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Our Ref: 000118.10

21 December 2022

Narre Warren Central Pty Ltd
Att Mr Paul Nio
52-54 Rathdowne Street
Carlton VIC 3053

Via email: pnio@osanrae.com.au
CC: cmistica@fidus.com.au; inga@natureadvisory.com.au

Dear Paul

Re: 2022 Annual Report of Water Quality and Dwarf Galaxias Monitoring for Casey Green

Aquatica Environmental was engaged by Narre Warren Central to undertake the 2022 annual monitoring of water quality and Dwarf Galaxias (*Galaxiella pusilla*) at the site of the Casey Green residential development at 96-166 Centre Road, Narre Warren, Victoria (the project).

The annual monitoring was undertaken to meet specific management actions outlined in the project's commonwealth, state and locally approved Dwarf Galaxias Management Plan (DGMP; BL&A 2015) and Dwarf Galaxias Salvage and Translocation Plan (DGSTP; Aquatica Environmental 2015). These actions were interpreted by the federal Department of Agriculture, Water and the Environmental (DAWE) to include the following monitoring requirements (DE 2016, including Aquatica Environmental 2015):

- **Dwarf Galaxias**: Survey for Dwarf Galaxias and predatory fish populations at established sites in November/December annually during construction and for least five years post completion of construction on the site.
- **Aquatic and riparian habitat condition**: Assess condition in conjunction with the Dwarf Galaxias survey.
- **Water quality**: Assess water quality at established sites fortnightly and/or after rainfall events >10mm during construction, including during Dwarf Galaxias monitoring (Condition 3b and 3d).

This report has been produce to provide a summary record of the 2022 water quality and Dwarf Galaxias monitoring in accordance with the DGMP and DGSTP.

1 Methodologies

1.1 Rainfall Monitoring

There is no rainfall gauge located on the site. The nearest Bureau of Meteorology (BOM) weather stations, with current rainfall monitoring data, are located at Ferny Creek, Moorabbin and Scoresby (Figure 1). To determine whether an approximately >10mm rainfall event had occurred at the site the average of the daily totals from the three BOM weather stations was used.

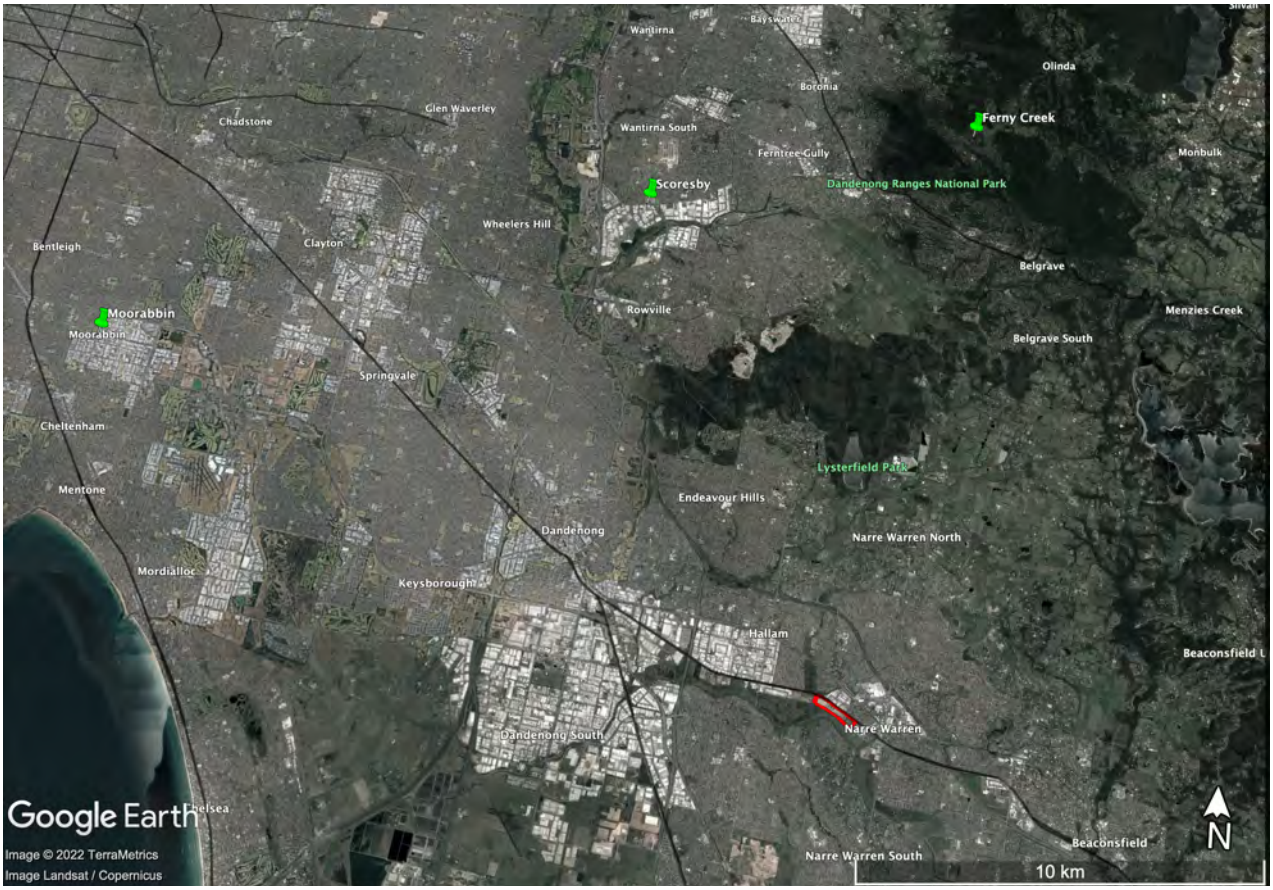

Figure 1 Bureau of meteorology weather station locations (green) relative to the site (red)

