pass*	Pass	Pass	Pass	Pass	Pass	Pass*
	Long	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*
	Mangrove Pond	Pass*	Pass*	Pass*	Pass	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass*
	Eastern Pond	Pass*	Pass*	Pass*	Pass	Pass	Pass*	Pass	Pass	Pass	Pass	Pass	Pass*
	Skinny	-	-	Pass*	-	-	Pass	-	-	Pass	-	-	Pass*
	Northern	-	-	-	-	-	-	-	-	-	-	-	-
Riverine Park and surrounds and Barton Park	Eastern Channel	-	-	Dry	-	-	Dry	-	-	Dry	-	-	Dry
	Southern Phragmites	Pass*	Pass*	Pass*	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*
	Bend Swamp	Pass*	Pass*	Dry	Pass	Pass	Dry	Pass	Pass	Dry	Pass	Pass	Dry
	Southern Jungle	Pass*	Pass	Dry	Pass	Pass	Dry	Pass	Pass	Dry	Pass	Pass	Dry
	Landing Lights East	Pass*	-	Pass*	Pass	-	Pass	Pass	-	Pass	Pass	-	Pass*
	Landing Lights West	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	Driving Range Wetland	Pass*	Pass*	Dry	Pass	Pass	Dry	Pass	Pass	Dry	Pass	Pass	Dry

\*Indicates outside higher survival threshold but within overall survival threshold as described in Mahony and Beranak.



## 2.2 Tadpole Releases

Table 2.2 shows the number of tadpoles released during the September-November 2022 quarter and the release location.

**Table 2.2: Number and location of tadpole releases**

Date	Site	Number
12 Oct 2022	M8 Marsh Street habitat area Pond A	100
27 Oct 2022	M8 Marsh Street habitat area Pond A	270
27 Oct 2022	M8 Marsh Street habitat area Pond B	420
17 Nov 2022	M8 Marsh Street habitat area Pond A	380
17 Nov 2022	M8 Marsh Street habitat area Pond B	340
25 Nov 2022	M8 Marsh Street habitat area Pond A	44
25 Nov 2022	M8 Marsh Street habitat area Pond B	8

## 2.3 Tadpole Monitoring

The results of the tadpole monitoring surveys are shown in Tables 2.3a, 2.3b and 2.3c. Tadpoles of the GGBF were detected in Ponds A and B of the M8 Marsh Street habitat area after the tadpole releases into those two ponds. No GGBF tadpoles were released elsewhere and no GGBF tadpoles were detected elsewhere. Tadpoles of the Peron's Tree Frog (*Litoria peronii*) were recorded in all three ponds in the M8 Marsh Street habitat area and the western RTA Pond. Tadpoles of the Striped Marsh Frog (*Limnodynastes peronii*) were recorded in repeatedly in Pond 4 of the Enhancement Area, as well as Ponds 5 and 6; Ponds B and C of the M8 Marsh Street habitat area; the eastern RTA Pond; and the Southern Phragmites, Bend Swamp and Southern Jungle in the Riverine Park and surrounds. Tadpoles of the Common Eastern Froglet (*Crinia signifera*) was recorded in the RTA Ponds and this species was also heard calling opportunistically in the nearby Enhancement Area.

