

## **APPENDIX A**

### **List of Plant Species Recorded at Study Area**

S/N	Species Name	Common Name	Family	Historical Observation	2019 Observation	2022 Observation	Origin	Local Status <sup>1</sup>	Global Status <sup>2</sup>
1	<i>Acacia auriculiformis</i>	Earleaf acacia	Fabaceae	-	✓	✓	Non-native	Naturalised	LC
2	<i>Acacia mangium</i>	Mangge hutan	Fabaceae	-	-	✓	Non-native	Naturalised	LC
3	<i>Acanthus ebracteatus</i>	Sea holly	Acanthaceae	✓	✓	✓	Native	VU	LC
4	<i>Acanthus ilicifolius</i>	Mangrove holly	Acanthaceae	✓	-	✓	Native	EN	LC
5	<i>Acanthus sp.</i>	-	Acanthaceae	-	-	✓	Native	NA	NA
6	<i>Acanthus sp. (climbing)</i>	-	Acanthaceae	-	-	✓	Native	NA	NA
7	<i>Acanthus volubilis</i>	Jeruju	Acanthaceae	✓	-	-	Native	EN	LC
8	<i>Acrostichum aureum</i>	Leather fern	Pteridaceae	-	✓	✓	Native	LC	LC
9	<i>Acrostichum speciosum</i>	Mangrove fern	Pteridaceae	✓	-	-	Native	LC	LC
10	<i>Adenanthera pavonina</i>	Saga	Fabaceae	-	✓	✓	Non-native	Naturalised	LC
11	<i>Allophylus cobbe</i>	Tit-berry	Sapindaceae	✓	-	✓	Native	LC	NA
12	<i>Alocasia macrorrhizos</i>	Giant taro	Araceae	-	✓	✓	Non-native	Naturalised	NA
13	<i>Alysicarpus vaginalis</i>	White moneywort	Fabaceae	-	-	✓	Native	LC	NA
14	<i>Ardisia elliptica</i>	Seashore ardisia	Primulaceae	✓	-	✓	Native	LC	NA
15	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae	-	✓	-	Non-native	Casual	NA
16	<i>Asplenium nidus</i>	Bird's-nest fern	Aspleniaceae	-	✓	✓	Native	LC	NA
17	<i>Avicennia alba</i>	Api api putih	Acanthaceae	✓	✓	✓	Native	LC	LC
18	<i>Avicennia officinalis</i>	Api api ludat	Acanthaceae	✓	✓	✓	Native	LC	LC
19	<i>Avicennia rumphiana</i>	Api api bulu	Acanthaceae	✓	✓	✓	Native	LC	VU
20	<i>Avicennia sp. (square twig)</i>	-	Acanthaceae	-	-	✓	Native	NA	NA
21	<i>Axonopus compressus</i>	Tropical carpet grass	Poaceae	-	-	✓	Non-native	Naturalised	LC
22	<i>Bambusa vulgaris</i>	Common bamboo	Poaceae	-	✓	-	Non-native	Excluded (Cultivated Only)	NA
23	<i>Barringtonia asiatica</i>	Sea putat	Lecythidaceae	-	✓	✓	Native	CR	LC
24	<i>Barringtonia racemosa</i>	Common putat	Lecythidaceae	-	-	✓	Native	CR	LC
25	<i>Bergera koenigii</i>	Curry	Rutaceae	-	✓	✓	Non-native	Casual	LC
26	<i>Bidens pilosa</i>	Beggar's tick	Asteraceae	-	✓	✓	Non-native	Naturalised	NA
27	<i>Bridelia stipularis</i>	Kenidai	Phyllanthaceae	-	-	✓	Native	LC	LC
28	<i>Bridelia tomentosa</i>	Kenidai	Phyllanthaceae	-	-	✓	Native	LC	LC
29	<i>Brownlowia tersa</i>	Dungun	Malvaceae	✓	-	-	Native	CR	NT
30	<i>Bruguiera cylindrica</i>	Pakau putih	Rhizophoraceae	✓	✓	✓	Native	LC	LC
31	<i>Bruguiera gymnorhiza</i>	Tumu merah	Rhizophoraceae	✓	-	✓	Native	LC	LC
32	<i>Bruguiera parviflora</i>	Lenggadai	Rhizophoraceae	✓	-	-	Native	EN	LC
33	<i>Buchanania arborescens</i>	Sparrow's manggo	Anacardiaceae	✓	-	-	Native	LC	LC

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34	<i>Caesalpinia crista</i>	Squirrel's claws	Fabaceae	✓	-	✓	Native	LC	NA
35	<i>Calamus erinaceus subsp. erinaceus</i>	Rotan bakau	Arecaceae	✓	-	-	Native	LC	NA
36	<i>Calophyllum inophyllum</i>	Penaga laut	Calophyllaceae	-	✓	✓	Native	EN	LC
37	<i>Canarium cf. vulgare</i>	Java almond	Burseraceae	-	-	✓	Non-native	Cultivated Only	LC
38	<i>Canavalia rosea</i>	Bay bean	Fabaceae	-	-	✓	Native	LC	LC
39	<i>Caryota mitis</i>	Fishtail palm	Arecaceae	-	✓	✓	Native	LC	LC
40	<i>Casuarina equisetifolia</i>	Casuarina	Casuarinaceae	✓	✓	✓	Native	LC	LC
41	<i>Causonis trifolia</i>	Three-Leaved wild vine	Vitaceae	-	-	✓	Native	DD	NA
42	<i>Cecropia pachystachya</i>	Ambay pumpwood	Urticaceae	-	✓	✓	Non-native	Naturalised	LC
43	<i>Cenchrus setosus</i>	Mission grass	Poaceae	-	-	✓	Non-native	Naturalised	NA
44	<i>Centrosema molle</i>	Soft butterfly pea	Fabaceae	-	-	✓	Non-native	Naturalised	NA
45	<i>Cerbera sp.</i>	-	Apocynaceae	-	-	✓	Native	NA	NA
46	<i>Ceriops tagal</i>	Tengar	Rhizophoraceae	✓	-	-	Native	VU	LC
47	<i>Ceriops zippeliana</i>	Tengar merah	Rhizophoraceae	✓	-	✓	Native	EN	LC
48	<i>Chaetomorpha gracilis</i>	Sea emerald	Cladophoraceae	-	✓	-	NA	NA	NA
49	<i>Christella arida</i>	Shield fern	Thelypteridaceae	-	-	✓	Native	LC	NA
50	<i>Cinnamomum iners</i>	Wild cinnamon	Lauraceae	-	✓	✓	Native	LC	LC
51	<i>Cissus hastata</i>	Spear-Shaped cissus	Vitaceae	-	-	✓	Native	LC	NA
52	<i>Cissus repens</i>	Malayan wild vine	Vitaceae	-	-	✓	Native	VU	NA
53	<i>Claoxylon indicum</i>	Laping budak	Euphorbiaceae	-	✓	✓	Native	LC	LC
54	<i>Clausena excavata</i>	Pink lime-berry	Rutaceae	-	-	✓	Native	LC	NA
55	<i>Coccinia grandis</i>	Ivy gourd	Cucurbitaceae	-	-	✓	Non-native	Naturalised	NA
56	<i>Cocos nucifera</i>	Coconut	Arecaceae	-	✓	✓	Non-native	Naturalised	NA
57	<i>Coleus monostachyus</i>	Monkey's potato	Lamiaceae	-	-	✓	Non-native	Naturalised	NA
58	<i>Colocasia esculenta</i>	Taro	Araceae	-	✓	-	Non-native	Casual	LC
59	<i>Colubrina asiatica</i>	Latherleaf	Rhamnaceae	-	-	✓	Native	LC	NA
60	<i>Combretum indicum</i>	Rangoon creeper	Combretaceae	-	✓	✓	Non-native	Casual	NA
61	<i>Commelina diffusa</i>	Spreading dayflower	Commelinaceae	-	-	✓	Uncertain	Cryptogenic	LC
62	<i>Crinum asiaticum</i>	Seashore lily	Amaryllidaceae	✓	-	-	Native	CR	NA
63	<i>Cynometra ramiflora</i>	Katong laut	Fabaceae	-	-	✓	Native	CR	LC
64	<i>Cyperus aromaticus</i>	Navua sedge	Cyperaceae	-	-	✓	Non-native	Naturalised	NA
65	<i>Cyperus sp.</i>	-	Cyperaceae	-	-	✓	NA	NA	NA
66	<i>Cyperus difformis</i>	Variable flatsedge	Cyperaceae	-	-	✓	Native	LC	LC
67	<i>Cyperus iria</i>	Rice flatsedge	Cyperaceae	-	-	✓	Native	LC	LC

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68	<i>Cyperus mindorensis</i>	White kyllinga	Cyperaceae	-	-	✓	Native	LC	NA
69	<i>Cyperus odoratus</i>	Fragrant flatsedge	Cyperaceae	-	-	✓	Non-native	Naturalised	LC
70	<i>Cyperus polystachyos</i>	Manyspike flatsedge	Cyperaceae	-	-	✓	Native	LC	LC
71	<i>Cyperus rotundus</i>	Nut sedge	Cyperaceae	-	-	✓	Native	LC	LC
72	<i>Cyperus sphacelatus</i>	Roadside flatsedge	Cyperaceae	-	-	✓	Non-native	Naturalised	NA
73	<i>Dalbergia candenatensis</i>	Liana	Fabaceae	✓	-	✓	Native	LC	LC
74	<i>Dalbergia oliveri</i>	Tamalan tree	Fabaceae	-	-	✓	Non-native	Cultivated Only	CR
75	<i>Dendrobium sp.</i>	-	Orchidaceae	✓	-	-	Native	NA	NA
76	<i>Dendrolobium umbellatum</i>	Dendulang	Fabaceae	-	-	✓	Native	LC	LC
77	<i>Dendrophloe sp.</i>	-	Loranthaceae	✓	-	-	Native	NA	NA
78	<i>Derris trifoliata</i>	Common derris	Fabaceae	✓	-	✓	Native	LC	NA
79	<i>Dieffenbachia seguine</i>	Dumbcane	Araceae	-	✓	-	Non-native	Casual	NA
80	<i>Dillenia suffruticosa</i>	Simpoh air	Dilleniaceae	-	-	✓	Native	LC	NA
81	<i>Dioscorea cf. bulbifera</i>	Air potato	Dioscoreaceae	-	-	✓	Uncertain	Cryptogenic	NA
82	<i>Dioscorea sansibarensis</i>	Zanzibar yam	Dioscoreaceae	-	✓	✓	Non-native	Naturalised	NA
83	<i>Diospyros ferrea</i>	Sea ebony	Ebenaceae	✓	-	-	Native	NEx	NA
84	<i>Dolichandrone spathacea</i>	Mangrove trumpet tree	Bignoniaceae	✓	-	✓	Native	CR	LC
85	<i>Dracaena fragrans</i>	Corn palm	Asparagaceae	-	✓	-	Non-native	Casual	LC
86	<i>Eclipta prostrata</i>	White heads	Asteraceae	-	-	✓	Non-native	Naturalised	LC
87	<i>Elaeis guineensis</i>	Oil palm	Arecaceae	-	✓	✓	Non-native	Casual	LC
88	<i>Elaeodendron viburnifolium</i>	Barat-barat	Celastraceae	✓	-	-	Native	CR	LC
89	<i>Eleutheranthera ruderalis</i>	Ogiera	Asteraceae	-	-	✓	Non-native	Naturalised	NA
90	<i>Emblica urinaria</i>	Shatterstone	Phyllanthaceae	-	-	✓	Non-native	Naturalised	NA
91	<i>Epipremnum aureum</i>	Golden pothos	Araceae	-	✓	-	Non-native	Casual	NA
92	<i>Eragrostis cumingii</i>	Cuming's lovegrass	Poaceae	-	-	✓	Native	LC	NA
93	<i>Eriochloa procera</i>	Cupgrass	Poaceae	-	-	✓	Native	LC	LC
94	<i>Excoecaria agallocha</i>	Buta-buta	Euphorbiaceae	✓	-	✓	Native	LC	LC
95	<i>Falcataria falcata</i>	Albizia	Fabaceae	-	✓	✓	Non-native	Naturalised	LC
96	<i>Ficus benjamina</i>	Weeping fig	Moraceae	-	-	✓	Uncertain	Cryptogenic	LC
97	<i>Ficus fistulosa</i>	Common yellow stem-fig	Moraceae	-	✓	✓	Native	LC	LC
98	<i>Ficus heteropleura</i>	Sandy-leafed fig	Moraceae	-	✓	✓	Native	LC	NA
99	<i>Ficus hispida</i>	Opposite leaf fig	Moraceae	-	✓	✓	Non-native	Casual	LC
100	<i>Ficus microcarpa</i>	Malayan banyan	Moraceae	-	✓	✓	Native	LC	LC
101	<i>Ficus religiosa</i>	Bodhi tree	Moraceae	-	-	✓	Non-native	Naturalised	LC
102	<i>Ficus variegata</i>	Common red-stem fig	Moraceae	-	✓	-	Native	LC	LC

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103	<i>Fimbristylis complanata</i>	Flat sedge	Cyperaceae	-	-	✓	Native	VU	LC
104	<i>Fimbristylis cymosa</i>	Button sedge	Cyperaceae	-	-	✓	Native	LC	LC
105	<i>Fimbristylis dichotoma</i>	Common fimbristylis	Cyperaceae	-	-	✓	Native	LC	LC
106	<i>Fimbristylis ovata</i>	English flat spike sedge	Cyperaceae	-	-	✓	Native	LC	LC
107	<i>Fimbristylis schoenoides</i>	Ditch fimbry	Cyperaceae	-	-	✓	Native	LC	LC
108	<i>Fimbristylis tristachya</i>	Three-spike fimbry	Cyperaceae	-	-	✓	Native	LC	NA
109	<i>Finlaysonia obovata</i>	Kalak kambing	Apocynaceae	✓	✓	✓	Native	CR	NA
110	<i>Flagellaria indica</i>	Rotan dini	Flagellariaceae	✓	-	✓	Native	LC	NA
111	<i>Fuirena umbellata</i>	Umbrella sedge	Cyperaceae	-	-	✓	Native	LC	LC
112	<i>Glochidion cf. obscurum</i>	Yellow-leaved pin-flower tree	Phyllanthaceae	-	-	✓	Native	CR	NA
113	<i>Glochidion littorale</i>	Monkey apple	Phyllanthaceae	✓	-	-	Native	EN	LC
114	<i>Grona heterophylla</i>	Variable-leaf tick trefoil	Fabaceae	-	-	✓	Native	LC	NA
115	<i>Grona triflora</i>	Creeping tick trefoil	Fabaceae	-	-	✓	Native	LC	NA
116	<i>Halophila beccarii</i>	Beccari's seagrass	Hydrocharitaceae	✓	✓	-	Native	EN	VU
117	<i>Heliconia sp.</i>	-	Heliconiaceae	-	✓	-	Non-native	NA	NA
118	<i>Heptapleurum ellipticum</i>	Ara bebari	Araliaceae	-	-	✓	Native	EN	LC
119	<i>Heritiera littoralis</i>	Dungun	Malvaceae	✓	-	✓	Native	EN	LC
120	<i>Hibiscus tiliaceus</i>	Sea hibiscus	Malvaceae	✓	✓	✓	Native	LC	LC
121	<i>Hibiscus tiliaceus var</i>	Sea hibiscus	Malvaceae	-	-	✓	Non-native	Cultivated Only	NA
122	<i>Hoya sp.</i>	-	Apocynaceae	✓	✓	-	Native	NA	NA
123	<i>Hydnophytum sp.</i>	-	Rubiaceae	✓	-	-	Native	NA	NA
124	<i>Imperata cylindrica</i>	Lalang	Poaceae	-	✓	✓	Native	LC	LC
125	<i>Indigofera hendecaphylla</i>	Trailing indigo	Fabaceae	-	-	✓	Non-native	Naturalised	NA
126	<i>Intsia bijuga</i>	Merbau ipil	Fabaceae	✓	-	-	Native	CR	NT
127	<i>Ipomoea cairica</i>	Mile-a-minute vine	Convolvulaceae	-	✓	✓	Non-native	Naturalised	LC
128	<i>Ipomoea indica</i>	Blue morning glory	Convolvulaceae	-	-	✓	Non-native	Naturalised	NA
129	<i>Ipomoea triloba</i>	Littlebell	Convolvulaceae	-	-	✓	Non-native	Naturalised	LC
130	<i>Ischaemum barbatum</i>	Indian fox tail	Poaceae	-	-	✓	Native	LC	NA
131	<i>Ischaemum ciliare</i>	Smut grass	Poaceae	-	-	✓	Native	LC	NA
132	<i>Ischaemum muticum</i>	Seashore centipede grass	Poaceae	-	-	✓	Native	LC	LC
133	<i>Kirganelia reticulata</i>	Potato-bush	Phyllanthaceae	-	-	✓	Native	DD	NA
134	<i>Lagerstroemia indica</i>	Crape myrtle	Lythraceae	-	-	✓	Non-native	Cultivated Only	LC
135	<i>Leea indica</i>	Common tree vine	Vitaceae	-	✓	✓	Native	LC	LC
136	<i>Lepisanthes rubiginosa</i>	Mertajam	Sapindaceae	-	-	✓	Native	LC	LC