1.2 Sampling Sites

During initial baseline and salvage surveys in 2016-17 a number of water quality and Dwarf Galaxias survey sites were established (Aquatica Environmental 2017). However, in the time since these surveys were undertaken development of the site (and neighbouring sites) has progressed significantly and not all of the originally established site still exist. Figure 2 shows the sites that were monitored during the 2022 monitoring year.

0 50 100 200
Metres

Water Quality (WQ) monitoring sites
DG monitoring
Retained Habitat
Site
Structure
Connector or drain
River
Stream
Wetland

Spatial Reference
Name: GDA2020 MGA Zone 55
PCS: GDA2020 MGA Zone 55
GCS: GDA2020
Datum: GDA2020
Projection: Transverse Mercator

N

Casey Green, 96-166 Centre Road, Narre Warren

Dwarf Galaxias and Water Quality monitoring sites

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1.3 Dwarf Galaxias and Predatory Fish Monitoring

Dwarf Galaxias and predatory fish monitoring was undertaken at Dwarf Galaxias monitoring location Figure 1. This sites align with previous year's monitoring, with Sites DG1 and DG2 corresponding to where Dwarf Galaxia were released during the 2016 salvage and translocation program (Aquatica Environmental 2017). These site are now effectively merged into one larger monitoring location, representative of the fully connected and wetter portion of the retained habitat and newer swales.

Sampling for adult Dwarf Galaxias and predatory was undertaken using hand-held dip-nets, sampling in and around areas of suitable habitat, and bait traps set overnight with phosphorescent baits. Sampling for larval Dwarf Galaxias was also undertaken by collecting a sample of water (approximately 10 litres) and placing it in a shallow white tray, where any larva would have been visible.

Active searching using dip-nets and bait-trapping are standard methods for sampling Dwarf Galaxias and are the most effective methods outlined in the Survey Guidelines for Australia's Threatened Fish (DSEWPaC 2004) and Biodiversity Precinct Structure Planning Kit (DSE 2010). They are also most appropriate method for sampling in the small and heavily vegetated water bodies, like those at the site.

Dwarf Galaxias sampling was undertaken by Aquatica Environmental at another nearby site, where Dwarf Galaxias also occur and as reference/baseline as to whether Dwarf Galaxias should have been detectable on the site.

1.4 Aquatic and Riparian Habitat Condition Monitoring

Aquatic and riparian habitat condition was visually and assessed during and at the Dwarf Galaxias monitoring locations during most water quality sampling events and the annual Dwarf Galaxias survey. The assessment was primarily based on a comparison of the aquatic and riparian vegetation condition during this survey as compared to previous surveys (i.e. temporal comparison).

1.5 Water Quality Monitoring

Water quality monitoring was undertaken fortnightly and/or following rainfall events >10 millimetres, and during the annual Dwarf Galaxias survey. In situ water quality data was collected by using a calibrated Hanna Instruments HI9829 multiparameter water quality metre. The parameters collected included temperate, electrical conductivity, pH, dissolved oxygen and turbidity.

2 Results

2.1 Sampling Frequency and Conditions

During the 2022 monitoring year[1] a total of 31 sampling events had occurred, including 12 scheduled, 18 post >10mm rainfall events and one during annual Dwarf Galaxias monitoring (Table 1).

The overall number of post >10mm rainfall events sampling was higher than in previous years, namely due to an extremely wet and high rainfall period In spring (i.e. August to December 2022). For the 2022 survey season there was a total of 35 days with >10mm rain (Figure 3), as compared to 2021 where there was 24 days.

The annual Dwarf Galaxias monitoring and associated water quality sampling occurred on the 3rd and 4th November 2022.

[1] The final water quality monitoring event, scheduled for 29th December will be included in the 2023 monitoring data.