**Table 2.3a: Summary of tadpole net sweep results 30 September 2022.**

Area	Pond	Tadpoles Present	Species	Number and Stage			
				A	B	C	D
M8 Marsh Street habitat area	A	No	-	-	-	-	-
	B	Yes	<i>Limnodynastes peronii</i>	-	3	1	-
	C	Yes	<i>Limnodynastes peronii</i>	-	1	-	-
RTA Ponds	Western	Yes	<i>Litoria peronii</i>	-	3	-	-
	Eastern	Yes	<i>Limnodynastes peronii</i>	-	4	-	-
Enhancement Area	1	Too dry	-	-	-	-	-
	2	No	-	-	-	-	-
	3	Too dry	-	-	-	-	-
	4	Yes	<i>Limnodynastes peronii</i>	-	20	-	-
	5	No	-	-	-	-	-
	6	No	-	-	-	-	-
Kogarah Golf Course	Circular	No	-	-	-	-	-
	Long	No	-	-	-	-	-
	Eastern	No	-	-	-	-	-
	Mangrove	No	-	-	-	-	-
Riverine Park and surrounds and Barton Park	No.9 Pond	N/s	-	-	-	-	-
	Eastern Channel	N/s	-	-	-	-	-
	Southern Phragmites	Yes	<i>Limnodynastes peronii</i>	-	1	-	-
	Bend Swamp	No	-	-	-	-	-
	Southern Jungle	Yes	<i>Limnodynastes peronii</i>	-	2	-	-
	Landing Lights East	No	-	-	-	-	-
	Landing Lights West	Too dry	-	-	-	-	-
Driving Range Wetland	No	-	-	-	-	-	

Table 2.2b: Summary of tadpole net sweep results 3 November 2022.

Area	Pond	Tadpoles Present	Species	Number and Stage			
				A	B	C	D
M8 Marsh Street habitat area	A	Yes	<i>Litoria peronii</i>	-	25+	-	-
	B	Yes	<i>Litoria aurea</i>	-	25+	-	-
			<i>Litoria peronii</i>	-	25+	-	-
C	Yes	<i>Litoria peronii</i>	-	15	-	-	
RTA Ponds	Western	Yes	<i>Litoria peronii</i>	-	6	-	-
			<i>Litoria</i> sp.	-	4	-	-
	Eastern	Yes	<i>Crinia signifera</i>	-	-	3	-
Enhancement Area	1	Too dry	-	-	-	-	-
	2	Too dry	-	-	-	-	-
	3	Too dry	-	-	-	-	-
	4	Yes	<i>Limnodynastes peronii</i>	14	50+	-	-
	5	Yes	<i>Limnodynastes peronii</i>	-	20+	-	-
	6	Yes	<i>Limnodynastes peronii</i>	-	34	-	-
Kogarah Golf Course	Circular	No	-	-	-	-	-
	Long	No	-	-	-	-	-
	Eastern	No	-	-	-	-	-
	Mangrove	No	-	-	-	-	-
Riverine Park and surrounds and Barton Park	No.9 Pond	N/s	-	-	-	-	-
	Eastern Channel	N/s	-	-	-	-	-
	Southern Phragmites	Yes	<i>Limnodynastes peronii</i>	-	25+	-	-
	Bend Swamp	No	<i>Limnodynastes peronii</i>	-	25+	-	-
	Southern Jungle	Yes	<i>Limnodynastes peronii</i>	-	25+	-	-
	Landing Lights East	N/s	-	-	-	-	-
	Landing Lights West	Too dry	-	-	-	-	-
Driving Range Wetland	No	-	-	-	-	-	

Table 2.4c: Summary of tadpole net sweep results 28 November 2022.

Area	Pond	Tadpoles Present	Species	Number and Stage			
				A	B	C	D
M8 Marsh Street habitat area	A	Yes	<i>Litoria aurea</i>	-	7	-	-
			<i>Litoria peronii</i>	20	2	-	-
	B	Yes	<i>Litoria aurea</i>	-	5	1	-
<i>Limnodynastes peronii</i>			-	3	1	1	
RTA Ponds	Western	Yes	<i>Litoria peronii</i>	-	1	-	-
	Eastern	No	-	-	-	-	-
Enhancement Area	1	Too dry	-	-	-	-	-
	2	Too dry	-	-	-	-	-
	3	Too dry	-	-	-	-	-
	4	Yes	<i>Limnodynastes peronii</i>	-	13	-	-
	5	Too dry	-	-	-	-	-
	6	No	-	-	-	-	-
Kogarah Golf Course	Circular	No	-	-	-	-	-
	Long	No	-	-	-	-	-
	Eastern	No	-	-	-	-	-
	Mangrove	No	-	-	-	-	-
Riverine Park and surrounds and Barton Park	No.9 Pond	N/s	-	-	-	-	-
	Eastern Channel	N/s	-	-	-	-	-
	Southern Phragmites	No	-	-	-	-	-
	Bend Swamp	No	-	-	-	-	-
	Southern Jungle	No	-	-	-	-	-
	Landing Lights East	N/s	-	-	-	-	-
	Landing Lights West	Too dry	-	-	-	-	-
Driving Range Wetland	Too dry	-	-	-	-	-	