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137	<i>Leucaena leucocephala</i>	Lead tree	Fabaceae	-	✓	✓	Non-native	Naturalised	NA
138	<i>Lomariopsis lineata</i>	Süswassertang	Lomariopsidaceae	-	✓	-	Native	EN	NA
139	<i>Lumnitzera littorea</i>	Teruntum merah	Combretaceae	✓	-	✓	Native	EN	LC
140	<i>Lumnitzera racemosa</i>	White teruntum	Combretaceae	✓	-	✓	Native	EN	LC
141	<i>Lumnitzera sp.</i>	-	Combretaceae	-	-	✓	Native	NA	NA
142	<i>Mallotus paniculatus</i>	Balik angin	Euphorbiaceae	-	✓	-	Native	LC	LC
143	<i>Malpighiaceae</i>	-	Malpighiaceae	-	-	✓	NA	NA	NA
144	<i>Mangifera indica</i>	Mango	Anacardiaceae	-	-	✓	Non-native	Casual	DD
145	<i>Manihot esculenta</i>	Tapioca	Euphorbiaceae	-	✓	-	Non-native	Naturalised	NA
146	<i>Merope angulata</i>	Mangrove lime	Rutaceae	✓	-	-	Native	CR	LC
147	<i>Millettia pinnata</i>	Pongam	Fabaceae	✓	-	✓	Native	EN	LC
148	<i>Mimosa pudica</i>	Touch-me-not	Fabaceae	-	-	✓	Non-native	Naturalised	LC
149	<i>Mimusops elengi</i>	Tanjong tree	Sapotaceae	-	-	✓	Non-native	Casual	LC
150	<i>Morinda citrifolia</i>	Mengkudu besar	Rubiaceae	-	✓	✓	Native	LC	NA
151	<i>Muntingia calabura</i>	Jamaican cherry	Muntingiaceae	-	✓	✓	Non-native	Naturalised	NA
152	<i>Murdannia nudiflora</i>	Doveweed	Commelinaceae	-	-	✓	Uncertain	Cryptogenic	NA
153	<i>Musa acuminata</i>	Blood banana	Musaceae	-	✓	✓	Non-native	Cultivated Only	LC
154	<i>Nephrolepis biserrata</i>	Broad sword fern	Nephrolepidaceae	-	✓	✓	Native	LC	NA
155	<i>Neptunia plena</i>	Water mimosa	Fabaceae	-	✓	✓	Non-native	Naturalised	LC
156	<i>Nypa fruticans</i>	Nipah palm	Arecaceae	✓	✓	✓	Native	VU	LC
157	<i>Ottochloa nodosa</i>	Slender panic grass	Poaceae	-	-	✓	Native	LC	NA
158	<i>Oxalis barrelieri</i>	Lavender sorrel	Oxalidaceae	-	-	✓	Non-native	Naturalised	NA
159	<i>Oxyceros longiflorus</i>	Akar berdarah laut	Rubiaceae	-	-	✓	Native	LC	NA
160	<i>Paederia foetida</i>	Lesser malayan stinkwort	Rubiaceae	-	-	✓	Native	LC	NA
161	<i>Pandanus odorifer</i>	Fragrant screw-pine	Pandanaceae	✓	-	-	Native	LC	LC
162	<i>Panicum trichocladum</i>	-	Poaceae	-	-	✓	Non-native	Naturalised	NA
163	<i>Passiflora edulis</i>	Passion fruit vine	Passifloraceae	-	✓	-	Non-native	Cultivated Only	NA
164	<i>Passiflora foetida</i>	Stinking passionflower	Passifloraceae	-	-	✓	Non-native	Naturalised	NA
165	<i>Peltophorum pterocarpum</i>	Yellow flame tree	Fabaceae	-	-	✓	Native	CR	NA
166	<i>Physalis minima</i>	Native gooseberry	Solanaceae	-	-	✓	Uncertain	Cryptogenic	VU
167	<i>Piper sarmentosum</i>	Daun kaduk	Piperaceae	-	✓	✓	Native	LC	NA
168	<i>Pipturus argenteus</i>	Australian white mulberry	Urticaceae	-	-	✓	Uncertain	Cryptogenic	LC
169	<i>Planchonella obovata</i>	Sea gutta	Sapotaceae	-	✓	✓	Native	LC	NA

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170	<i>Pleocnemia conjugata</i>	-	Dryopteridaceae	-	✓	-	Non-native	Naturalised	NA
171	<i>Podocarpus polystachyus</i>	Sea teak	Podocarpaceae	✓	-	-	Native	EN	VU
172	<i>Premna serratifolia</i>	Buas-buas	Lamiaceae	-	-	✓	Native	LC	LC
173	<i>Pteris vittata</i>	Chinese brake	Pteridaceae	-	-	✓	Uncertain	Cryptogenic	LC
174	<i>Pterocarpus indicus</i>	Angsana tree	Fabaceae	-	-	✓	Non-native	Casual	EN
175	<i>Ptychosperma macarthurii</i>	MacArthur palm	Arecaceae	-	-	✓	Non-native	Naturalised	NA
176	<i>Pyrosia piloselloides</i>	Dragon scale fern	Polypodiaceae	✓	-	✓	Native	LC	NA
177	<i>Rhizophora apiculata</i>	Bakau minyak	Rhizophoraceae	✓	✓	✓	Native	LC	LC
178	<i>Rhizophora mucronata</i>	Bakau kurap	Rhizophoraceae	✓	✓	✓	Native	LC	LC
179	<i>Rhizophora sp.</i>	-	Rhizophoraceae	-	-	✓	Native	NA	NA
180	<i>Rhizophora stylosa</i>	Bakau pasir	Rhizophoraceae	✓	-	-	Native	VU	LC
181	<i>Ruellia repens</i>	Creeping ruellia	Acanthaceae	-	-	✓	Uncertain	Cryptogenic	NA
182	<i>Sacciolepis indica</i>	Cupscale grass	Poaceae	-	-	✓	Native	LC	LC
183	<i>Samanea saman</i>	Raintree	Fabaceae	-	-	✓	Non-native	Casual	LC
184	<i>Scaevola taccada</i>	Ambung-ambung	Goodeniaceae	✓	-	-	Native	LC	NA
185	<i>Scurrula sp.</i>	-	Loranthaceae	✓	-	-	Native	NA	NA
186	<i>Scyphiphora hydrophylacea</i>	Chengam	Rubiaceae	✓	-	-	Native	EN	LC
187	<i>Sieruela rutidosperma</i>	Fringed spiderflower	Cleomaceae	-	-	✓	Non-native	Naturalised	NA
188	<i>Sonneratia alba</i>	Perepat	Lythraceae	✓	✓	✓	Native	LC	LC
189	<i>Sonneratia caseolaris</i>	Crabapple mangrove	Lythraceae	✓	-	✓	Native	CR	LC
190	<i>Sonneratia ovata</i>	Gedabu	Lythraceae	✓	✓	-	Native	CR	NT
191	<i>Spathodea campanulata</i>	African tulip	Bignoniaceae	-	✓	✓	Non-native	Naturalised	LC
192	<i>Spigelia anthelmia</i>	Pinkroot	Loganiaceae	-	-	✓	Non-native	Naturalised	NA
193	<i>Sporobolus indicus</i>	Smut grass	Poaceae	-	-	✓	Native	LC	LC
194	<i>Stachytarpheta jamaicensis</i>	Brazilian tea	Verbenaceae	-	-	✓	Non-native	Naturalised	LC
195	<i>Suregada glomerulata</i>	Limau-Limau	Euphorbiaceae	-	-	✓	Native	CR	LC
196	<i>Swietenia macrophylla</i>	Broad-leafed mahogany	Meliaceae	-	-	✓	Non-native	Casual	VU
197	<i>Syngonium angustatum</i>	Arrowhead plant	Araceae	-	✓	✓	Non-native	Naturalised	NA
198	<i>Syzygium cumini</i>	Malabar plum	Myrtaceae	-	-	✓	Non-native	Naturalised	LC
199	<i>Syzygium grande</i>	Sea apple	Myrtaceae	-	✓	✓	Native	LC	NA
200	<i>Syzygium myrtifolium</i>	Red lip	Myrtaceae	-	-	✓	Native	CR	NA
201	<i>Syzygium polyanthum</i>	Salam	Myrtaceae	-	-	✓	Native	LC	NA
202	<i>Syzygium zeylanicum</i>	Spicate eugenia	Myrtaceae	-	-	✓	Native	LC	NA
203	<i>Tabebuia rosea</i>	Trumpet tree	Bignoniaceae	-	-	✓	Non-native	Casual	LC
204	<i>Tamarindus indica</i>	Tamarind	Fabaceae	-	-	✓	Non-native	Casual	LC
205	<i>Terminalia catappa</i>	Sea almond	Combretaceae	✓	✓	✓	Native	LC	LC

S/N	Species Name	Common Name	Family	Historical Observation	2019 Observation	2022 Observation	Origin	Local Status <sup>1</sup>	Global Status <sup>2</sup>
206	<i>Thespesia populnea</i>	Bendy tree	Malvaceae	✓	-	✓	Native	LC	LC
207	<i>Tristellateia australasiae</i>	Maiden's jealousy	Malpighiaceae	✓	-	-	Native	EN	NA
208	<i>Vernonia cinerea</i>	Little ironweed	Asteraceae	-	-	✓	Native	LC	NA
209	<i>Vincetoxicum sp.</i>	-	Apocynaceae	-	-	✓	Native	NA	NA
210	<i>Volkameria inermis</i>	Seashore tubeflower	Lamiaceae	✓	-	✓	Native	LC	NA
211	<i>Wollastonia biflora</i>	Sea daisy	Asteraceae	-	-	✓	Native	LC	NA
212	<i>Xylocarpus granatum</i>	Nyireh bunga	Meliaceae	✓	-	✓	Native	LC	LC

<sup>1</sup> Davison et al., 2008; Chong et al., 2009; Lindsay, et al., 2022; Nparks, 2023

<sup>2</sup> International Union for Conservation of Nature and Natural Resources (IUCN, 2021)