Table 1 2022 sampling schedule

DAY	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	KEY
Saturday	1/1/2022									1/10/2022			Standard WQ Monitoring Event
Sunday	2/1/2022				1/5/2022					2/10/2022			Next scheduled
Monday	3/1/2022				2/5/2022			1/8/2022		3/10/2022			Post >10mm rainfall event
Tuesday	4/1/2022	1/2/2022	1/3/2022		3/5/2022			2/8/2022		4/10/2022	1/11/2022		Incident
Wednesday	5/1/2022	2/2/2022	2/3/2022		4/5/2022	1/6/2022		3/8/2022		5/10/2022	2/11/2022		Annual DG Survey
Thursday	6/1/2022	3/2/2022	3/3/2022		5/5/2022	2/6/2022		4/8/2022	1/9/2022	6/10/2022	3/11/2022	1/12/2022	Other
Friday	7/1/2022	4/2/2022	4/3/2022	1/4/2022	6/5/2022	3/6/2022	1/7/2022	5/8/2022	2/9/2022	7/10/2022	4/11/2022	2/12/2022	Rainfall > 10mm
Saturday	8/1/2022	5/2/2022	5/3/2022	2/4/2022	7/5/2022	4/6/2022	2/7/2022	6/8/2022	3/9/2022	8/10/2022	5/11/2022	3/12/2022	
Sunday	9/1/2022	6/2/2022	6/3/2022	3/4/2022	8/5/2022	5/6/2022	3/7/2022	7/8/2022	4/9/2022	9/10/2022	6/11/2022	4/12/2022	
Monday	10/1/2022	7/2/2022	7/3/2022	4/4/2022	9/5/2022	6/6/2022	4/7/2022	8/8/2022	5/9/2022	10/10/2022	7/11/2022	5/12/2022	
Tuesday	11/1/2022	8/2/2022	8/3/2022	5/4/2022	10/5/2022	7/6/2022	5/7/2022	9/8/2022	6/9/2022	11/10/2022	8/11/2022	6/12/2022	
Wednesday	12/1/2022	9/2/2022	9/3/2022	6/4/2022	11/5/2022	8/6/2022	6/7/2022	10/8/2022	7/9/2022	12/10/2022	9/11/2022	7/12/2022	
Thursday	13/1/2022	10/2/2022	10/3/2022	7/4/2022	12/5/2022	9/6/2022	7/7/2022	11/8/2022	8/9/2022	13/10/2022	10/11/2022	8/12/2022	
Friday	14/1/2022	11/2/2022	11/3/2022	8/4/2022	13/5/2022	10/6/2022	8/7/2022	12/8/2022	9/9/2022	14/10/2022	11/11/2022	9/12/2022	
Saturday	15/1/2022	12/2/2022	12/3/2022	9/4/2022	14/5/2022	11/6/2022	9/7/2022	13/8/2022	10/9/2022	15/10/2022	12/11/2022	10/12/2022	
Sunday	16/1/2022	13/2/2022	13/3/2022	10/4/2022	15/5/2022	12/6/2022	10/7/2022	14/8/2022	11/9/2022	16/10/2022	13/11/2022	11/12/2022	
Monday	17/1/2022	14/2/2022	14/3/2022	11/4/2022	16/5/2022	13/6/2022	11/7/2022	15/8/2022	12/9/2022	17/10/2022	14/11/2022	12/12/2022	
Tuesday	18/1/2022	15/2/2022	15/2/2022	12/4/2022	17/5/2022	14/6/2022	12/7/2022	16/8/2022	13/9/2022	18/10/2022	15/11/2022	13/12/2022	
Wednesday	19/1/2022	16/2/2022	16/3/2022	13/4/2022	18/5/2022	15/6/2022	13/7/2022	17/8/2022	14/9/2022	19/10/2022	16/11/2022	14/12/2022	
Thursday	20/1/2022	17/2/2022	17/3/2022	14/4/2022	19/5/2022	16/6/2022	14/7/2022	18/8/2022	15/9/2022	20/10/2022	17/11/2022	15/12/2022	
Friday	21/1/2022	18/2/2022	18/3/2022	15/4/2022	20/5/2022	17/6/2022	15/7/2022	19/8/2022	16/9/2022	21/10/2022	18/11/2022	16/12/2022	
Saturday	22/1/2022	19/2/2022	19/3/2022	16/4/2022	21/5/2022	18/6/2022	16/7/2022	20/8/2022	17/9/2022	22/10/2022	19/11/2022	17/12/2022	
Sunday	23/1/2022	20/2/2022	20/3/2022	17/4/2022	22/5/2022	19/6/2022	17/7/2022	21/8/2022	18/9/2022	23/10/2022	20/11/2022	18/12/2022	
Monday	24/1/2022	21/2/2022	21/3/2022	18/4/2022	23/5/2022	20/6/2022	18/7/2022	22/8/2022	19/9/2022	24/10/2022	21/11/2022	19/12/2022	
Tuesday	25/1/2022	22/2/2022	22/3/2022	19/4/2022	24/5/2022	21/6/2022	19/7/2022	23/8/2022	20/9/2022	25/10/2022	22/11/2022	20/12/2022	
Wednesday	26/1/2022	23/2/2022	23/3/2022	20/4/2022	25/5/2022	22/6/2022	20/7/2022	24/8/2022	21/9/2022	26/10/2022	23/11/2022	21/12/2022	
Thursday	27/1/2022	24/2/2022	24/3/2022	21/4/2022	26/5/2022	23/6/2022	21/7/2022	25/8/2022	22/9/2022	27/10/2022	24/11/2022	22/12/2022	
Friday	28/1/2022	25/2/2022	25/3/2022	22/4/2022	27/5/2022	24/6/2022	22/7/2022	26/8/2022	23/9/2022	28/10/2022	25/11/2022	23/12/2022	
Saturday	29/1/2022	26/2/2022	26/3/2022	23/4/2022	28/5/2022	25/6/2022	23/7/2022	27/8/2022	24/9/2022	29/10/2022	26/11/2022	24/12/2022	
Sunday	30/1/2022	27/2/2022	27/3/2022	24/4/2022	29/5/2022	26/6/2022	24/7/2022	28/8/2022	25/9/2022	30/10/2022	27/11/2022	25/12/2022	
Monday	31/1/2022	28/2/2022	28/3/2022	25/4/2022	30/5/2022	27/6/2022	25/7/2022	29/8/2022	26/9/2022	31/10/2022	28/11/2022	26/12/2022	
Tuesday			29/3/2022	26/4/2022	31/5/2022	28/6/2022	26/7/2022	30/8/2022	27/9/2022		29/11/2022	27/12/2022	
Wednesday			30/3/2022	27/4/2022		29/6/2022	27/7/2022	31/8/2022	28/9/2022		30/11/2022	28/12/2022	
Thursday			31/3/2022	28/4/2022		30/6/2022	28/7/2022		29/9/2022			29/12/2022	
Friday				29/4/2022			29/7/2022		30/9/2022			30/12/2022	
Saturday				30/4/2022			30/7/2022					31/12/2022	
Sunday							31/7/2022						