## 2.4 Nocturnal GGBF Monitoring in the M8 Marsh Street habitat area

Very few adult GGBFs were found in the M8 Marsh Street habitat area during the survey in October 2022, although male GGBFs were calling in Pond C on the night of the survey and GGBFs had been heard calling at the site in the weeks prior to the survey, by neighbours. A total of six GGBFs were observed or heard calling at Pond C on the night of the survey.

Striped Marsh Frogs and Peron's Tree Frogs were the only other frog species recorded in the M8 Marsh Street habitat area during the survey period.

## 2.5 Nocturnal Frog Monitoring in the Wider Study Area

Results of the frog monitoring survey in the wider study area are summarised in Table 2.4. One GGBF was recorded on Kogarah Golf Course (in the Circular Pond), and was an adult male that had first been captured and tagged in the previous (2021-2022) season, also at Kogarah Golf Course (in the Long Pond).

The most activity of frogs of other species was recorded at the RTA Ponds, where Striped Marsh Frogs, Peron's Tree Frogs, Eastern Dwarf Tree Frogs (*Litoria fallax*) and Common Eastern Froglets were found. Striped Marsh Frogs were also recorded at the Circular Pond on Kogarah Golf Course and the Southern Phragmites area in Riverine Park and surrounds.

**Table 2.5: Summary of frog survey results outside of the M8 Marsh Street Habitat Area**

Area	Pond	<i>Litoria aurea</i>	<i>Limnodynastes peronii</i>	<i>Litoria peronii</i>	<i>Litoria fallax</i>	<i>Crinia signifera</i>
Eastern Frog Corridor and Creek area	Creek (west)	-	-	-	-	-
	Creek (east)	-	-	-	-	-
	Underpass	-	-	-	-	-
RTA Ponds	Western	-	-	15	16	-
	Eastern	-	1	-	3	15
Enhancement Area	1	-	-	-	-	-
	2	-	-	-	-	-
	3	-	-	-	-	-
	4	-	-	-	-	-
	5	-	-	-	-	-
	6	-	-	-	-	-
	Creek	-	-	-	-	-
Kogarah Golf Course	Circular	1	6	-	-	-
	Long	-	-	-	-	-
	Eastern	-	-	-	-	-
	Skinny	-	-	-	-	-
	Northern	-	-	-	-	-
	Mangrove	-	-	-	-	-
Riverine Park and surrounds and Barton Park	Number 9 Pond	-	-	-	-	-
	Eastern Channel	-	-	-	-	-
	Southern Phragmites	-	3	-	-	-
	Bend Swamp	-	-	-	-	-
	Southern Jungle	-	-	-	-	-
	Driving Range Wetland	-	-	-	-	-
	Landing Lights West	-	-	-	-	-
	Landing Lights East	-	-	-	-	-
Total						



Figure 2.1: Locations where GGBFs were observed, September to November 2022.

## 2.6 Maintenance Observations

### 2.6.1 M8 Marsh Street habitat area

At the time of the site inspections all ponds within the M8 Marsh Street habitat area were holding water and no Plague Minnow (*Gambusia holbrooki*) were observed. Water levels were high during the survey period.

Terrestrial vegetation management was undertaken by Total Earth Care including re-establishment of native species in areas of jute matting placed east of each pond. Other works included hand-weeding emerging woody weeds, “dead-heading” tall wind-blown herbaceous weeds, cutting back overgrown vegetation along the inside of the frog fence, and maintenance of vegetation in the planted areas.

### 2.6.2 RTA Ponds

No Plague Minnow were recorded in either of the RTA Ponds during water quality and tadpole surveys in the survey period from September to November 2022.