## **APPENDIX B**

### **Photographs of Plants Observed at Study Area**

**MANGROVES AND ASSOCIATED SPECIES (COMMON SPECIES)**



*Acanthus ilicifolius*



*Avicennia alba*



*Bruguiera cylindrica*



*Bruguiera gymnorhiza*



*Hibiscus tiliaceus*



*Rhizophora apiculata*



*Rhizophora mucronata*



*Sonneratia alba*



*Xylocarpus granatum*

**MANGROVE AND ASSOCIATED SPECIES OF CONSERVATION SIGNIFICANCE**



*Acanthus ebracteatus*



*Ardisia elliptica*



*Ceriops zippeliana*



*Dolichandrone spathacea*



*Finlaysonia obovata*



*Heritiera littoralis*



*Lumnitzera littorea*



*Lumnitzera racemosa*



*Nypa fruticans*



*Sonneratia caseolaris*



*Heptapleurum ellipticum*

**OTHER TREES SHRUBS AND HERBS**



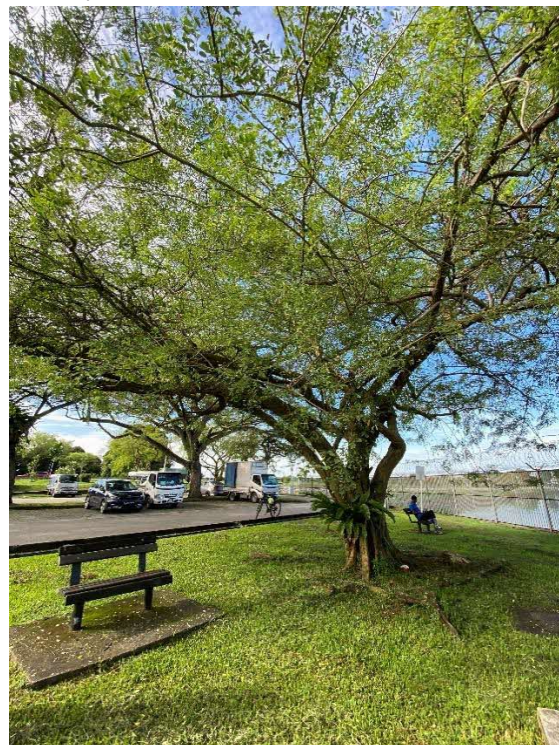
*Acacia auriculiformis*



*Caesalpinia crista*



*Casuarina equisetifolia*



*Dalbergia oliveri*



*Derris trifoliata*



*Excoecaria agallocha*



*Falcataria falcata*



*Pterocarpus indicus*



*Samanea saman*



*Syzygium grande*



**SPECIES OF CONSERVATION SIGNIFICANCE**



*Bridelia stipularis*



*Calophyllum inophyllum*



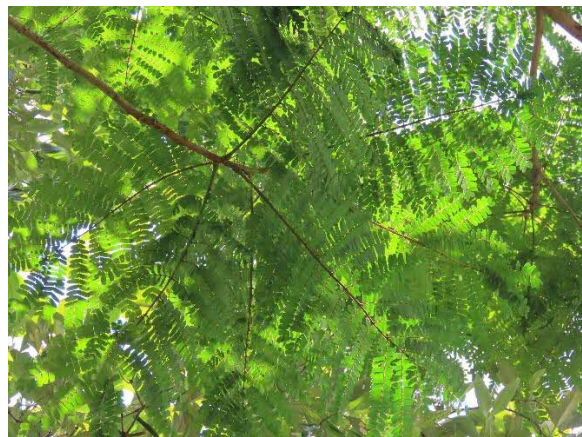
*Causonis trifolia*



*Glochidion cf. obscurum*



*Oxyceros longiflorus*



*Peltophorum pterocarpum*

## **APPENDIX C**

### **List of Fauna Species Recorded at Study Area**

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
<b>FAUNA</b>										
	<b>Birds</b>									
1	Birds	Acanthizidae	<i>Gerygone sulphurea</i>	Golden-bellied gerygone	RB (F/W)	v	v	v	NT	LC
2	Birds	Accipitridae	<i>Accipiter gularis</i>	Japanese sparrowhawk	PM WV	v	-	-	LC	LC
3	Birds	Accipitridae	<i>Aviceda leuphotes</i>	Black baza	PM WV (F/W)	v	-	-	LC	LC
4	Birds	Accipitridae	<i>Elanus caeruleus</i>	Black-winged kite	RB	v	-	-	VU	LC
5	Birds	Accipitridae	<i>Haliaeetus ichhyaetus</i>	Grey-headed fish eagle	RB (F/W)	v	v	v	VU	NT
6	Birds	Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied sea eagle	RB	v	v	v	LC	LC
7	Birds	Accipitridae	<i>Haliaastur indus</i>	Brahminy kite	RB	v	v	v	LC	LC
8	Birds	Accipitridae	<i>Nisaetus cirrhatus</i>	Changeable hawk-eagle	RB (F/W)	v	-	v	VU	LC
9	Birds	Accipitridae	<i>Pernis ptilorhynchus</i>	Crested honey buzzard	PM WV NBV	v	v	v	LC	LC
10	Birds	Acrocephalidae	<i>Acrocephalus orientalis</i>	Oriental reed warbler	WV	v	-	-	VU	LC
11	Birds	Aegithinidae	<i>Aegithina tiphia</i>	Common iora	RB	v	v	v	LC	LC
12	Birds	Alcedinidae	<i>Alcedo atthis</i>	Common kingfisher	WV	v	v	-	VU	LC
13	Birds	Alcedinidae	<i>Halcyon pileata</i>	Black-capped kingfisher	WV PM	v	v	-	VU	LC
14	Birds	Alcedinidae	<i>Halcyon smymensis</i>	White-throated kingfisher	RB	v	v	v	LC	LC
15	Birds	Alcedinidae	<i>Pelargopsis capensis</i>	Stork-billed kingfisher	RB	v	-	-	LC	LC
16	Birds	Alcedinidae	<i>Todiramphus chloris</i>	Collared kingfisher	RB	v	v	v	LC	LC
17	Birds	Apodidae	<i>Apus affinis</i>	Little swift	-	v	-	-	-	LC
18	Birds	Apodidae	<i>Apus nipalensis</i>	House swift	RB	v	-	-	VU	LC
19	Birds	Apodidae	<i>Apus pacificus</i>	Fork-tailed/Pacific swift	PM WV	v	-	-	LC	LC
20	Birds	Apodidae	<i>Aerodramus germani</i>	Germain's swiftlet	RB	v	-	-	LC	LC
21	Birds	Apodidae	<i>Aerodramus maximus</i>	Black-nest swiftlet	RB	v	-	-	NT	LC
22	Birds	Apodidae	<i>Cypsiurus balasiensis</i>	Asian palm swift	RB	v	-	-	NT	LC
23	Birds	Ardeidae	<i>Ardea alba</i>	Great egret	WV	v	v	v	VU	LC
24	Birds	Ardeidae	<i>Ardea cinerea</i>	Grey heron	RB	v	v	v	LC	LC
25	Birds	Ardeidae	<i>Ardea intermedia</i>	Intermediate egret	WV	v	-	v	LC	LC
26	Birds	Ardeidae	<i>Ardea purpurea</i>	Purple heron	RB	v	-	v	EN	LC
27	Birds	Ardeidae	<i>Ardea sumatrana</i>	Great-billed heron	RB	-	-	v	CR	LC
28	Birds	Ardeidae	<i>Ardeola bacchus</i>	Chinese pond heron	WV, prefers freshwater	v	v	-	LC	LC
29	Birds	Ardeidae	<i>Ardeola speciosa</i>	Javan pond heron	WV	v	-	-	LC	LC
30	Birds	Ardeidae	<i>Bubulcus coromandus</i>	Eastern cattle egret	IR(B) WV	v	-	-	VU	LC
31	Birds	Ardeidae	<i>Bubulcus ibis</i>	Cattle egret	WV, prefers freshwater	v	-	-	-	LC
32	Birds	Ardeidae	<i>Butorides striata</i>	Striated heron	RB WV	v	v	v	NT	LC
33	Birds	Ardeidae	<i>Egretta eulophotes</i>	Chinese egret	WV	v	-	-	EN	VU
34	Birds	Ardeidae	<i>Egretta garzetta</i>	Little egret	WV	v	v	v	LC	LC
35	Birds	Ardeidae	<i>Egretta sacra</i>	Pacific reef heron	R(B)	v	-	-	EN	LC
36	Birds	Ardeidae	<i>Ixobrychus flavicollis</i>	Black bittern	PM WV	v	-	-	LC	LC
37	Birds	Ardeidae	<i>Nycticorax nycticorax</i>	Black-crowned night heron	RB	v	v	v	EN	LC
38	Birds	Bucerotidae	<i>Anthracoceros albirostris</i>	Oriental pied hornbill	RB	-	-	v	NT	LC
39	Birds	Campephagidae	<i>Lalage nigra</i>	Pied triller	RB	v	v	v	LC	LC
40	Birds	Campephagidae	<i>Pericrocotus divaricatus</i>	Ashy minivet	WV PM (F/W)	v	-	-	LC	LC
41	Birds	Caprimulgidae	<i>Caprimulgus macrurus</i>	Large-tailed nightjar	RB	v	v	v	LC	LC
42	Birds	Charadriidae	<i>Charadrius dubius</i>	Little ringed plover	WV PM	v	-	-	EN	LC
43	Birds	Charadriidae	<i>Charadrius leschenaultii</i>	Greater sand plover	WV PM	v	-	-	NT	LC
44	Birds	Charadriidae	<i>Charadrius mongolus</i>	Lesser sand plover	WV PM	v	-	-	NT	LC
45	Birds	Charadriidae	<i>Pluvialis fulva</i>	Pacific golden plover	WV PM	v	-	v	VU	LC
46	Birds	Cisticolidae	<i>Orthotomus atrogularis</i>	Dark-necked tailorbird	RB (F/W)	v	-	v	LC	LC
47	Birds	Cisticolidae	<i>Orthotomus ruficeps</i>	Ashy tailorbird	RB	v	v	v	LC	LC

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
48	Birds	Cisticolidae	<i>Orthotomus sutorius</i>	Common tailorbird	RB	v	v	v	LC	LC
49	Birds	Cisticolidae	<i>Prinia flaviventris</i>	Yellow-bellied Prinia	RB	-	v	v	NT	LC
50	Birds	Columbidae	<i>Columba livia</i>	Rock dove	IRB	v	v	v	NA	LC
51	Birds	Columbidae	<i>Ducula bicolor</i>	Pied imperial pigeon	IR(B) NBV	-	-	v	DD	LC
52	Birds	Columbidae	<i>Geopelia striata</i>	Zebra dove	RB	v	v	v	LC	LC
53	Birds	Columbidae	<i>Spilopelia chinensis</i>	Spotted dove	RB	v	v	v	LC	LC
54	Birds	Columbidae	<i>Treron vernans</i>	Pink-necked green pigeon	RB	v	v	v	LC	LC
55	Birds	Coraciidae	<i>Eurystomus orientalis</i>	Oriental dollarbird	RB WV (F/W)	v	v	v	LC	LC
56	Birds	Corvidae	<i>Corvus macrorhynchos</i>	Large-billed crow	RB (F/W)	v	v	v	VU	LC
57	Birds	Corvidae	<i>Corvus splendens</i>	House crow	IRB	v	v	v	NA	LC
58	Birds	Cuculidae	<i>Cacomantis merulinus</i>	Plaintive cuckoo	RB (F/W)	v	v		LC	LC
59	Birds	Cuculidae	<i>Cacomantis sepulcralis</i>	Rusty-breasted/Brush cuckoo	RB (F/W)	v	-	-	NT	LC
60	Birds	Cuculidae	<i>Cacomantis sonneratii</i>	Banded bay cuckoo	RB (F/W)	v	v	-	LC	LC
61	Birds	Cuculidae	<i>Centropus bengalensis</i>	Lesser coucal	RB	v	v	v	LC	LC
62	Birds	Cuculidae	<i>Centropus sinensis</i>	Greater coucal	RB	v	-	v	NT	LC
63	Birds	Cuculidae	<i>Chrysococcyx minutillus</i>	Little bronze cuckoo	RB	v	-	v	LC	LC
64	Birds	Cuculidae	<i>Clamator coromandus</i>	Chestnut-winged cuckoo	PM WV (F/W)	v	-	-	LC	LC
65	Birds	Cuculidae	<i>Cuculus micropterus</i>	Indian cuckoo	WV PM	v	-	-	LC	LC
66	Birds	Cuculidae	<i>Eudynamis scolopaceus</i>	Asian koel	RB WV	v	v	v	LC	LC
67	Birds	Dicaeidae	<i>Dicaeum cruentatum</i>	Scarlet-backed flowerpecker	RB	v	v	v	LC	LC
68	Birds	Dicruridae	<i>Dicrurus annectens</i>	Crow-billed drongo	WV PM (F/W)	v	-	-	NT	LC
69	Birds	Dicruridae	<i>Dicrurus paradiseus</i>	Greater racket-tailed drongo	RB	-	v	-	LC	LC
70	Birds	Estrildidae	<i>Lonchura leucogastroides</i>	Javan munia	IRB	v	-	v	NA	LC
71	Birds	Estrildidae	<i>Lonchura punctulata</i>	Scaly-breasted munia	RB	v	v	-	LC	LC
72	Birds	Falconidae	<i>Falco peregrinus</i>	Peregrine falcon	WV	v	-	-	LC	LC
73	Birds	Hirundinidae	<i>Cecropsis daurica</i>	Red-rumped swallow	PM WV	v	-	-	LC	LC
74	Birds	Hirundinidae	<i>Hirundo rustica</i>	Barn swallow	WV PM	v	v	v	NT	LC
75	Birds	Hirundinidae	<i>Hirundo tahitica</i>	Pacific/Tahiti swallow	RB	v	v	v	LC	LC
76	Birds	Karidae	<i>Chroicocephalus ridibundus</i>	Black-headed gull	WV	v	-	-	NT	LC
77	Birds	Laniidae	<i>Lanius cristatus</i>	Brown shrike	WV PM	v	v	v	VU	LC
78	Birds	Laniidae	<i>Lanius tigrinus</i>	Tiger shrike	WV PM (F/W)	v	v	v	NT	LC
79	Birds	Laridae	<i>Chlidonias leucopterus</i>	White-winged tern	WV PM	v	-	v	EN	LC
80	Birds	Laridae	<i>Gelochelidon nilotica</i>	Gull-billed tern	WV PM	v	-	-	DD	LC
81	Birds	Laridae	<i>Hydroprogne caspia</i>	Caspian tern	WV	v	-	-	NE	LC
82	Birds	Laridae	<i>Onychoprion aleuticus</i>	Aleutian tern	PM	v	-	-	VU	VU
83	Birds	Laridae	<i>Sterna sumatrana</i>	Black-naped tern	RB	v	-	-	EN	LC
84	Birds	Laridae	<i>Sterna albifrons</i>	Little tern	RB WV	v	v	-	EN	LC
85	Birds	Laridae	<i>Thalasseus bengalensis</i>	Lesser crested tern	WV	v	-	-	EN	LC
86	Birds	Laridae	<i>Thalasseus bergii</i>	Greater crested tern	WV	v	-	-	EN	LC
87	Birds	Megalaimidae	<i>Psilopogon haemacephalus</i>	Coppersmith barbet	RB	v	v	-	LC	LC
88	Birds	Megalaimidae	<i>Psilopogon lineatus</i>	Lineated barbet	IRB	-	v	v	NA	LC
89	Birds	Meropidae	<i>Merops philippinus</i>	Blue-tailed bee-eater	WV	v	-	-	LC	LC
90	Birds	Meropidae	<i>Merops viridis</i>	Blue-throated bee-eater	MB (F/W)	v	v	v	LC	LC
91	Birds	Monarchidae	<i>Terpsiphona affinis</i>	Blyth's paradise flycatcher	PM WV	-	v	-	LC	LC
92	Birds	Motacillidae	<i>Anthus rufulus</i>	Paddyfield pipit	RB	-	-	v	LC	LC
93	Birds	Motacillidae	<i>Motacilla flava</i>	Western yellow wagtail	WV	v	-	-	-	LC
94	Birds	Motacillidae	<i>Motacilla tschutschensis</i>	Eastern yellow wagtail	WV	v	-	-	VU	LC
95	Birds	Muscicapidae	<i>Copsychus saularis</i>	Oriental magpie-robin	RB	v	v	v	VU	LC
96	Birds	Muscicapidae	<i>Ficedula zanthopygia</i>	Yellow-rumped flycatcher	PM	-	-	v	LC	LC

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
97	Birds	Muscicapidae	<i>Muscicapa dauurica</i>	Asian brown flycatcher	WV PM (F/W)	v	v	v	LC	LC
98	Birds	Nectariniidae	<i>Aethopyga siparaja</i>	Crimson sunbird	RB (F/W)	v	-	-	LC	LC
99	Birds	Nectariniidae	<i>Antheptes malacensis</i>	Brown-throated sunbird	RB	v	v	v	LC	LC
100	Birds	Nectariniidae	<i>Cinnyris jugularis</i>	Olive-backed sunbird	RB	v	v	v	LC	LC
101	Birds	Nectariniidae	<i>Leptocoma calcostetha</i>	Copper-throated sunbird	RB	v	v	-	VU	LC
102	Birds	Oriolidae	<i>Oriolus chinensis</i>	Black-naped oriole	RB	v	v	v	LC	LC
103	Birds	Pandionidae	<i>Pandion haliaetus</i>	Western osprey	NBV	v	-	-	LC	LC
104	Birds	Passeridae	<i>Passer montanus</i>	Eurasian tree sparrow	RB (I?)	v	-	v	LC	LC
105	Birds	Pellorneidae	<i>Pellorneum rostratum</i>	White-chested babbler	RB	v	-	-	CR	NT
106	Birds	Phasianidae	<i>Gallus gallus</i>	Red junglefowl	RB	v	v	v	NT	LC
107	Birds	Phylloscopidae	<i>Phylloscopus borealis</i>	Arctic warbler	WV PM (F/W)	v	v	v	LC	LC
108	Birds	Picidae	<i>Chrysophlegma miniaceum</i>	Banded woodpecker	RB	-	v	-	LC	LC
109	Birds	Picidae	<i>Dinopium javanense</i>	Common flameback	RB (F/W)	v	v	v	LC	LC
110	Birds	Picidae	<i>Micropternus brachyurus</i>	Rufous woodpecker	RB (F/W)	v	v	-	LC	LC
111	Birds	Picidae	<i>Picus vittatus</i>	Laced woodpecker	RB (F/W)	v	v	v	LC	LC
112	Birds	Picidae	<i>Yungipicus moluccensis</i>	Sunda pygmy woodpecker	RB	v	v	v	LC	LC
113	Birds	Ploceidae	<i>Ploceus philippinus</i>	Baya weaver	RB	-	-	v	VU	LC
114	Birds	Psittacidae	<i>Loriculus galgulus</i>	Blue-crowned hanging parrot	RB	-	v	v	LC	LC
115	Birds	Psittacidae	<i>Psittacula alexandri</i>	Red-breasted parakeet	IRB	-	v	v	NA	NT
116	Birds	Psittacidae	<i>Psittacula krameri</i>	Rose-ringed parakeet	IRB	-	v	v	NA	LC
117	Birds	Psittacidae	<i>Psittacula longicauda</i>	Long-tailed parakeet	RB (F/W)	v	v	v	NT	VU
118	Birds	Psittacidae	<i>Trichoglossus haematodus</i>	Coconut lorikeet	IRB	-	-	v	NA	LC
119	Birds	Pycnonotidae	<i>Pycnonotus goiavier</i>	Yellow-vented bulbul	RB	v	v	v	LC	LC
120	Birds	Pycnonotidae	<i>Pycnonotus plumosus</i>	Olive-winged bulbul	RB	-	v	-	LC	LC
121	Birds	Pycnonotidae	<i>Pycnonotus zeylanicus</i>	Straw-headed bulbul	RB (F/W)	v	-	v	EN	CR
122	Birds	Rallidae	<i>Amauromis phoenicurus</i>	White-breasted waterhen	RB WV	v	-	v	LC	LC
123	Birds	Rallidae	<i>Gallirallus striatus</i>	Slaty-breasted rail	RB	v	v	v	LC	LC
124	Birds	Rallidae	<i>Rallina fasciata</i>	Red-legged crane	RB WV	-	-	v	NT	LC
125	Birds	Rhipiduridae	<i>Rhipidura javanica</i>	Malaysian pied fantail	RB	v	v	v	LC	LC
126	Birds	Scolopacidae	<i>Actitis hypoleucos</i>	Common sandpiper	WV PM	v	v	v	VU	LC
127	Birds	Scolopacidae	<i>Arenaria interpres</i>	Ruddy turnstone	WV	v	-	-	EN	LC
128	Birds	Scolopacidae	<i>Calidris falcinellus</i>	Broad-billed sandpiper	WV PM	v	-	-	VU	LC
129	Birds	Scolopacidae	<i>Calidris ferruginea</i>	Curlew sandpiper	WV PM	v	-	-	EN	NT
130	Birds	Scolopacidae	<i>Calidris ruficollis</i>	Red-necked stint	WV PM	v	-	-	NT	NT
131	Birds	Scolopacidae	<i>Calidris tenuirostris</i>	Great knot	WV	v	-	-	EN	EN
132	Birds	Scolopacidae	<i>Limnodromus semipalmatus</i>	Asian dowitcher	WV PM	v	-	-	VU	NT
133	Birds	Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed godwit	WV PM	v	-	v	VU	NT
134	Birds	Scolopacidae	<i>Limosa limosa</i>	Black-tailed godwit	WV PM	v	-	-	CR	NT
135	Birds	Scolopacidae	<i>Numenius arquata</i>	Eurasian curlew	WV PM	v	-	-	EN	NT
136	Birds	Scolopacidae	<i>Numenius phaeopus</i>	Whimbrel	WV PM	v	v	v	NT	LC
137	Birds	Scolopacidae	<i>Tringa brevipes</i>	Grey-tailed tattler	WV PM	v	-	-	VU	NT
138	Birds	Scolopacidae	<i>Tringa glareola</i>	Wood sandpiper	WV PM	v	-	-	EN	LC
139	Birds	Scolopacidae	<i>Tringa nebularia</i>	Common greenshank	WV	v	v	v	VU	LC
140	Birds	Scolopacidae	<i>Tringa stagnatilis</i>	Marsh sandpiper	WV PM	v	-	-	EN	LC
141	Birds	Scolopacidae	<i>Tringa totanus</i>	Common redshank	WV PM	v	-	v	VU	LC
142	Birds	Scolopacidae	<i>Xenus cinereus</i>	Terek sandpiper	WV PM	v	-	-	EN	LC
143	Birds	Strigidae	<i>Ketupa ketupu</i>	Buffy fish owl	RB	-	-	v	VU	LC
144	Birds	Strigidae	<i>Otus lempiji</i>	Sunda scops owl	RB	-	-	v	LC	LC
145	Birds	Strigidae	<i>Strix seloputo</i>	Spotted wood owl	RB	-	-	v	VU	LC