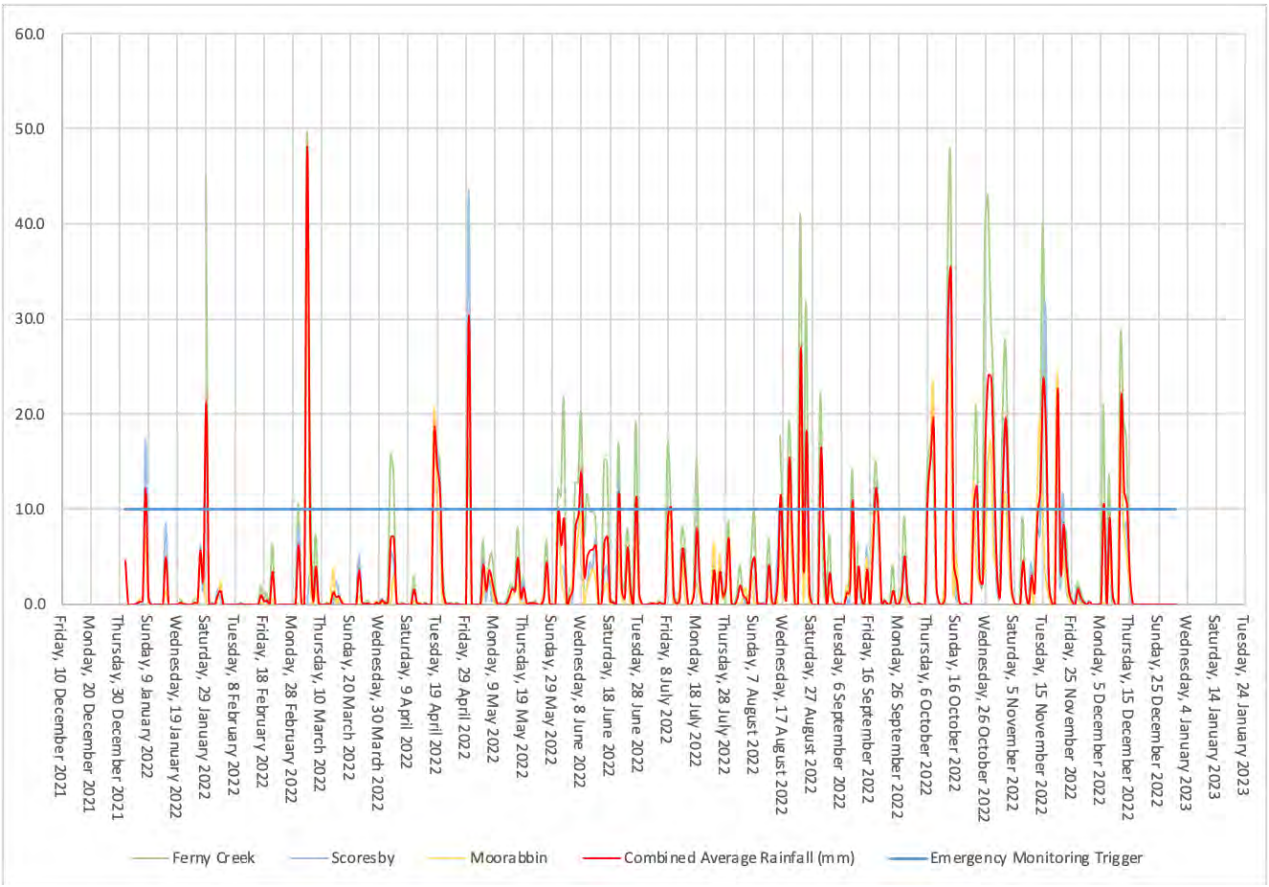

Figure 3 2022 rainfall chart

2.2 Dwarf Galaxias and Predatory Fish

The annual Dwarf Galaxias survey was undertaken on 3rd and 4th November 2022. The weather during the survey was mild to warm with temperatures ranging between 17°C (day time maximum) and 5.8°C (night time minimum). Approximately 7 millimetres of rain fell across the 24 hour survey period (BOM 2022).