### 2.6.3 Enhancement Area

All ponds within the Enhancement Area are now overgrown with weeds and grasses. Several ponds were dry at times during the survey period. Duckweed was also present in Pond 4.

## 2.7 Security and Habitat

Prior to the night surveys in October 2022 a contractor entered the M8 Marsh Street habitat area and slashed vegetation. It is AMBS’ understanding that the contractor was intended to mow or slash a grassy area on the other side of Eve Street, but went to the wrong site, forced their way into the GGBF habitat area (despite the warnings of a neighbour), and slashed a substantial area of grassy vegetation.

It is fortunate that this occurred early in the season. No breeding had been observed and no tadpoles had yet been released. The contractor left a buffer area of un-slashed vegetation around each pond, as well as leaving several large clumps of tussock grass intact, and did not slash the vegetation to ground level. Most of the vegetation was slashed to around 30 cm in height, which is consistent with the height of a first slash that would be undertaken during a “frog clearance” event.

On the night of the first survey in October 2022, the surveyors were on-site when they heard someone at the gate. When the surveyors approached, whoever was at the gate got in a car and drove off rapidly. The chain on the gate had been cut. Security were notified and the chain and locks have been replaced.

## 3 Discussion

The results of the surveys in the initial part of the 2022-23 season show that, as in previous years, GGBFs from the previous season or seasons have survived the winter period, continue to occupy the site and male GGBFs are calling from the ponds. However, the number of GGBFs observed this spring is much less than in previous years. This is almost certainly an outcome of the previous season, in which very few tadpoles from the captive breeding program were brought in, resulting in fewer adult frogs being on the site at the end of the previous season.

## 4 Conclusion

The objectives of the monitoring program are stated in the Plan of Management (ELA 2018) as “to assess the ongoing survival of the Arncliffe population at the Kogarah Golf Course and within the RTA ponds” and in the HCCBP as “to provide information for adaptive management on the effectiveness of the habitat created as part of the project” (i.e., the M8 Marsh Street habitat area).

The M8 Marsh Street habitat continues to provide habitat for GGBFs, although the number of GGBFs observed was considerably lower than in previous years when the population was bolstered by animals from the captive breeding program. The lack of GGBFs observed in the RTA ponds suggests the survival of GGBF population at Arncliffe is currently heavily dependent on the M8 Marsh Street habitat area.

## 5 References

ELA (2018) Green and Golden Bell Frog Plan of Management - Arncliffe. Prepared by Eco Logical Australia for NSW Roads and Maritime Services.

Mahony, M. and Beranak C. (undated). *Water Quality parameters measured to assess suitability for Green and Golden Bell Frog occupancy*. Unpublished report provided to NSW Roads and Maritime Services.