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
146	Birds	Sturnidae	<i>Acridotheres javanicus</i>	Javan myna	IRB	v	v	v	NA	VU
147	Birds	Sturnidae	<i>Acridotheres tristis</i>	Common myna	RB	v	v	v	LC	LC
148	Birds	Sturnidae	<i>Agropsar sturninus</i>	Daurian starling	WV PM	v	-	-	LC	LC
149	Birds	Sturnidae	<i>Aplonis panayensis</i>	Asian glossy starling	RB	v	v	v	LC	LC
150	Birds	Sturnidae	<i>Gracula religiosa</i>	Common hill myna	RB	-	-	v	NT	LC
151	Birds	Sulidae	<i>Sula leucogaster</i>	Brown booby	NBV	v	-	-	LC	LC
152	Birds	Sylviidae	<i>Orthotomus sericeus</i>	Rufous-tailed tailorbird	RB	v	-	-	NT	LC
153	Birds	Timaliidae	<i>Mixornis gularis</i>	Pin-striped tit-babbler	RB	-	v	v	LC	LC
154	Birds	Zosteropidae	<i>Zosterops palpebrosus</i>	Oriental white-eye	-	v	v	-	-	LC
-	Birds	Apodidae	<i>Aerodramus</i> sp.	Swiftlet	-	-	-	v	-	-
-	Birds	Ardeidae	<i>Ardea</i> sp.	Unidentified heron	-	-	-	v	-	-
-	Birds	Laridae	<i>Chlidonias</i> sp.	Unidentified marsh tern	-	-	-	v	-	-
-	Birds	Corvidae	<i>Corvus</i> sp.	Unidentified Crow	-	-	-	v	-	-
-	Birds	Hirundinidae	<i>Hirundo</i> sp.	Unidentified Swallow	-	-	-	v	-	-
-	Birds	Meropidae	<i>Merops</i> sp.	Unidentified bee-eater	-	-	-	v	-	-
-	Birds	Cisticolidae	<i>Orthotomus</i> sp.	Unidentified Tailorbird	-	-	-	v	-	-
-	Birds	Psittaculidae	<i>Psittacula</i> sp.	Unidentified parakeet	-	-	-	v	-	-
	<b>Mammals</b>									
1	Mammals	Canidae	<i>Canis lupus familiaris</i>	Feral dog	I	v	v	v	Not applicable	-
2	Mammals	Cercopithecidae	<i>Macaca fascicularis</i>	Long-tailed macaque	N	v	v	v	LC	EN
3	Mammals	Emballonuridae	<i>Taphozous longimanus</i>	Long-winged tomb bat	N	-	-	v	CR	LC
4	Mammals	Emballonuridae	<i>Saccolaimus saccolaimus</i>	Pouched tomb bat	N	-	-	v	LC	LC
5	Mammals	Emballonuridae	<i>Taphozous melanopogon</i>	Black-bearded tomb bat	N	-	-	v	LC	LC
6	Mammals	Manidae	<i>Manis javanica</i>	Sunda pangolin	N	-	-	v	CR	CR
7	Mammals	Muridae	<i>Rattus norvegicus</i>	Brown rat	I	-	-	v	Not applicable	LC
8	Mammals	Muridae	<i>Rattus rattus</i>	Black/House rat	I	-	v	-	Not applicable	LC
9	Mammals	Muridae	<i>Rattus tanezumi</i>	Oriental house rat	N	-	v	-	LC	LC
10	Mammals	Mustelidae	<i>Lutrogale perspicillata</i>	Smooth-coated otter	N	v	v	v	EN	VU
11	Mammals	Pteropodidae	<i>Cynopterus brachyotis</i>	Lesser dog-faced fruit bat	N	-	-	v	LC	LC
12	Mammals	Rhinolophidae	<i>Rhinolophus refulgens</i>	Glossy horseshoe bat	N	-	-	v	LC	-
13	Mammals	Sciuridae	<i>Callosciurus notatus</i>	Plantain squirrel	N	-	v	v	LC	LC
14	Mammals	Sciuridae	<i>Sundasciurus tenuis</i>	Slender squirrel	N	-	v	-	LC	LC
15	Mammals	Suidae	<i>Sus scrofa</i>	Wild pig	N	v	v	v	LC	LC
16	Mammals	Tupaiaidae	<i>Tupaia glis</i>	Common Malayan treeshrew	N	-	v	v	LC	LC
17	Mammals	Vespertilionidae	<i>Myotis horsfieldii</i>	Horsfield's bat	N	-	-	v	LC	LC
18	Mammals	Vespertilionidae	<i>Myotis muricola</i>	Whiskered myotis	N	-	-	v	LC	LC
19	Mammals	Vespertilionidae	<i>Pipistrellus javanicus</i>	Javan pipistrelle	N	-	-	v	LC	LC
20	Mammals	Vespertilionidae	<i>Scotophilus kuhlii</i>	Lesser asian house bat	N	-	-	v	LC	LC
21	Mammals	Viverridae	<i>Paradoxurus musangus</i>	Common palm civet	N	-	-	v	LC	LC
	<b>Reptiles</b>									
1	Reptiles	Agamidae	<i>Calotes versicolor</i>	Changeable lizard	I	-	v	v	Not Applicable	LC
2	Reptiles	Agamidae	<i>Bronchocela cristatella</i>	Green crested lizard	N	-	-	v	LC	LC
3	Reptiles	Colubridae	<i>Dendrelaphis pictus</i>	Painted bronzeback	N	-	v	v	LC	LC
4	Reptiles	Colubridae	<i>Ptyas korros</i>	Indochinese rat snake	N	-	-	v	LC	NT
5	Reptiles	Colubridae	<i>Ahaetulla prasina</i>	Oriental whip snake	N	-	-	v	LC	LC
6	Reptiles	Crocodylidae	<i>Crocodylus porosus</i>	Estuarine crocodile	N	v	v	v	CR	LC
7	Reptiles	Elapidae	<i>Naja sumatrana</i>	Equatorial spitting cobra	N	-	-	v	LC	LC
8	Reptiles	Emydidae	<i>Trachemys scripta elegans</i>	Red-eared slider	I	-	v	-	Not Applicable	LC
9	Reptiles	Gekkonidae	<i>Gehyra mutilata</i>	Four-clawed gecko	N	-	-	v	LC	LC

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10	Reptiles	Gekkonidae	<i>Hemidactylus frenatus</i>	Spiny-tailed house gecko	N	-	-	v	LC	LC
11	Reptiles	Gekkonidae	<i>Hemidactylus brookii</i>	Brooke's house gecko	I	-	-	v	Not Applicable	LC
12	Reptiles	Gekkonidae	<i>Lepidodactylus lugubris</i>	Mourning gecko	N	-	-	v	LC	LC
13	Reptiles	Gekkonidae	<i>Gekko monarchus</i>	Spotted house gecko	N	-	-	v	LC	LC
14	Reptiles	Homalopsidae	<i>Cerberus schneiderii</i>	Dog-faced water snake	N	v	-	-	LC	LC
15	Reptiles	Iguanidae	<i>Iguana iguana</i>	Green iguana	I	-	-	v	Not Applicable	LC
16	Reptiles	Scincidae	<i>Emoia atrocostata</i>	Mangrove skink	N	v	-	-	CR	LC
17	Reptiles	Scincidae	<i>Eutropis multifasciata</i>	Many-lined sun skink	N	-	v	v	LC	LC
18	Reptiles	Scincidae	<i>Subdoluseps bowringii</i>	Bowring's Agile Skink	N	-	v	-	LC	LC
19	Reptiles	Varanidae	<i>Varanus nebulosus</i>	Clouded monitor	N	-	-	v	LC	LC
20	Reptiles	Varanidae	<i>Varanus salvator</i>	Malayan water monitor	N	v	v	v	LC	LC
<b>Amphibians</b>										
1	Amphibians	Bufonidae	<i>Duttaphrynus melanostictus</i>	Asian toad	N	-	-	v	LC	LC
2	Amphibians	Dicroglossidae	<i>Fejervarya cancrivora</i>	Crab-eating frog	N	-	-	v	LC	LC
3	Amphibians	Dicroglossidae	<i>Fejervarya limnocharis</i>	Field frog	N	-	-	v	LC	LC
4	Amphibians	Dicroglossidae	<i>Limnonectes blythii</i>	Malayan giant frog	N	-	-	v	LC	NT
5	Amphibians	Eleutherodactylidae	<i>Eleutherodactylus planirostris</i>	Greenhouse frog	I	-	-	v	Not Applicable	LC
6	Amphibians	Microhylidae	<i>Kaloula pulchra</i>	Banded bullfrog	I	-	-	v	Not Applicable	LC
7	Amphibians	Microhylidae	<i>Microhyla cf. butleri</i>	Painted chorus frog	N	-	-	v	LC	LC
8	Amphibians	Microhylidae	<i>Microhyla cf. heymonsi</i>	Dark-sided chorus frog	N	-	-	v	LC	LC
9	Amphibians	Microhylidae	<i>Microhyla cf. mukhlesuri</i>	Mukhlesur's narrow-mouthed frog	I	-	v	v	Not Applicable	LC
10	Amphibians	Ranidae	<i>Sylvirana guentheri</i>	Gunther's frog	I	-	-	v	Not Applicable	LC
11	Amphibians	Rhacophoridae	<i>Polypedates leucomystax</i>	Four-lined tree frog	N	-	-	v	LC	LC
<b>Butterflies</b>										
1	Butterflies	Hesperiidae	<i>Ampittia dioscorides camertes</i>	Bush hopper	Moderately Common	-	-	v	LC	-
2	Butterflies	Hesperiidae	<i>Hasora badra badra</i>	Common awl	Moderately Common	-	-	v	LC	-
3	Butterflies	Hesperiidae	<i>Iambrix salsala salsala</i>	Chestnut bob	Common	-	-	v	LC	-
4	Butterflies	Hesperiidae	<i>Pelopidas agna agna</i>	Bengal swift	Moderately Common	-	-	v	LC	-
5	Butterflies	Hesperiidae	<i>Pelopidas mathias mathias</i>	Small branded swift	Common	-	-	v	LC	-
6	Butterflies	Hesperiidae	<i>Suastrus gremius gremius</i>	Palm bob	Common	-	-	v	LC	-
7	Butterflies	Hesperiidae	<i>Taractrocera archias quinta</i>	Yellow grass dart	Moderately Common	-	-	v	LC	-
8	Butterflies	Hesperiidae	<i>Telicota colon stinga</i>	Common palm dart	Moderately Common	-	-	v	LC	-
9	Butterflies	Lycaenidae	<i>Arhopala centaurus nakula</i>	Centaur oakblue	Moderately Common	-	-	v	LC	-
10	Butterflies	Lycaenidae	<i>Curetis saronis sumatrana</i>	Sumatran sunbeam	Moderately Common	-	-	v	LC	-
11	Butterflies	Lycaenidae	<i>Euchrysops cnejus cnejus</i>	Gram blue	Moderately Common	-	-	v	LC	-
12	Butterflies	Lycaenidae	<i>Rapala pheretima sequeira</i>	Copper flash	Moderately Common	-	-	v	LC	-
13	Butterflies	Lycaenidae	<i>Spalgis epius epius</i>	Apefly	Moderately Common	-	-	v	LC	-
14	Butterflies	Lycaenidae	<i>Tajuria cippus maxentius</i>	Peacock royal	Moderately Common	-	-	v	LC	-
15	Butterflies	Lycaenidae	<i>Zizeeria maha serica</i>	Pale grass blue	Common	-	-	v	LC	-
16	Butterflies	Lycaenidae	<i>Zizina otis lampa</i>	Lesser grass blue	Common	-	-	v	LC	-
17	Butterflies	Nymphalidae	<i>Acraea terpsicore</i>	Tawny coster	Common	-	v	v	LC	-
18	Butterflies	Nymphalidae	<i>Amathusia phidippus phidippus</i>	Palm king	Moderately Rare	-	-	v	NT	-
19	Butterflies	Nymphalidae	<i>Danaus chrysippus chrysippus</i>	Plain tiger	Common	-	-	v	LC	-
20	Butterflies	Nymphalidae	<i>Danaus genutia genutia</i>	Common tiger	Moderately Common	-	v	v	LC	-
21	Butterflies	Nymphalidae	<i>Dryas iulia</i>	Julia heliconian	-	-	-	v	-	-
22	Butterflies	Nymphalidae	<i>Doleschallia bisaltide ?bisaltide var.</i>	Autumn leaf	Common	-	-	v	LC	-
23	Butterflies	Nymphalidae	<i>Elymnias hypermnestra agina</i>	Common palmfly	Common	-	-	v	LC	-
24	Butterflies	Nymphalidae	<i>Elymnias panthera panthera</i>	Tawny palmfly	Moderately Common	-	-	v	NT	-
25	Butterflies	Nymphalidae	<i>Hypolimnas bolina bolina</i>	Great eggfly	Moderately Common	-	-	v	LC	-