Due to recent significant rain, the retained habitat and survey area was extremely inundated (Plate 3), meaning resident fish were disburse and more difficult to detect. The seasonal timing for the survey (late spring) was typically ideal and young of year and adults would be expected to be found following the usual late autumn to spring breeding season, however, .

A total of 11 Dwarf Galaxias were recorded during the November survey, including 3 adult males and 8 juveniles from the most recent breeding season, which likely occurred through August to October based on the juvenile's size (Plate 1).

Based on the number and condition of the individuals recorded during this survey, it appears there has been another good year for the species on the site. I.e. similarly 2019, 2020 and 2021 and commensurate with the La Nina climate cycle south-eastern Australia has been experiencing. This has also been our experience at other sites in the region, mostly due to above average winter/spring rains and mild temperatures.

The results also confirm that the constructed swales are continuing to function well and as intended, by supplying consistent water levels to the retained habitat, but limiting pest fish ingress to the retained habitat drain.

The results of the November 2022 survey are provided in Table 2 and compared to previous rounds of monitoring.

Similarly to all previous surveys (i.e. 2021-2018, excluding 2017) the Section 75 of the *Fisheries Act 1995* listed as 'noxious' Mosquitofish (*Gambusia holbrooki*) were recorded in small numbers the retained habitat. They were also observed in large numbers in the open areas of the Centre Road drain (both sides of the road), culvert openings across the site and in the constructed swales.

A single oriental Weatherloach was also recorded (Plate 2). The species is also listed as 'noxious under Section 75 of the *Fisheries Act 1995.*

Table 2 Species and number of individuals recorded

Common Name	Scientific Name	Sampling Event					
		2022	2021	2020	2019	2018	2017
Dwarf Galaxias	*Galaxiella pusilla*	11	17	25	12	3	2
Mosquitofish	*Gambusia holbrooki*	10s	10s	12	6	3	-
Goldfish	*Carassius auratus*	-	-	-	2	4	-
Flathead Gudgeon							
Freshwater Burrowing Crayfish	*Engeus spp.*	-	-	-	1	1	-
Oriental Weatherloach	*Misgurnus anguillicaudatus*	1	-	1	-	-	-

Plate 1 Dwarf Galaxias adult male (top and juvenile (bottom)

Plate 2 Oriental Weatherloach

2.3 Aquatic and Riparian Habitat Condition

During the Dwarf Galaxias survey the monitoring location (also WQ6) was heavily inundated due to high spring rainfall (Plate 3), especially when compared to its usual water level (Plate 4). The inundation had been present for long enough to drown-out much of the lower-lying macrophytes, leaving mostly just the Phragmites, Juncus and Melaleuca visible above water. It is assumed that the lower-lying macrophytes will re-establish and return once water levels drop closer to baseline.

Aquatic and riparian habitat condition at the other five water quality monitoring sites along Centre Road (WQ1-5) remained mostly this same previous surveys.

Plate 3 Habitat vegetation and inundation at Site Dwarf Galaxias survey location in November 2022

Plate 4 Habitat vegetation at Site Dwarf Galaxias survey location in March 2022

2.4 Water Quality

The raw water quality data is provided in Appendix B. Table 1 provides a summary of the relevant statistical analysis and/or relevant Environmental Reference Standards (ERS; EPA 2021) objectives for the Urban segment, Lowlands of Western Port catchment.

Overall the data showed the following patterns:

- Temperature was on average very consist across the sites across the year, showing expected heating and cooling phases in summer and winter. The highest temperatures across the sites were experienced in January and the

lowest in July. The highest individual temperature was 26.39°C at Site 5 on the 12h January (the most sun exposed site) and the lowest was 6.34 °C at Site 6 on 13th July (the. Most shaded site). On average Site 1 had the highest temperatures, apparently due to the discharge of water from the culvert. Site 6 had the lowest due to shading by the dense vegetation at the site. There is no ERS objective for temperature.

- pH was on average consistent across all sites (mean range=6.80-6.98), not appearing to be linked to seasonal or weather variations and was withing the ERS objectives at all sites.
- Electrical conductivity was consistently higher at Sites 6 (mean=567 µS/cm compared to mean=366-458 µS/cm at Sites 1-5), most likely reflective of the lack of direct flows and the concentration of salts due to evaporation. However, the average at Site 6 was lower than previous years, possibly indicating the effects of dilution from much higher than average rainfall and the greater water volumes of the attached swales. The ERS objective of 75th %ile ≤500 µS/cm was exceeded at Sites 1, 2 and 6. The levels observed appeared not attributable to the development of the site, rather occurred naturally and/or other influences, and were clearly of no concern for Dwarf Galaxias due to their ongoing presence and increased abundance at the site.
- Percent dissolved oxygen was again consistently low across all sites (mean range=28.1-44.0%). The ERS objective of ≥70% was not met at any site. Similarly to electrical conductivity, the levels observed were not attributable to the development of the site, rather occurred naturally and/or other influences, and were clearly of no concern for the resident Dwarf Galaxias population.
- Turbidity was on average highest at Site 1 (mean=62.1 NTU), indicating a high turbidity input from the culvert and unknown upstream sources. Site 6 had the lowest average turbidity (mean=31.7 NTU). The data showed that turbidity reduces through the downstream flowing sites (i.e. Site 1 to 5) with no indication of any observable inputs from the development of the site. This indicated that the retained Centre Road drain vegetation and construction/vegetation of the project's swales are functioning as designed and resulting in an overall reduction turbidity as surface waters pass by the site. The ERS of ≤35 NTU was not met at any site due to catchment inputs and localised influences.