## Appendix 1: Water Quality Results

Table A1-1: Water Quality Results for September 2022

Location	Date	Pond	General Condition	mVpH	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
Eve Street	30/09/2022	A	Pond full	84.7	7.6	234.9	46.1	4.49	127	106	63	0.06	17.8	16.5	No
	30/09/2022	B	Pond full	95.2	7.4	244.9	55.2	5.21	7310	6175	3055	4.05	7.7	16.8	No
	30/09/2022	C	Overfull	85.3	7.6	233.80	28.8	2.5	272	232	136	0.13	10.2	17.1	No
RTA	30/09/2022	Western	Pond full	86.1	7.5	234.1	60.3	5.85	99	84	49	0.05	17.3	16.8	No
	30/09/2022	Eastern	Pond full	86.8	7.5	238	55.3	5.4	111	93	56	0.05	16.3	16.4	No
Enhancement Area	30/09/2022	1	Dry												
	30/09/2022	2	Almost dry	94.7	7.4	251.6	38.2	3.7	23	24	14	0.01	83.1	16	No
	30/09/2022	3	Dry												
	30/09/2022	4	Pond full	85.2	7.5	235.2	36.7	3.6	87	70	42	0.04	87.2	15.9	No
	30/09/2022	5	1/3 full	85	7.6	239.5	34	3.2	193	162	96	0.09	380	16.5	No
	30/09/2022	6	Pond full	96.2	7.3	253.9	32.5	3	658	511	309	0.32	230	15.4	No
Kogarah Golf Course	30/09/2022	Circular	Pond full	86.1	7.5	241.4	35.4	3.5	3051	2591	1520	1.4	195	15.7	Yes
	30/09/2022	Long	Pond full	85.3	7.5	238.2	39	3.72	3880	3303	1946	2.07	20.3	17	Yes
	30/09/2022	Mangrove Pond	Pond full	85	7.6	243.2	65	6.06	13429	11844	6322	7.4	25.7	16.1	Yes
	30/09/2022	Eastern	Pond full	86.8	7.5	235.4	40	3.87	3650	3134	1832	1.94	30.1	17.5	Yes
	30/09/2022	Skinny	Not sampled												
	30/09/2022	Northern	Dry												
Barton Park	30/09/2022	No.9 Pond	Not sampled												
	30/09/2022	Eastern Channel	Not sampled												
	30/09/2022	Southern Phragmites	Pond full	84.9	7.6	240.3	28.5	2.83	1350	1104	675	0.68	15.2	15.4	No
	30/09/2022	Northern Phragmites	Not sampled												
	30/09/2022	Bend Swamp	3/4 full	85.6	7.5	243	26.2	2.49	920	742	461	0.4	18.7	14.8	No

	30/09/2022	Southern Jungle	Pond full	86.2	7.8	240	73.5	6.72	2196	1970	1099	1.13	33.3	19.6	No
	30/09/2022	Landing Lights East	Pond full	91	7.6	245.7	24.7	2.33	1619	1350	797	0.81	22.1	17	Yes
	30/09/2022	Landing Lights West	Dry												
	30/09/2022	Driving Range Wetland	1/2 full	85.3	7.8	237.1	9.1	0.9	2219	1818	110	1.13	12.6	15.5	No

**Table A1-2: Water Quality Results for October 2022**

Location	Date	Pond	General Condition	mVpH	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
Eve Street	3/11/2022	A	Pond full	16.1	6.8	14.4	6.3	0.61	153	126	76	0.07	13.4	15.9	No
	3/11/2022	B	Pond full	26.6	6.6	125.7	5.9	0.55	5025	4234	2513	2.72	2.2	16.7	No
	3/11/2022	C	Pond full	7.1	6.9	117.60	2.7	0.26	255	224	128	0.12	1.1	18.5	No
RTA	3/11/2022	Western	Pond full	29.4	7.5	27.7	7.7	0.75	92	76	46	0.04	7.3	16.1	No
	3/11/2022	Eastern	Pond full	30.9	6.5	92.4	2.5	0.25	107	86	54	0.05	9.4	14.7	No
Enhancement Area	3/11/2022	1	Dry												
	3/11/2022	2	Dry												
	3/11/2022	3	Dry												
	3/11/2022	4	Pond full	19.1	6.7	131.5	3.1	0.32	150	116	75	0.07	19.3	13.2	No
	3/11/2022	5	Very low	21.6	6.7	90.1	5.7	0.58	74	68	46	0.04	20.8	12.5	No
	3/11/2022	6	Pond full	-9.8	7.2	-75.1	1.5	0.15	1017	804	493	0.49	15.4	14.1	No
Kogarah Golf Course	3/11/2022	Circular	Pond full	-13.6	7.3	-26.9	4.4	0.44	3998	3149	1996	2.13	34.2	13.9	Yes
	3/11/2022	Long	Pond full	-72.3	8.3	19.9	20.5	1.92	2508	2171	1762	1.31	4.4	17.9	Yes
	3/11/2022	Mangrove Pond	Pond full	-21.3	7.4	-58.2	4.4	0.39	25140	21300	12936	12.53	39.9	17.1	Yes
	3/11/2022	Eastern	Pond full	-71.1	8.3	56.8	14.4	1.36	2578	2196	1291	1.34	7	17.2	Yes
	3/11/2022	Skinny	Not sampled												
	3/11/2022	Northern	Not sampled												
Barton Park	3/11/2022	No.9 Pond	Not sampled												