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26	Butterflies	Nymphalidae	<i>Ideopsis vulgaris macrina</i>	Blue glassy tiger	Common	-	-	v	LC	LC
27	Butterflies	Nymphalidae	<i>Parantica agleoides agleoides</i>	Dark glassy tiger	Common	-	-	v	LC	-
28	Butterflies	Nymphalidae	<i>Junonia almana javana</i>	Peacock pansy	Common	-	v	v	LC	LC
29	Butterflies	Nymphalidae	<i>Junonia hedonia ida</i>	Chocolate pansy	Common	-	v	v	LC	-
30	Butterflies	Nymphalidae	<i>Junonia atlites atlites</i>	Grey pansy	Moderately Common	-	-	v	LC	-
31	Butterflies	Nymphalidae	<i>Junonia orithya wallacei</i>	Blue pansy	Common	-	-	v	LC	-
32	Butterflies	Nymphalidae	<i>Mycalesis mineus macromalayana</i>	Dark-brand bush brown	Common	-	v	-	LC	-
33	Butterflies	Nymphalidae	<i>Mycalesis visala phamis</i>	Long brand bush brown	Moderately Common	-	-	v	NT	-
34	Butterflies	Nymphalidae	<i>Neptis hylas papaja</i>	Common sailor	Moderately Common	-	-	v	LC	-
35	Butterflies	Nymphalidae	<i>Phaedyma columella singa</i>	Short banded sailor	Common	-	v	v	LC	-
36	Butterflies	Nymphalidae	<i>Polyura schreiber tisamenus</i>	Blue nawab	Moderately Rare	-	-	v	LC	-
37	Butterflies	Nymphalidae	<i>Mycalesis perseus cepheus</i>	Dingy bush brown	Moderately Common	-	v	v	LC	-
38	Butterflies	Papilionidae	<i>Papilio demoleus malayanus</i>	Lime butterfly	Common	-	-	v	LC	-
39	Butterflies	Papilionidae	<i>Papilio polytes romulus</i>	Common mormon	Common	-	-	v	LC	-
40	Butterflies	Pieridae	<i>Appias libythea olferna</i>	Striped albatross	Common	-	-	v	LC	-
41	Butterflies	Pieridae	<i>Catopsilia pomona pomona</i>	Lemon emigrant	Common	-	-	v	LC	-
42	Butterflies	Pieridae	<i>Delias hyparete metarete</i>	Painted jezebel	Common	-	-	v	LC	-
43	Butterflies	Pieridae	<i>Eurema hecabe contubernalis</i>	Common grass yellow	Common	-	v	v	LC	-
44	Butterflies	Pieridae	<i>Eurema blanda snelleni</i>	Three spot grass yellow	Common	-	v	-	LC	-
45	Butterflies	Pieridae	<i>Eurema sari sodalis</i>	Chocolate grass yellow	Moderately Common	-	-	v	LC	-
46	Butterflies	Pieridae	<i>Leptosia nina malayana</i>	Psyche	Common	-	v	v	LC	-
-	Butterflies	Lycaenidae	<i>Arhopala</i> sp.	Unidentified Oakblue	-	-	-	v	-	-
-	Butterflies	Lycaenidae	-	Unidentified Grass Blue	-	-	-	v	-	-
-	Butterflies	Hesperiidae	-	Unidentified Dart	-	-	-	v	-	-
-	Butterflies	Hesperiidae	-	Unidentified Skipper	-	-	-	v	-	-
<b>Odonates</b>										
1	Odonates	Libellulidae	<i>Crocothemis servilla</i>	Common scarlet	Widespread & Common	-	v	v	LC	LC
2	Odonates	Libellulidae	<i>Brachydiplax chalybea</i>	Blue dasher	Widespread & Common	-	-	v	LC	LC
3	Odonates	Libellulidae	<i>Lathrecista asiatica</i>	Scarlet grenadier	Widespread & Common	-	-	v	LC	LC
4	Odonates	Libellulidae	<i>Macrodiplax cora</i>	Coastal glider	Widespread & Common	-	v	v	LC	LC
5	Odonates	Libellulidae	<i>Neurothemis fluctuans</i>	Common parasol	Widespread & Common	-	v	v	LC	LC
6	Odonates	Libellulidae	<i>Orthetrum chrysis</i>	Spine-tufted skimmer	Widespread & Common	-	-	v	LC	LC
7	Odonates	Libellulidae	<i>Orchithemis pulcherrima</i>	Variable sentinel	Widespread & Common	v	-	-	LC	LC
8	Odonates	Libellulidae	<i>Orthetrum sabina</i>	Variiegated green skimmer	Widespread & Common	-	-	v	LC	LC
9	Odonates	Libellulidae	<i>Orthetrum testaceum</i>	Scarlet skimmer	Widespread & Common	-	v	v	LC	LC
10	Odonates	Libellulidae	<i>Pantala flavescens</i>	Wandering glider	Widespread & Common	-	-	v	LC	LC
11	Odonates	Libellulidae	<i>Pornothemis starrei</i>	Mangrove marshal	Widespread but Uncommon	v	-	v	NT	NT
12	Odonates	Libellulidae	<i>Rhodothemis rufa</i>	Common redbolt	Common redbolt	-	-	v	LC	LC
13	Odonates	Libellulidae	<i>Rhyothemis phyllis</i>	Yellow-barred flutterer	Widespread & Common	-	v	v	LC	LC
14	Odonates	Libellulidae	<i>Tramea transmarna euryale</i>	Saddleback glider	Widespread & Common	-	-	v	LC	LC
15	Odonates	Libellulidae	<i>Tholymis tillarga</i>	White-barred duskhawk	Widespread & Common	-	-	v	LC	LC
16	Odonates	Libellulidae	<i>Urothemis signata insignata</i>	Scarlet basker	Widespread & Common	-	-	v	LC	LC
<b>Fish</b>										
1	Fish	Adrianichthyidae	<i>Oryzias javanicus</i>	Medaka/Javan ricefish	-	v	-	v	-	LC
2	Fish	Apogonidae	<i>Yarica hyalosoma</i>	Mangrove cardinalfish	-	-	-	v	-	LC
3	Fish	Characidae	<i>Hemigrammus rodwayi</i>	Gold tetra	-	-	-	v	-	-
4	Fish	Cyprinidae	<i>Gobio gobio</i>	Gudgeon	-	-	-	v	-	-
5	Fish	Danionidae	<i>Danionella priapus</i>	Priapus fish	-	-	-	v	-	DD
6	Fish	Eleotridae	<i>Butis butis</i>	Butis	-	-	-	v	-	LC



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7	Fish	Gobiidae	<i>Brachygobius kabiliensis</i>	Mangrove/Kabili bumblebee goby	-	v	-	-	-	LC
8	Fish	Gobiidae	<i>Calamiana variegata</i>	Stripe-face brackish goby	-	v	-	-	-	LC
9	Fish	Gobiidae	<i>Glossogobius circumspectus</i>	Mangrove flathead goby	-	v	-	-	-	LC
10	Fish	Gobiidae	<i>Periophthalmodon schlosseri</i>	Giant mudskipper	-	-	v	-	LC	LC
11	Fish	Gobiidae	<i>Pseudogobius javanicus</i>	Java fat-nose goby	-	v	-	v	-	-
12	Fish	Osphronemidae (gour)	<i>Trichopsis vittata</i>	Striped croaking gourami	N	-	-	v	LC	LC
13	Fish	Poeciliidae (live-bearing)	<i>Poecilia sphenops</i>	Common molly	I	-	-	v	-	LC
14	Fish	Poeciliidae (live-bearing)	<i>Gambusia affinis</i>	Mosquitofish	I	-	-	v	-	LC
15	Fish	Poeciliidae (live-bearing)	<i>Poecilia reticulata</i>	Guppy	I	-	-	v	-	LC
16	Fish	Scatophagidae	<i>Scatophagus argus</i>	Spotted scat	-	-	-	v	-	LC
17	Fish	Zenarchopteridae	<i>Zenarchopterus buffonis</i>	Striped-nose half beak	-	-	-	v	LC	LC
18	Fish	Cichlidae	<i>Oreochromis</i> sp.	Tilapia	-	-	-	v	-	-
19	Fish	Toxotidae	<i>Toxotes</i> sp.	Archerfish	-	-	-	v	-	-
-	Fish	Eleotridae	-	Sleeper fish	-	-	-	v	-	-
-	Fish	Gobiidae	<i>Pseudogobius</i> sp.	Goby	-	-	-	v	-	-
-	Fish	Ictaluridae	-	Catfish	-	-	-	v	-	-
-	Fish	Mugilidae	-	Mullet	-	-	-	v	-	-
	<b>Molluscs</b>									
1	Molluscs	Achatinidae	<i>Achatina fulica</i>	Giant African snail	I	-	v	v	-	-
2	Molluscs	Ampullariidae	<i>Pomacea canaliculata</i>	Golden apple snail	-	-	-	v	-	LC
3	Molluscs	Anomiidae	<i>Enigmonia aenigmatica</i>	-	-	v	-	-	-	-
4	Molluscs	Arcidae	<i>Anadara antiquata</i>	-	-	-	v	-	-	-
5	Molluscs	Assimineidae	<i>Sphaerassiminea miniata</i>	Red berry snail	-	v	-	-	-	-
6	Molluscs	Columbellidae	<i>Columbella duclosiana</i>	Mangrove dove shell	-	-	v	-	-	-
7	Molluscs	Cyrenidae	<i>Geloina erosa</i>	-	-	v	-	-	-	-
8	Molluscs	Cyrenidae	<i>Geloina expansa</i>	Mangrove clam / lokan shell	-	v	-	v	-	-
9	Molluscs	Cyrenidae	<i>Polymesoda expansa</i>	Marsh clam	-	-	v	-	-	LC
10	Molluscs	Dreissenidae	<i>Mytilopsis sallei</i>	Black-striped mussel	-	v	-	v	-	-
11	Molluscs	Dyakiidae	<i>Quantula striata</i>	Land snail	-	-	v	-	LC	-
12	Molluscs	Ellobiidae	<i>Cassidula aurisfelis</i>	Cat ear	-	v	-	-	-	LC
13	Molluscs	Ellobiidae	<i>Cassidula mustelina</i>	Banded mangrove ear snail	-	v	-	-	-	DD
14	Molluscs	Ellobiidae	<i>Ellobium aurisjudae</i>	Judas ear	-	v	-	-	LC	LC
15	Molluscs	Ellobiidae	<i>Ellobium aurismidae</i>	Midas ear	-	v	-	-	LC	LC
16	Molluscs	Ellobiidae	<i>Ellobium scheepmakeri</i>	Mangrove land snail	-	v	-	-	CR	-
17	Molluscs	Ellobiidae	<i>Pythia plicata</i>	Pythia snail	-	v	-	-	LC	LC
18	Molluscs	Glaucnomidae	<i>Glaucnoma virens</i>	-	-	v	-	-	-	-
19	Molluscs	Iravadiidae	<i>Acliceratia</i> sp.	-	-	v	-	-	-	-
20	Molluscs	Iravadiidae	<i>Fluviocingula resima</i>	-	-	v	-	-	-	-
21	Molluscs	Iravadiidae	<i>Iravadia bombayana</i>	-	-	v	-	-	-	-
22	Molluscs	Laemodonta	<i>Laemodonta punctostriata</i>	-	-	v	-	-	-	-
23	Molluscs	Littorinidae	<i>Littoraria carinifera</i>	Carinate periwinkle	-	v	-	-	LC	-
24	Molluscs	Littorinidae	<i>Littoraria conica</i>	Common periwinkle	-	v	-	-	LC	-
25	Molluscs	Littorinidae	<i>Littoraria melanostoma</i>	Black-mouth mangrove periwinkle snail	-	v	-	v	LC	-
26	Molluscs	Littorinidae	<i>Littoraria vespacia</i>	-	-	v	-	-	LC	-
27	Molluscs	Littorinidae	<i>Mainwaringia rhizophila</i>	-	-	v	-	-	-	-
28	Molluscs	Lucinidae	<i>Austriella corrugata</i>	-	-	-	-	v	LC	-
29	Molluscs	Mactridae	<i>Heterocardia</i> sp.	-	-	v	-	-	-	-
30	Molluscs	Melanoides	<i>Melanoides tuberculata</i>	Malayan trumpet snail	N	v	-	v	-	LC
31	Molluscs	Mesodesmatidae	<i>Coecella horsfieldii</i>	-	-	-	-	v	NT	-

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
32	Molluscs	Muricidae	<i>Chicoreus capucinus</i>	Mangrove murex	-	v	v	v	LC	-
33	Molluscs	Muricidae	<i>Indothais gradata</i>	Malayan drill	-	-	v	-	-	-
34	Molluscs	Mytilidae	<i>Arcuatula senhousia</i>	Nest mussel	-	-	-	v	DD	-
35	Molluscs	Mytilidae	<i>Mytella strigata</i>	Charru mussel / american mussel	l	-	v	v	-	-
36	Molluscs	Nassariidae	<i>Nassarius jacksonianus</i>	Mud whelk	-	v	-	-	LC	-
37	Molluscs	Naticidae	<i>Notocochlis tigrina</i>	Tiger moon snail	-	-	v	-	LC	-
38	Molluscs	Neritidae	<i>Neripteron violaceum</i>	Violet nerite	-	v	v	-	LC	-
39	Molluscs	Neritidae	<i>Neripteron comucopia</i>	Black-mouth nerite	-	-	v	-	LC	-
40	Molluscs	Neritidae	<i>Nerita articulata</i>	Lined nerite	-	v	v	v	LC	LC
41	Molluscs	Onchidiidae	<i>Onchidium</i> sp.	Onch slug	-	v	-	v	-	-
42	Molluscs	Potamididae	<i>Pirenella cingulata</i>	Girdled horn-shell	-	v	-	-	LC	-
43	Molluscs	Cerithiidae	<i>Cerithium coralium</i>	Mud creeper	-	-	v	v	LC	LC
44	Molluscs	Pharidae	<i>Pharella javanica</i>	-	-	v	-	-	-	-
45	Molluscs	Plakobranchidae	<i>Elysia</i> sp.	Leaf slug	-	-	-	v	-	-
46	Molluscs	Psammobiidae	<i>Gari elongata</i>	-	-	v	-	-	-	-
47	Molluscs	Psammobiidae	<i>Gari togata</i>	-	-	-	v	-	LC	-
48	Molluscs	Potamididae	<i>Telescopium telescopium</i>	Rodong snail	-	v	v	v	LC	LC
49	Molluscs	Tellinidae	<i>Tellinides timorensis</i>	-	-	v	-	-	-	-
50	Molluscs	Thiaridae	<i>Sermyla riquetii</i>	-	-	v	-	-	-	LC
51	Molluscs	Thiaridae	<i>Tarebia gianifera</i>	Quilted melania	-	-	-	v	-	-
52	Molluscs	Veneridae	<i>Dosinia</i> sp.	-	-	v	-	-	-	-
53	Molluscs	Veneridae	<i>Marcia hiantina</i>	-	-	v	-	-	LC	-
54	Molluscs	Veneridae	<i>Marcia recens</i>	-	-	v	-	v	LC	-
55	Molluscs	Veneridae	<i>Paphia</i> sp.	Saltwater clam	-	-	-	v	-	-
-	Molluscs	Arcidae	<i>Anadara</i> sp.	See-hum	-	-	-	v	-	-
-	Molluscs	Assimineidae	<i>Assiminea</i> sp.	Red berry snail	-	-	-	v	-	-
-	Molluscs	Cyrenidae	<i>Geloina</i> sp.	-	-	-	-	v	-	-
-	Molluscs	Littorinidae	<i>Littoraria</i> sp.	Mangrove periwinkle snail	-	-	-	v	-	-
-	Molluscs	Lucinidae	<i>Austriella</i> sp.	-	-	v	-	-	-	-
-	Molluscs	Muricidae	<i>Thais</i> sp.	Elegant drill	-	-	-	v	-	-
-	Molluscs	Order Ceriantharia	-	-	-	-	-	v	-	-
<b>Crustaceans</b>										
1	Crustaceans	Alpheidae	<i>Potamalpheops johnsoni</i>	Caridean shrimp	-	v	-	-	EN	-
2	Crustaceans	Balanidae	<i>Balanus</i> sp.	Acorn barnacle	-	-	-	v	-	-
3	Crustaceans	Camptandriidae	<i>Ilyogynnis microcheirum</i>	Common silt crab	-	v	-	-	LC	-
4	Crustaceans	Diogenidae	<i>Diogenes</i> sp.	Tidal hermit crab	-	-	v	v	-	-
5	Crustaceans	Grapsidae	<i>Metaplex elegans</i>	Orange signaller crab	-	-	v	-	-	-
6	Crustaceans	Hymenosomatidae	<i>Neorhynchoplax mangalis</i>	Mangrove-dwelling hymenosomatid crab	-	v	-	-	NT	-
7	Crustaceans	Ligiidae	<i>Ligia hawaiiensis</i>	Sea slater	-	-	v	-	-	-
8	Crustaceans	Macrophthalmidae	<i>Macrophthalmus</i> sp.	Sentinel crab	-	-	v	-	-	-
9	Crustaceans	Menippidae	<i>Myomenippe hardwickii</i>	Stone/Thunder crab	-	-	v	-	LC	-
10	Crustaceans	Penaedidae	<i>Penaeus</i> sp.	Prawn	-	v	-	v	-	-
11	Crustaceans	Portunidae	<i>Portunus pelagicus</i>	Flower crab	-	-	v	-	-	-
12	Crustaceans	Portunidae	<i>Scylla olivacea</i>	Orange mud crab	-	-	v	-	-	-
13	Crustaceans	Portunidae	<i>Scylla</i> sp.	Mud crab	-	-	v	v	-	-
14	Crustaceans	Sesarmidae	<i>Episesarma singaporense</i>	Singapore vinegar crab	-	-	v	-	-	-
15	Crustaceans	Sesarmidae	<i>Episesarma versicolor</i>	Violet vinegar crab	-	-	v	-	-	-
16	Crustaceans	Sesarmidae	<i>Haberma nanum</i>	Grasping dwarf sesarmid	-	-	v	-	NT	-
17	Crustaceans	Sesarmidae	<i>Selatium brockii</i>	Mangrove tree-dwelling crab	-	-	-	v	-	-