Table 3 2022 water quality sampling summary

Parameter		ERS Objective	Centre Road Drain Sites			Habitat Sites		
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Temperature (°C)	Min.	NA	9.89	7.74	7.71	7.28	8.43	6.34
	Max.		23.75	24.65	23.79	23.50	26.39	23.99
	Mean		16.33	15.22	15.22	15.08	15.77	14.82
pH	25th %tile	≥6.4	6.57	6.57	6.69	6.64	6.63	6.88
	75th %tile	≤7.9	7.21	7.00	7.03	7.01	7.05	7.12
	Mean	NA	6.90	6.81	6.83	6.80	6.84	6.98
Electrical Conductivity (µS/cm)	75th %	≤500	531	532	489	446	410	657
	Mean	NA	440	458	394	383	366	567
Dissolved Oxygen (%)	75th %tile	≥70	38.5	37.0	43.4	41.7	49.9	50.7
	Max.	130	83.7	55.4	55.2	60.3	67.6	101.5
	Mean	NA	30.6	28.1	34.1	33.9	40.2	44.0
Turbidity (NTU)	75th %tile	≤35	99.9	69.0	64.8	57.5	55.0	39.3
	Mean	NA	62.1	44.5	37.2	35.4	37.5	31.7

Orange highlight = parameter did not meet the ERS objective

3 Summary

The 2022 annual Dwarf Galaxias monitoring event detected 11 individual Dwarf Galaxias in the retained habitat drain (compared to 17 in 2021, 25 in 2020, 12 in 2019 and 3 in 2018). This was at about the average of the previous survey records indicating that conditions for the species are being maintained and likely continuing to improve, due to the establishment of further suitable habitat in the constructed swales. The primary reason for this is that the constructed swales result in more water and a more constant water level in the retained habitat drain in a manner

that is clearly suited to the resident Dwarf Galaxias population (i.e. still maintaining ephemerality but not allowing over drying).

Considering this and previous rounds of sampling for the project and historical records (Aquatica Environmental 2017, 2019, 2020, 2021 and 202), it is considered likely the abundance and distribution of the Dwarf Galaxias population in the habitat areas is somewhat dynamic, varying between years and due to seasonal influenced on water availability and therefore habitat. However, with the continued improvement of the retained habitat and expansion of suitable habitat into the constructed swales it is clearly resulting in an overall increase in the quality and area of available habitat for Dwarf Galaxias. This appears to have also correlated with a slight increase in the number of predatory fish species (i.e. Mosquitofish), however their presence doesn't appear to have impacted the successful breeding and increasing numbers of Dwarf Galaxias. This is probably due to the habitat being more suitable to Dwarf Galaxias than the pest/predatory species.

Based on the results of the 2022 annual survey and data, it is our option that development of the Casey Green site to date has been undertaken in accordance the DGSTP and associated approvals. No ecologically significant impacts have been observed to the retained habitat, with the constructed swales having improved overall conditions for Dwarf Galaxias on the site and in the region.

The 2023 monitoring year will commence on 1st January 2022, will included any remaining sampling for the 2022 year and in accordance with approved DGSTP (and the project DGMP; BL&A 2015) the following monitoring should occur during the year:

- Water quality monitoring: Fortnightly and/or after rainfall events > 10 millimetres until all construction is completed (i.e. all works on site completed) and then monthly following completion.
- Dwarf Galaxias monitoring: Annually in November/December for at least five years post construction.

Please note, we interoperate the “completion of construction” to be the point at all major works including site clean-up, landscaping, etc. Have been completed and there is not further risk to the Dwarf Galaxias and their habitat (i.e. all possible sources of sediment/contaminant runoff have been mitigated.

If you have any questions or would like to discuss this assessment, report or any other matter further, please do not hesitate to call me on 0413 935 497.

Kind Regards,

Aaron Jenkin
Director and Principal Ecologist
Aquatica Environmental

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4 References

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EPA (2018), State Environmental Protection Policy (Waters). Victorian Environmental Protection Authority.