	3/11/2022	Eastern Channel	Not sampled												
	3/11/2022	Southern Phragmites	Pond full	-15.3	7.3	-106.2	9.8	0.97	291	658	396	0.39	15.2	16.6	No
	3/11/2022	Northern Phragmites	Not sampled												
	3/11/2022	Bend Swamp	Pond full	-10.2	7.2	-63.1	2.5	0.24	627	536	313	0.31	12.8	17.4	No
	3/11/2022	Southern Jungle	Pond full	-45.1	7.8	-128.2	11.6	1.13	1157	1188	579	0.57	36.4	20.1	No
	3/11/2022	Landing Lights East	No access												
	3/11/2022	Landing Lights West	Dry												
	3/11/2022	Driving Range Wetland	Almost dry	-9.1	7.2	-91	3.8	0.38	2252	1783	1128	1.16	24.6	14.2	No

**Table A1-3: Water Quality Results for November 2022**

Location	Date	Pond	General Condition	mVpH	pH	ORP [mV]	% Sat (DO%)	Diss. O2 [mg/l]	Conduct [uS/cm]	Resist [ms/cm]	TDS ppm	Salinity (PSU)	Turbidity [FNU]	Temp [C°]	Gambusia
Eve Street	2/12/2022	A	50% full	116.3	5	328.2	19	1.68	230	0.0043	115	0.11	39	19.74	No
	2/12/2022	B	50% full	117.6	5	327.4	22.7	2.12	4424	0.0002	2211	2.37	321	19.96	No
	2/12/2022	C	50% full	117.7	5.1	324	32	2.95	268	0.0037	134	0.13	176	21.5	No
RTA	2/12/2022	Western	50% full	112.8	5.07	326.4	22.1	1.88	120	0.0083	60	0.06	11.8	18.75	No
	2/12/2022	Eastern	25% full	113.4	5.06	327.4	1.9	0.22	114	0.0088	57	0.05	18.2	17.5	No
Enhancement Area	2/12/2022	1	Dry												
	2/12/2022	2	Dry												
	2/12/2022	3	Dry												
	2/12/2022	4	25% full	113.6	5.07	327.7	18.6	1.77	344	0.0025	175	0.19	4	17.85	No
	2/12/2022	5	Dry												
	2/12/2022	6	50% full	112.7	5.07	327.3	9.1	0.81	19.24	0.0001	9624	11.5	738	17.42	No
Kogarah Golf Course	2/12/2022	Circular	50% full	122.4	4.9	339.7	13.4	1.23	8309	0.0001	4154	4.65	95.4	17.68	Yes
	2/12/2022	Long	50% full	113.3	5.04	336.1	22.4	2.08	3661	0.0003	1824	1.93	12.6	18.67	Yes

	2/12/2022	Mangrove Pond	50% full	112.9	5.07	328.7	8.4	0.68	50	0	25	32.82	51.4	17.7	No
	2/12/2022	Eastern	75% full	113.7	5.08	330.3	50.1	4.46	11.92	0.0001	5965	6.85	33.4	19.46	Yes
	2/12/2022	Skinny	25% full	112.4	5.07	330.6	14.6	1.8	876	0.0011	438	0.43	24.2	16.79	Yes
	2/12/2022	Northern	Not sampled												
<b>Barton Park</b>	2/12/2022	No.9 Pond	Not sampled												
	2/12/2022	Eastern Channel	Dry												
	2/12/2022	Southern Phragmites	25% full	114.1	5.04	325.5	5.5	0.54	1180	0.0008	590	0.59	14.4	16.53	No
	2/12/2022	Northern Phragmites	Not sampled												
	2/12/2022	Bend Swamp	Dry												
	2/12/2022	Southern Jungle	Dry												
	2/12/2022	Landing Lights East	50% full	115	5.04	326.7	8.5	0.66	1613	0.0006	806	0.82	16	19.21	No
	2/12/2022	Landing Lights West	Dry												
	2/12/2022	Driving Range Wetland	Dry												