No	Taxa	Family	Species Name	Common Name	Local Status	Historical Observation	2019 Observation	2022 Observation	SRDB3 Local Status	IUCN Global Status
18	Crustaceans	Sesarmidae	<i>Parasesarma eumolpe</i>	Face-banded sesarmine crab	-	v	-	v	-	-
19	Crustaceans	Sesarmidae	<i>Parasesarma indiarum</i>	Face-banded sesarmine crab	-	v	-	-	-	-
20	Crustaceans	Talitridae	<i>Microrchestia</i> sp.	Mangrove mudhopper	-	v	-	-	-	-
21	Crustaceans	Thalassinidae	<i>Thalassina</i> sp.	Mud lobster	-	v	v	-	EN	-
<b>Horseshoe Crab</b>										
1	Horseshoe Crab	Limulidae	<i>Carcinoscorpius rotundicauda</i>	Mangrove horseshoe crab	N	-	v	v	VU	DD
2	Horseshoe Crab	Limulidae	<i>Tachypleus gigas</i>	Coastal horseshoe crab	N	-	v	-	VU	DD
<b>Other Benthic Macrofauna</b>										
1	Benthic Macrofauna	Aiptasiidae	<i>Paraipatasia radiata</i>	Snail-hitching anemone	-	-	-	v	-	-
2	Benthic Macrofauna	Eunicidae	<i>Eunice grubei</i>	-	-	v	-	-	-	-
3	Benthic Macrofauna	Eunicidae	<i>Marphysa mossambica</i>	-	-	v	-	-	-	-
4	Benthic Macrofauna	Haliactiidae	<i>Stephensonactis omata</i>	Petal-mouthed mangrove anemone	-	-	v	-	-	-
5	Benthic Macrofauna	Nereidae	<i>Dendronereides heteropoda</i>	-	-	v	-	-	-	-
6	Benthic Macrofauna	Nereidae	<i>Namalycastis indica</i>	-	-	v	-	-	-	-
7	Benthic Macrofauna	Nereidae	<i>Namanereis quadraticeps</i>	-	-	v	-	-	-	-
8	Benthic Macrofauna	Nereidae	<i>Neanthes glandicincta</i>	-	-	v	-	-	-	-
9	Benthic Macrofauna	Phascolosomatidae	<i>Phascolosoma arcuatum</i>	-	-	v	-	-	-	-
10	Benthic Macrofauna	Trapeziidae	<i>Neotrapezium sublaevigatum</i>	-	-	v	-	-	-	-
11	Benthic Macrofauna	Ungulinidae	<i>Diplodonta</i> sp.	-	-	v	-	v	-	-
-	Benthic Macrofauna	Nereidae	<i>Neanthes</i> sp.	-	-	-	v	-	-	-
<b>Other Insects and Spiders</b>										
1	Insects and Spiders	Araneae	<i>Nephila entipodiana</i>	Batik golden weaver spider	-	-	v	-	-	-
2	Insects and Spiders	Calliphoridae	<i>Chrysomya megacephala</i>	Oriental latrine fly	-	-	v	-	-	-
3	Insects and Spiders	Cicadellidae	<i>Bothogronia</i> sp.	Sharpshooter leafhopper	-	-	v	-	-	-
4	Insects and Spiders	Erebidae	<i>Spirama retorta</i>	Noctuid moth	-	-	v	-	-	-
5	Insects and Spiders	Syrphidae	<i>Ischiodon scutellaris</i>	Hover fly	-	-	v	-	-	-
6	Insects and Spiders	Tettigoniidae	<i>Phaneroptera</i> sp.	Katydid	-	-	v	-	-	-
7	Insects and Spiders	Trigonidiidae	<i>Svistella chekjawa</i>	Chek Jawa cricket	-	-	v	-	-	-
8	Insects and Spiders	Vespidae	<i>Vespa affinis</i>	Lesser banded hornets	-	v	v	-	-	-

## **APPENDIX D**

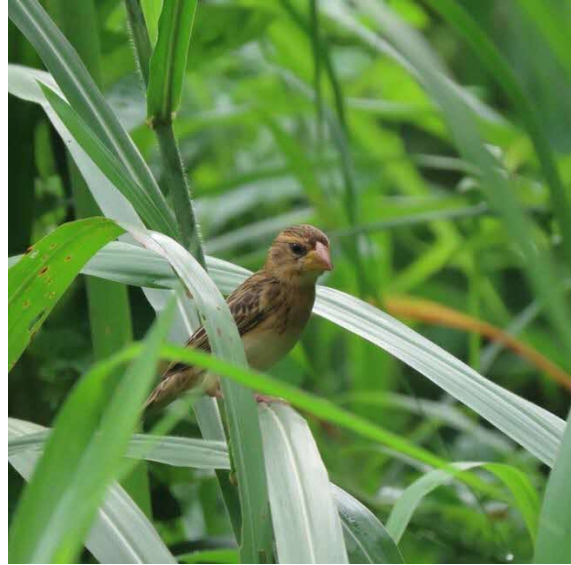
### **Photographs of Animals Observed at Study Area**

## Birds

**Asian brown flycatcher**



**Baya weaver**



**Blue-throated bee-eater**



**Brahminy kite**



**Brown shrike**



**Buffy fish owl**



**Common hill myna**



**Common iora**



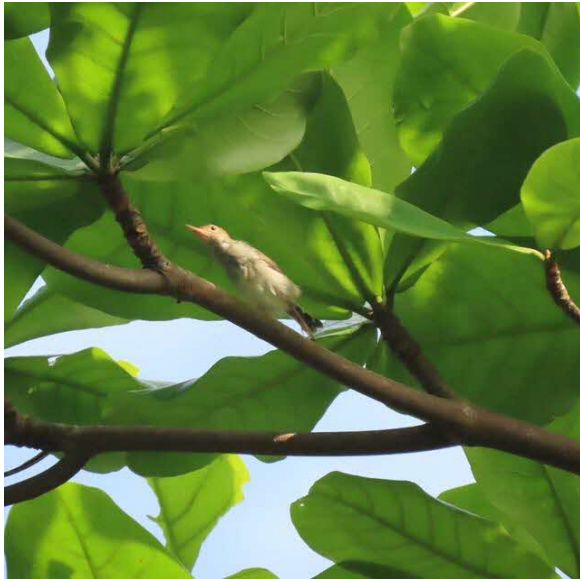
**Common redshank**



**Common sandpiper**



**Common tailorbird**



**Eurasian whimbrel**



**Great egret**



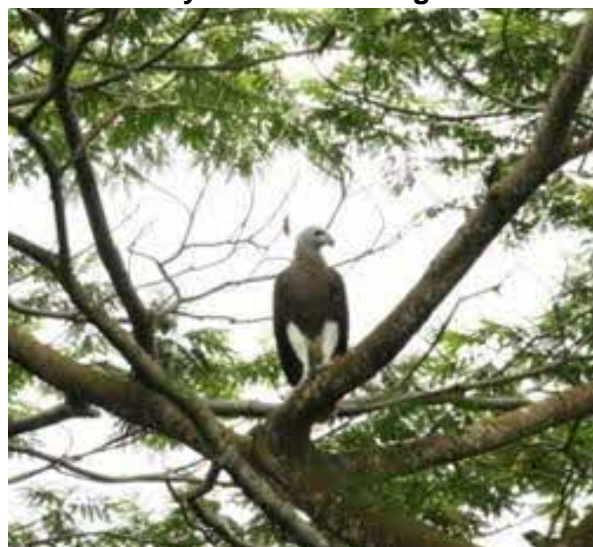
**Great-billed heron**



**Grey heron**



**Grey-headed fish eagle**



**House crow**



**Javan munia**



**Javan myna**



**Laced woodpecker**



**Large-tailed nightjar**

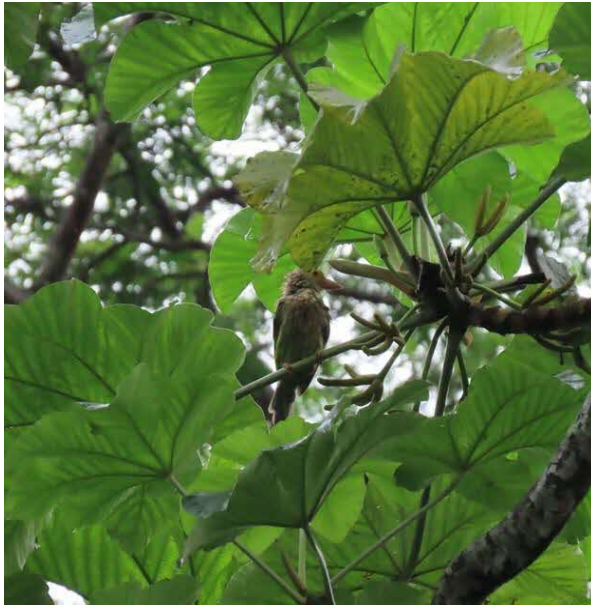


**Lesser coucal**





**Lineated barbet**



**Little egret**



**Oriental Magpie-robin**



**Oriental dollarbird**



**Paddyfield pipit**



**Pied imperial pigeon**



**Pied triller**



**Pink-necked green pigeon**



**Purple heron**



**Red junglefowl**



**Red-breasted parakeet**



**Red-legged crake**



**Rose-ringed parakeet**



**Spotted wood owl**



**Spotted Dove**



**Striated heron**



**White bellied sea eagle**



**White-winged tern**



**White-breasted waterhen**



**Yellow-vented bulbul**



**Mammals**

**Sunda Pangolin**



**Smooth-coated otter**



**Common palm civet**



**Common Malayan treeshrew**



**Feral dog**



**Long-tailed macaque**



**Plantain squirrel**



**Wild pig**



**Reptiles**

**Estuarine crocodile**



**Mourning gecko**



**Green crested lizard**



**Oriental whipsnake**



**Brooke's gecko**



**Changeable lizard**



**Indochinese rat snake**



**Painted bronzeback**



**Malayan water monitor**



**Green iguana**



**Amphibians**

**Asian Toad**



**Banded bullfrog**



**Crab-eating frog**



**Field frog**



**Invertebrates (Butterflies)**

**Blue glassy tiger**



**Common / Short-banded sailor**



**Common awl**



**Common grass yellow**



**Common tiger**



**Lime butterfly**





**Long brand bushbrown**



**Palm bob**



**Palm king**



**Small branded swift**



**Striped albatross**



**Invertebrates (Odonates)**

**Common parasol**



**Common redbolt**



**Common scarlet**



**Mangrove marshall**



**Scarlet Grenadier**



**Spine-tufted skimmer**



**Variegated Green Skimmer**



**White-barred duskhawk**



**Aquatic biodiversity (bony fish)**

**Gudgeon (*Butis sp.*)**



**Archerfish**



**Croaking Gourami**



**Molly**



**Mosquitofish**



**Goby**



**Medaka rice fish**



**Tilapia**



**Aquatic invertebrates (Decapods)**

**Mangrove Horseshoe crab**



**Mangrove tree-dwelling crab**



**Aquatic invertebrates (bivalves & sessile crustaceans)**

**Acorn barnacle**



**American brackish mussels**



***Mytella strigata***



***Marcia recens***



***Paphia* sp.**



***Geloina* sp.**



***Coecella horsfieldii***



***Anadara* sp.**



***Austriella corrugata***



***Arcuatula senhousia***



***Mytilopsis sallei***



**Aquatic invertebrates (Gastropods)**

***Thais* sp.**



**Mangrove periwinkle snail**



**Elegant drill**



**Plain creeper snail**



**Telescopium telescopium**



**Mangrove murex**



**Lined nerite**



**Golden apple snail**



**Littoraria melanostoma**



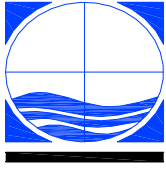
*Polychetes (aquatic invertebrates)*





## **APPENDIX E**

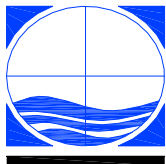
### **Baseline Surface Water Quality Laboratory Test Report**



**YJP SURVEYORS PTE LTD**

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# **REPORT OF SURFACE WATER QUALITY SAMPLING IN MANDAI MANGROVE AND MUDFLAT**



## CONTENTS

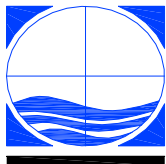
<b>1</b>	<b>INTRODUCTION</b> .....	<b>5</b>
<b>2</b>	<b>Methodology</b> .....	<b>5</b>
2.1	Sampling Location .....	5
2.2	Equipment and Resources .....	6
2.2.1	Vessel and navigation used for sample collection .....	6
2.2.2	Water Quality Monitoring equipment and sensors .....	8
2.2.2.1	Van Dorn Water Sampler .....	8
2.2.2.2	In-Situ Monitoring Sensor .....	9
2.3	Method of sampling .....	11
<b>3</b>	<b>Results</b> .....	<b>12</b>
	<b>APPENDIX A Boat License &amp; Insurance</b> .....	<b>17</b>
	<b>APPENDIX B Van Dorn Water Sample</b> .....	<b>20</b>
	<b>APPENDIX C Aqua TROLL® 500 Multiparameter Sonde</b> .....	<b>22</b>
	<b>APPENDIX D IN SITU SURFACE WATER SAMPLING RESULTS</b> .....	<b>25</b>
	SW 7 (Spring Tide, Flood) .....	26
	SW 8 (Spring Tide, Flood) .....	27
	SW 9 (Spring Tide, Flood) .....	28
	SW 4 (Spring Tide, Flood) .....	29
	SW 5 (Spring Tide, Flood) .....	30
	SW 6 (Spring Tide, Flood) .....	31
	SW 3 (Spring Tide, Flood) .....	32