Appendix A: Raw Water Quality Results

Temperature (°C)

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
12/1/2022	23.68	24.19	23.40	22.91	26.39	22.51
28/1/2022	23.75	24.65	23.79	23.50	25.36	23.99
1/2/2022	23.66	23.14	23.01	22.58	24.18	23.20
15/2/2022	23.16	21.11	21.95	21.58	22.54	20.60
28/2/2022	22.54	21.10	21.66	21.56	22.29	18.99
7/3/2022	21.64	20.10	19.66	19.57	20.29	18.99
21/3/2022	21.38	19.01	18.95	17.89	17.57	16.35
13/4/2022	19.11	17.52	16.23	16.20	15.85	15.96
21/4/2022	18.36	16.27	15.48	12.45	14.99	15.21
2/5/2022	15.56	13.33	13.35	13.27	13.55	12.20
16/5/2022	14.81	12.07	12.59	12.03	12.90	11.95
8/6/2022	9.89	9.96	9.69	9.89	10.07	9.85
22/6/2022	10.38	10.47	10.18	10.40	10.57	9.95
28/6/2022	10.54	9.15	8.91	8.88	9.46	7.15
13/7/2022	10.73	7.74	7.71	7.28	8.43	6.34
27/7/2022	10.92	8.46	8.60	8.20	9.08	7.39
10/8/2022	11.22	9.23	9.42	9.17	9.78	8.49
22/8/2022	11.50	10.03	10.30	10.16	10.49	9.57
1/9/2022	11.69	10.73	11.10	11.06	11.11	10.65
12/9/2022	12.06	10.60	10.90	10.45	10.01	10.24
21/9/2022	13.88	11.57	12.40	11.38	10.72	10.66
5/10/2022	15.58	14.55	15.49	14.50	14.50	14.56
10/10/2022	15.85	13.90	14.62	15.18	15.52	16.62
17/10/2022	15.80	14.16	14.46	14.99	15.63	16.48
28/10/2022	15.77	14.23	14.28	15.51	15.85	16.29
4/11/2022	14.66	15.00	14.82	14.63	15.43	15.24
17/11/2022	16.10	16.65	15.54	17.20	17.66	17.50
21/11/2022	17.75	17.73	17.85	18.79	20.61	20.22
7/12/2022	18.40	18.70	18.63	18.80	19.65	18.10
15/12/2022	19.45	21.20	21.69	22.50	22.73	19.50

pH

12/1/2022	7.24	7.09	7.11	7.15	7.14	6.97
28/1/2022	7.37	6.76	6.70	7.02	6.90	6.91
1/2/2022	7.05	6.84	6.84	6.29	6.61	7.12
15/2/2022	7.32	7.00	6.98	6.92	6.98	7.10
28/2/2022	7.50	7.18	7.13	7.11	7.13	7.35
7/3/2022	7.70	7.38	7.29	7.10	7.07	7.55
21/3/2022	7.21	7.24	7.19	7.12	7.05	7.29
13/4/2022	7.12	7.09	7.06	7.11	7.03	7.23
21/4/2022	7.55	7.32	7.03	7.20	7.11	7.13
2/5/2022	7.23	7.00	6.85	7.01	6.98	7.15
16/5/2022	7.20	6.85	6.41	6.45	6.45	7.01
8/6/2022	6.96	7.47	7.47	6.81	7.43	6.98

12/1/2022	7.24	7.09	7.11	7.15	7.14	6.97
22/6/2022	6.57	6.57	6.73	6.64	6.71	7.07
28/6/2022	6.55	6.71	6.82	6.88	6.95	6.59
13/7/2022	6.92	6.77	6.39	6.45	6.27	7.30
27/7/2022	6.48	6.52	6.72	6.65	6.59	6.67
10/8/2022	7.05	6.91	7.06	6.78	6.54	6.64
22/8/2022	6.77	6.75	6.94	6.84	6.82	6.88
1/9/2022	6.95	6.82	6.90	6.86	6.50	6.75
12/9/2022	6.08	6.34	6.68	6.71	6.38	6.38
21/9/2022	6.26	6.43	6.51	6.62	6.58	6.79
5/10/2022	6.77	6.75	6.94	6.84	6.82	6.88
10/10/2022	6.76	6.51	6.48	6.77	7.35	6.86
17/10/2022	6.57	6.57	6.73	6.64	6.71	7.07
28/10/2022	6.59	6.56	6.67	6.71	6.86	6.91
4/11/2022	6.22	6.21	6.30	6.29	6.69	6.97
17/11/2022	6.45	6.44	6.39	6.51	6.75	6.97
21/11/2022	6.57	6.57	6.73	6.64	6.71	7.07
7/12/2022	6.99	6.85	7.01	7.01	7.09	6.96
15/12/2022	7.01	6.93	6.95	6.95	6.92	6.95

Electrical Conductivity (µS/cm)

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
12/1/2022	551	502	498	478	497	623
28/1/2022	532	509	462	449	415	565
1/2/2022	484	638	517	466	346	987
15/2/2022	532	540	502	479	420	825
28/2/2022	526	572	504	475	404	692
7/3/2022	181	479	421	412	403	551
21/3/2022	830	753	505	438	446	576
13/4/2022	1079	953	568	556	509	594
21/4/2022	825	749	387	388	352	684
2/5/2022	522	494	356	370	345	661
16/5/2022	319	338	325	351	338	862
8/6/2022	226	339	268	339	412	523
22/6/2022	264	428	413	377	370	692
28/6/2022	284	355	355	375	399	646
13/7/2022	325	376	397	415	367	961
27/7/2022	400	369	361	350	348	476
10/8/2022	526	456	419	361	336	481
22/8/2022	432	409	369	349	315	465
1/9/2022	216	235	246	256	260	465
12/9/2022	226	339	268	289	312	444
21/9/2022	273	292	288	286	294	365
5/10/2022	260	282	278	282	285	384
10/10/2022	295	316	300	303	302	325
17/10/2022	282	306	294	294	298	343
28/10/2022	280	297	292	289	297	352

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
4/11/2022	304	329	310	307	310	302
17/11/2022	361	365	344	335	293	405
21/11/2022	398	399	325	320	281	595
7/12/2022	756	694	613	575	544	551
15/12/2022	696	634	643	525	474	601

Dissolved Oxygen (%)

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
12/1/2022	38.3	37.8	37.9	32.0	40.2	54.2
28/1/2022	24.9	10.1	15.6	14.3	58.3	43.2
1/2/2022	0.1	1.3	3.3	2.9	10.7	58.9
15/2/2022	19.0	17.8	42.2	36.5	67.6	29.9
28/2/2022	27.5	33.3	43.6	43.7	47.3	42.0
7/3/2022	14.2	11.1	6.4	7.6	11.0	15.2
21/3/2022	14.6	18.6	28.4	31.0	22.3	39.4
13/4/2022	16.9	27.8	52.3	56.3	53.3	43.5
21/4/2022	23.0	21.8	46.2	40.5	62.6	44.9
2/5/2022	12.6	16.6	16.4	29.0	20.3	46.3
16/5/2022	18.9	22.8	24.4	24.9	45.4	53.1
8/6/2022	83.7	53.0	55.2	45.3	41.6	29.6
22/6/2022	24.9	10.1	26.3	14.3	58.3	43.2
28/6/2022	38.6	26.0	31.5	30.2	51.4	50.7
13/7/2022	44.8	40.2	31.3	29.3	33.5	101.5
27/7/2022	39.2	55.4	46.8	32.3	36.5	36.3
10/8/2022	36.2	25.5	46.9	60.3	37.4	37.4
22/8/2022	31.1	33.6	42.8	58.6	42.3	45.6
1/9/2022	40.3	28.2	26.7	17.6	22.4	35.6
12/9/2022	39.2	55.4	46.8	32.3	36.5	36.3
21/9/2022	36.2	25.5	46.9	60.3	37.4	37.4
5/10/2022	31.1	33.6	42.8	58.6	42.3	45.6
10/10/2022	42.9	37.4	38.3	39.4	48.7	52.1
17/10/2022	36.8	35.6	40.9	42.1	34.8	38.6
28/10/2022	17.4	19.0	29.7	26.1	50.3	24.2
4/11/2022	28.5	22.2	17.3	19.5	16.0	27.1
17/11/2022	38.3	37.8	37.9	32.0	40.2	54.2
21/11/2022	22.0	21.5	37.5	38.2	45.9	48.7
7/12/2022	38.3	37.8	37.9	32.0	40.2	54.2
15/12/2022	38.6	26.0	23.9	30.2	51.4	50.7

Turbidity (NTU)

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
12/1/2022	35.9	34.6	33.9	19.3	21.6	16.1
28/1/2022	52.60	43.5	36.0	39.6	52.9	19.6
1/2/2022	4.4	17.6	11.6	11.7	15.8	20.1
15/2/2022	10.10	9.3	17.4	2.1	4.7	18.8
28/2/2022	16.8	10.3	17.4	11.8	10.2	16.0
7/3/2022	122.0	13.8	13.4	10.6	17.6	48.9

Sample Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
21/3/2022	113.0	12.6	15.3	16.4	12.7	33.0
13/4/2022	7.2	10.8	14.8	10.9	8.5	15.3
21/4/2022	26.8	22.3	18.4	15.8	12.8	26.0
2/5/2022	93.3	15.6	15.3	16.7	13.0	19.0
16/5/2022	31.4	19.6	16.3	10.6	9.3	19.7
8/6/2022	135.0	70.1	82.6	36.4	30.0	23.6
22/6/2022	96.4	51.0	68.3	59.0	65.1	32.0
28/6/2022	104.0	81.7	54.3	73.9	95.1	40.5
13/7/2022	127.0	47.3	33.4	28.2	24.8	17.5
27/7/2022	130.0	47.0	38.6	57.5	49.3	18.4
10/8/2022	94.1	107.0	84.5	87.0	95.7	95.7
22/8/2022	153.0	69.0	75.9	66.0	85.9	55.9
1/9/2022	58.8	118.8	85.5	110.0	108.0	46.3
12/9/2022	101.0	99.9	81.0	88.7	95.5	66.1
21/9/2022	46.6	130.0	17.7	57.5	49.3	18.4
5/10/2022	94.1	107.0	84.5	46.0	55.7	55.6
10/10/2022	53.0	69.0	75.9	66.0	85.9	55.9
17/10/2022	31.4	19.6	16.3	10.6	9.3	26.0
28/10/2022	26.8	22.3	18.4	15.8	12.8	26.0
4/11/2022	12.5	15.3	17.7	25.4	19.0	15.5
17/11/2022	16.8	10.3	17.4	11.8	10.2	16.0
21/11/2022	17.8	17.7	17.9	18.8	20.6	20.2
7/12/2022	22.0	15.5	16.2	15.4	12.3	35.7
15/12/2022	28.9	27.1	21.6	24.0	20.6	32.1