**YJP SURVEYORS PTE LTD**

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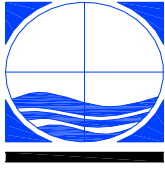
SW 2 (Spring Tide, Flood) .....	33
SW 1 (Spring Tide, Flood) .....	34
SW 1 (Spring Tide, Ebb) .....	35
SW 2 (Spring Tide, Ebb) .....	36
SW 3 (Spring Tide, Ebb) .....	37
SW 6 (Spring Tide, Ebb) .....	38
SW 5 (Spring Tide, Ebb) .....	39
SW 4 (Spring Tide, Ebb) .....	40
SW 9 (Spring Tide, Ebb) .....	41
SW 8 (Spring Tide, Ebb) .....	42
SW 7 (Spring Tide, Ebb) .....	43
SW 7 (Neap Tide, Flood) .....	44
SW 8 (Neap Tide, Flood) .....	45
SW 9 (Neap Tide, Flood) .....	46
SW 4 (Neap Tide, Flood) .....	47
SW 5 (Neap Tide, Flood) .....	48
SW 6 (Neap Tide, Flood) .....	49
SW 3 (Neap Tide, Flood) .....	50
SW 2 (Neap Tide, Flood) .....	51
SW 1 (Neap Tide, Flood) .....	52



SW 1 (Neap Tide, Ebb).....	53
SW 2 (Neap Tide, Ebb).....	53
SW 3 (Neap Tide, Ebb).....	54
SW 6 (Neap Tide, Ebb).....	55
SW 5 (Neap Tide, Ebb).....	56
SW 4 (Neap Tide, Ebb).....	57
SW 9 (Neap Tide, Ebb).....	58
SW 8 (Neap Tide, Ebb).....	59
SW 7 (Neap Tide, Ebb).....	60
<b>APPENDIX E WATER SAMPLING LABORATORY RESULTS.....</b>	<b>61</b>

### Table of Figures

<b>Figure 1.</b> Sampling location.....	6
<b>Figure 2.</b> Photo of Survey Vessel.....	7
<b>Figure 3.</b> Van Dorn Water Sampler .....	8
<b>Figure 4:</b> In-situ Monitoring Sensor .....	9
<b>Figure 5:</b> Parameters for in-situ water quality assessment .....	9
<b>Figure 6:</b> Parameters for ex-situ water quality assessment.....	10
<b>Figure 7.</b> In Situ Water Sample Parameters (Flood Current, Spring Tide; December 09, 2022)...	12
<b>Figure 8.</b> In Situ Water Sample Parameters (Ebb Current, Spring Tide; December 09, 2022) .....	13
<b>Figure 9.</b> In Situ Water Sample Parameters (Flood Current, Neap Tide; December 16, 2022).....	14
<b>Figure 10.</b> In Situ Water Sample Parameters (Flood Current, Neap Tide; December 16, 2022)...	15



## **1 INTRODUCTION**

YJP Surveyors Pte Ltd was appointed to conduct Environmental Quality baseline surveys that include sampling of surface water quality for physico-chemical-biological profiles and suspended sediment analysis.

This report presents the measured water quality parameters (salinity, RDO concentration, pH, turbidity, temperature) and water sampling laboratory test results from 9 sampling locations in Mandai Mangrove and Mudflat. In situ analysis for water parameters were taken using In Situ Monitoring Sensor Aqua Troll 500 and surface water quality samples were tested with Marchwood Laboratory, a SINGLASS accredited laboratory for testing of chemical and bacteriological parameters.

## **2 METHODOLOGY**

### **2.1 Sampling Location**

Surface water sampling and in-situ activities were conducted on 9 sampling locations in Mandai Mangrove and Mudflats as shown in Figure 1.

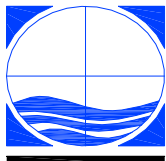


Figure 1. Sampling location.

## 2.2 Equipment and Resources

### 2.2.1 Vessel and navigation used for sample collection

The Survey Vessel, SR366H workboat was deployed for this project. See Figure 2 below.

She is an SR class work vessel with an approved license from MPA. The vessel is approximately 3m long and is suitable for carrying out surveying works in Singapore Waters. License and insurance are enclosed in Appendix A.

The vessel was equipped with a The Trimble Differential GPS model SPS351 and was used as a primary positioning system.

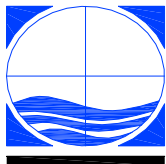
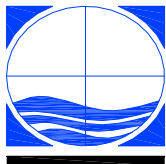


Figure 2. Photo of Survey Vessel

Vessel's Details.

- License No. :- SR 3666H
- Name of Craft :- SR 3666H
- Length :- 3m
- Breadth of Craft :- 1.6m
- Depth of Craft :- 0.7m
- Gross Tonnage :- 0.9 Ton





## 2.2.2 Water Quality Monitoring equipment and sensors

YJP carried out ex-situ water quality surveys during Neap (December 09, 2022; Flood and Ebb) and Spring (December 16, 2022; Flood and Ebb) tide. The samples collected were then delivered to a SINGLAS accredited laboratory, Marchwood Laboratory, for testing of chemical and bacteriological parameters. Samples were collected at the surface of 9 different locations.

### 2.2.2.1 Van Dorn Water Sampler

The water quality measurement, known as water sampling, was conducted by using the Van Dorn Water Sampler. It consists of a long tube with a valve at the bottom that can be opened and closed to collect a water sample at a specific depth. Refer to **Figure 3** and **Appendix B** for full specifications.

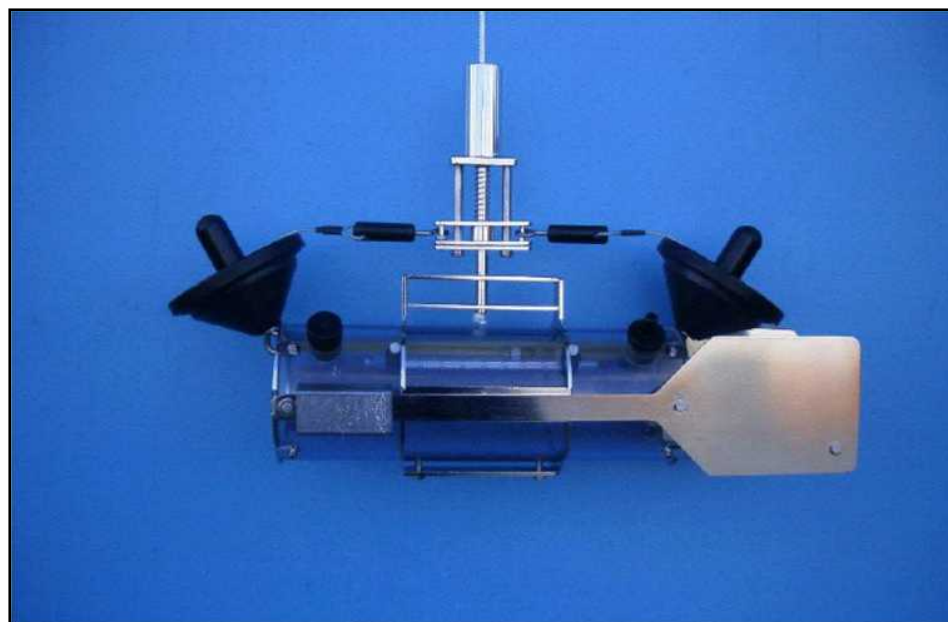


Figure 3. Van Dorn Water Sampler



### 2.2.2.2 In-Situ Monitoring Sensor

Water parameters were captured by using the Aqua Troll 500 In-Situ monitoring sensor shown in **Figure 4**.

The full specifications for this sensor is included in **Appendix C**.

This sensor is connected to a wireless communication device, Wireless Troll, to facilitate real-time monitoring and observation of data collected which is displayed on a mobile device or computer through Bluetooth connection. The parameters for in-situ water quality assessment is shown in **Figure 5**.

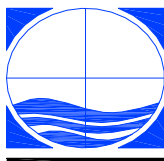


Figure 4: In-situ Monitoring Sensor

Parameters	Units	Standards	Detection Limits	Depth
<b>Physical</b>				
Temperature	°C	N/A	N/A	Profile at 1m interval
pH	N/A		N/A	
Salinity	ppt		N/A	
Turbidity	NTU		N/A	
Dissolved Oxygen	mg/L		N/A	
Light	$\mu\text{mol s}^{-1} \text{m}^{-2}$		N/A	
Secchi depth	m		N/A	N/A
Chlorophyll-a	$\mu\text{g/L}$	APHA 10200H	0.1 $\mu\text{g/L}$	

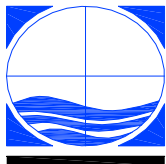
\* 1m below water surface

Figure 5: Parameters for in-situ water quality assessment



Parameters	Units	Standards	Detection Limits	Depth
<b>Chemical</b>				
Ammonia as NH <sub>3</sub> -N	mg/L	APHA 4500-NH <sub>3</sub> (H)	0.005mg/L	Surface* and near seabed
Nitrate as NO <sub>3</sub> -N	mg/L	APHA 4500-NO <sub>3</sub> (I)	0.005mg/L	
Nitrite as NO <sub>2</sub> -N	mg/L	HACH 10019	0.005mg/L	
Phosphate as PO <sub>4</sub> -P	mg/L	APHA 4500-P (G)	0.005mg/L	
Total Nitrogen, TN	mg/L	APHA 4500-N (C) (I)	0.01mg/L	
Total Phosphorus, TP	mg/L	APHA 4500-P (H)	0.01mg/L	
Total Petroleum Hydrocarbon (TPH)	mg/L	APHA 5520C	0.05mg/L	
BOD	mg/L	APHA PT 5210 B	1.0mg/L	
Total alkalinity	mg/L	APHA 2320 B	0.5mg/L	
Dissolved Inorganic Carbon (DIC)	mg/L	APHA 5310 B	10mg/L	
Total Organic Carbon (TOC)	mg/L	APHA 5310B	1mg/L	Surface* and near seabed
Oil and grease	mg/L	APHA 5520B	10mg/L	
Arsenic as As	µg/L	APHA 3125B	0.1µg/L	
Boron as B	µg/L	APHA 3125B	1 µg/L	
Cadmium as Cd	µg/L	APHA 3125B	0.1µg/L	
Chromium as Cr	µg/L	APHA 3125B	0.1µg/L	
Copper as Cu	µg/L	APHA 3125B	0.5µg/L	
Lead as Pb	µg/L	APHA 3125B	0.1µg/L	
Nickel as Ni	µg/L	APHA 3125B	0.5µg/L	
Zinc as Zn	µg/L	APHA 3125B	0.5µg/L	
Mercury as Hg	µg/L	APHA 3125B	0.05µg/L	
Vanadium as V	µg/L	APHA 3125B	0.15µg/L	
<b>Biological</b>				
Faecal Coliform	MPN/100mL	APHA 9221E	2 MPN/100mL	Surface* and near seabed
Enterococci	CFU/100mL	APHA 9230C	2 CFU/100mL	
E. Coli	MPN/100ml	APHA 9221F	1.8	
Phytoplankton	N/A	APHA 10200F (Microscopic)	1 cell/mL	Tow for entire water column for
Zooplankton	N/A	APHA 10200G (Microscopic)	1 org/mL	
Chlorophyll-a	µg/L	APHA 10200H	0.1µg/L	zooplankton
<b>Physical</b>				
Total suspended solids (TSS)	mg/L	APHA PT 2540D	1mg/L	Surface* and near seabed

Figure 6: Parameters for ex-situ water quality assessment



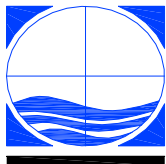
### **2.3 Method of sampling**

- In-Situ Multi-meter

The sensor used is In-Situ Aqua TROLL® 500 Multi parameter multi meter model. Aqua Troll 500 instrument used was calibrated before use. During the deployment of the sensor, the sensor was kept in a gentle motion throughout the water column while the reading is being taken.

- Water Sampling

The sampling equipment was cleaned with De-con 90, rinsed with de-ionised water and was examined as maintained and in good working condition. Sampling bottles for use on collecting water samples were obtained from the accredited laboratory where the samples will then be submitted for testing. The bottles used were pre-cleaned, coloured glass and was sent from the laboratories in clearly marked containers after sampling. Procedures for sampling shall follow US APHA standards.



### 3 RESULTS

Results obtained from in situ monitoring for surface water sampling are attached in Appendix C. Below, Figures 7-10 show the results plotted after getting the average of around 15-20 observations made on every sampling location during the flood and ebb currents of both Spring (December 09, 2022) and Neap (December 16, 2022) tides.

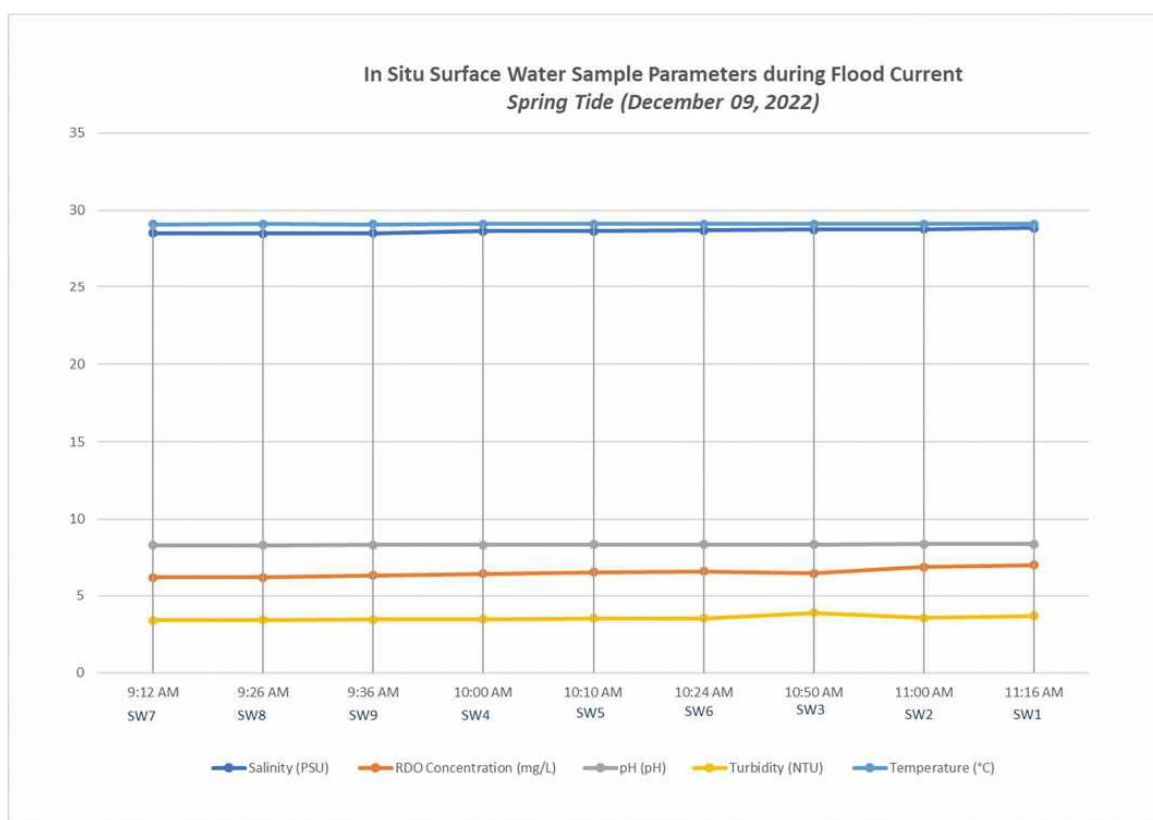


Figure 7. In Situ Water Sample Parameters (Flood Current, Spring Tide; December 09, 2022)

During the spring tide on December 9, 2022, the average salinity at flood current was 28.66 and at ebb current was 29.01. The average dissolved oxygen (RDO) concentration at flood current was 6.51 and at ebb current was 6.93. The average pH at flood current was 8.37 and at ebb current was 8.45. The average turbidity at flood current was 3.55 and at ebb current was 4.07. The average temperature at flood current was 29.10 degrees Celsius and at ebb current was 30.54 degrees Celsius, all for water samples taken at a depth of 1 meter in average.

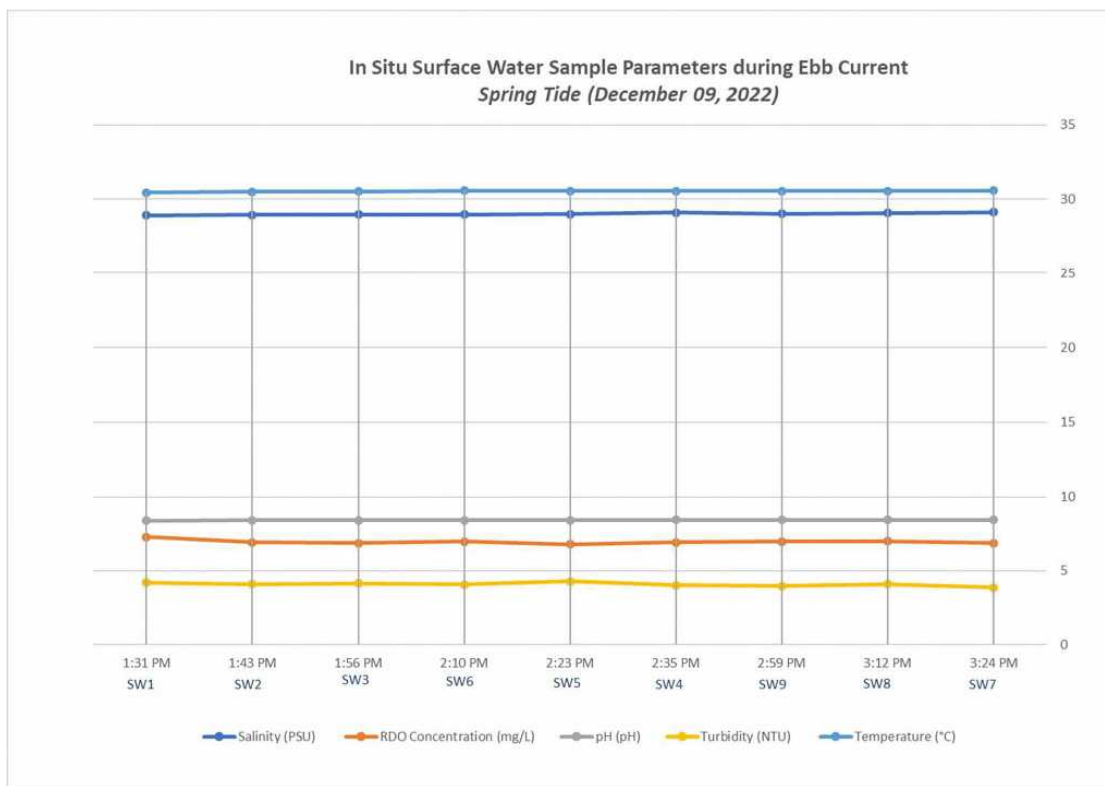
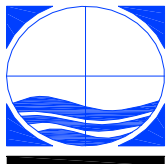
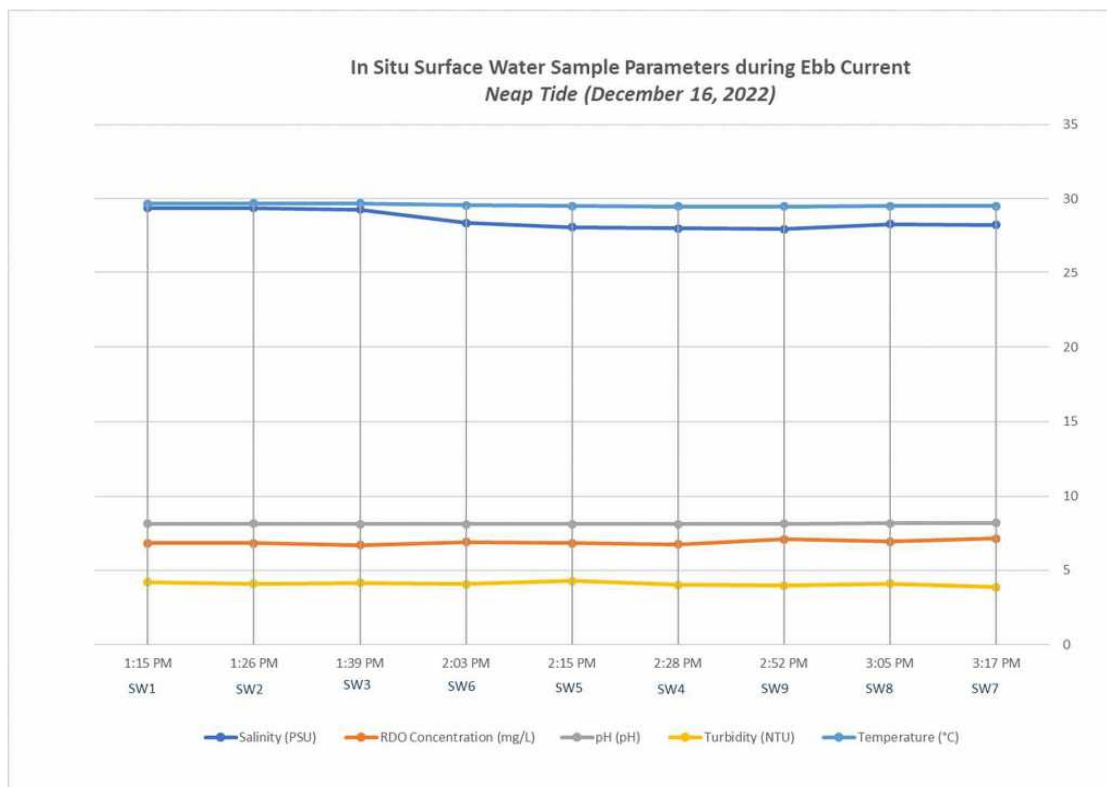
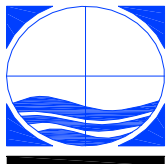


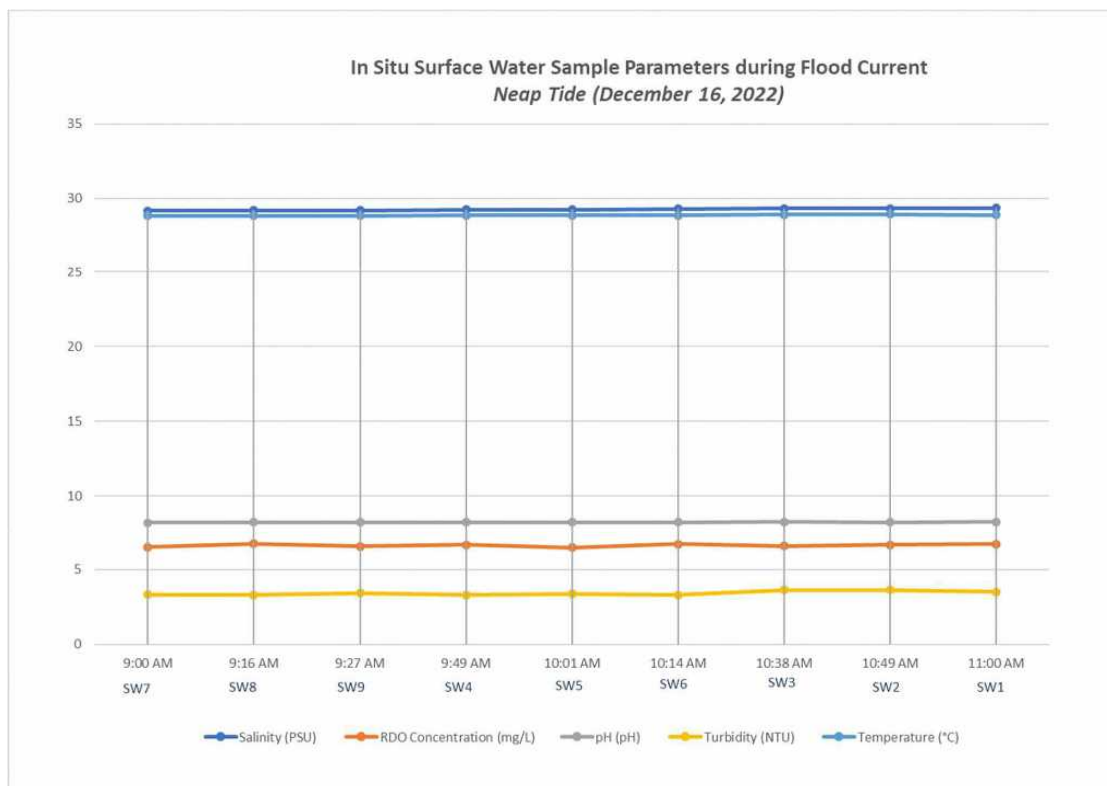
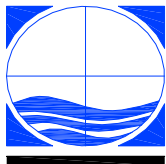
Figure 8. In Situ Water Sample Parameters (Ebb Current, Spring Tide; December 09, 2022)

During the neap tide on December 16, 2022, the average salinity at flood current was 29.26 and at ebb current was 28.56. The average dissolved oxygen (RDO) concentration at flood current was 6.62 and at ebb current was 6.85. The average pH at flood current was 8.23 and at ebb current was 8.16. The average turbidity at flood current was 3.42 and at ebb current was 3.03. The average temperature at flood current was 28.87 degrees Celsius and at ebb current was 29.57 degrees Celsius, all for water samples taken at an average depth of 1 meter.

Based on trends shown in Figures 7-10, it is noted that for Spring tide, the average salinity, dissolved oxygen, pH and turbidity during flood current is lower than during ebb current. While during Neap tide, the average salinity, dissolved oxygen, pH and turbidity during flood current is higher compared to during ebb current.



**Figure 9.** *In Situ Water Sample Parameters (Flood Current, Neap Tide; December 16, 2022)*

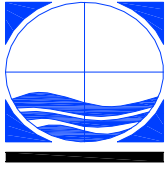


**Figure 10.** *In Situ Water Sample Parameters (Flood Current, Neap Tide; December 16, 2022)*

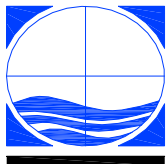
In comparing these in situ results, in general, the following observations can be made:

- The average salinity is slightly below the typical range for seawater, which is typically between 30 and 35 PSU.
- The average dissolved oxygen (RDO) concentration falls within the typical range for marine waters, which is between 6 and 8 mg/L.
- The average pH falls within the typical range for seawater, which is between 7.5 and 8.5.
- The average turbidity is within the typical range for marine waters in Singapore, which is between 1 and 5 NTU.





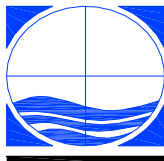
- The average temperature falls within the typical range for seawater, which is between 20 and 30 degrees Celsius.



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## **APPENDIX A BOAT LICENSE & INSURANCE**



YJP SURVEYORS PTE LTD

QBE Insurance (Singapore) Pte Ltd

Part of QBE Insurance Group - Unique Entity No. 198401363C

1 Wallich Street, #35-01 Guoco Tower, Singapore 078881
Tel: 65-6224 6633 Fax: 65-6533 3270
GST Registration No.: M200644018
www.qbe.com.sg



Page 1 of 4

Date of issue 22/02/2021

MARINE THIRD PARTY LIAB
POLICY SCHEDULE

Renewal

Table with 3 columns: Policy Number, Period of Insurance, Account Number. Values include 8-M0526478-MCH-R005, 01/04/2021 to 31/03/2022, 01000819, etc.

We, QBE Insurance (Singapore) Pte Ltd, hereby agree, in consideration of the payment to us by or on behalf of the Insured of the premium specified in the Schedule, to insure against loss, liability or expense in the manner hereinafter provided.

The Insured : YJP Surveyors Pte Ltd

Risk Details Commercial Hull Risk No 0001

Table with 2 columns: Risk Details, Commercial Hull. Values include Vessel Name SR 3666H (SUPREME 10FT ALUMINIUM BOAT), Type of Vessel WORKBOAT, etc.

Table with 2 columns: Interest Insured, Insured Value (SGD). Values include 1. Marine Third Party Liability, - Limit of Liability any one accident or occurrence, 200,000.00

Deductible S\$2,500.00 on all claims each accident or occurrence.

Trading Limit Warranted trading within Singapore Port Limits.

Subject to the following terms, conditions, exclusions, clauses, endorsements and warranties printed hereon or attached hereto:

Co-Assured

- 1) Maritime and Port Authority of Singapore (MPA)
2) Penta-Ocean/Hyundai/Boskalis Joint Venture (PHB JV)
3) Public Utilities Board (PUB)
4) Jurong Port Pte Ltd

Subject to waiver of subrogation rights against the above co-assureds.

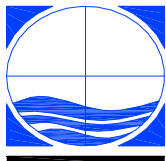
Conditions and Warranties

Pollution Sub-Limit : S\$200,000.00

As per Clauses 7 to 9 of the Institute Time Clauses - Hulls Port Risks 20.7.87 up to limit of S\$200,000.00 any one accident or occurrence but excluding liabilities to crew and cargo absolutely.

Including legal liability to passenger up to a limit of S\$100,000.00 any one person, any accident or series of accidents arising out of any one event and/or occurrence and subject to a combined single limit of S\$200,000.00 in respect of this section and clause 9 of Institute Time Clauses Hulls - Port Risks 20.7.87

SGPDWI



YJP SURVEYORS PTE LTD



MARITIME AND PORT AUTHORITY OF SINGAPORE  
HARBOUR CRAFT LICENCE

This licence is issued in accordance with the provisions of  
THE MARITIME AND PORT AUTHORITY OF SINGAPORE ACT  
THE MARITIME AND PORT AUTHORITY OF SINGAPORE (HARBOUR CRAFT) REGULATIONS

LICENCE S/No.106597 - PARTICULARS OF CRAFT

Licence No. SR 3666H	Name of Craft SR 3666H
Port of Registry NIL	Type of Craft WORKBOAT
Gross Tonnage 0.9	Craft Dimensions (in metres) LENGTH 3.0, BREADTH 1.6, DEPTH 0.7
Engine Power(in KW) 6	Registered Lien on Craft No
Mooring Base PRIVATE RESIDENCE	No. of Persons to Carry 2
No. of Passengers to carry 0	Minimum Manning Requirement Steersman
Licensed Use of Craft AS WORK BOAT/BARGE WITH NO CRANE ONBOARD.	
Conditions of Licence 1. To keep clear of swimmers. 2. When not in use, the craft is not to be moored or stored elsewhere except at the permitted mooring/storage base stipulated above. 3. To comply with all applicable Port Marine Circulars and Port Marine Notices as may be amended or supplemented from time to time and which are available on MPA's website at <a href="http://www.mpa.gov.sg">http://www.mpa.gov.sg</a>	

PARTICULARS OF OWNERS

Name of Owner YJP SURVEYORS PTE LTD	Name of Co-Owner
Address of Owner 10 GENTING ROAD THE BLUE BLDG #05-00 SINGAPORE 349473	Address of Co-Owner

**This Licence will remain in force, unless previously cancelled, until 31 MAR 2023**  
**Please note that all harbour craft or pleasure craft dues paid to MPA are not refundable.**

Date Issued : 29 MAR 2022

THIS LICENCE IS NOT A CERTIFICATE OF NATIONALITY  
This is a computer generated licence. No signature is required.





**YJP SURVEYORS PTE LTD**

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## **APPENDIX B VAN DORN WATER SAMPLE**



**OSIL**

Environmental Instruments  
and Systems

## Van Dorn Water Sampler



The horizontal Van Dorn water sampler is intended for taking water samples near the bottom in lakes, streams, or in stratified water bodies. The water sampler is based on the Van Dorn design. The sampler is made of a sturdy transparent acrylic tube and has a double releaser, activated by a drop messenger. The release system is manufactured from AISI 316 stainless steel.

The water sampler comes with a standard, non-Mercury thermometer, with a temperature range between - 10 and + 60 degrees °C (1 degree indications on the scale).

When the 2 rubber end covers are released, they are held together by a rubber strap.

All Van Dorn models have been re-designed for better performance and now the steering fins are integrated into the sampler, ensuring a better stabilization in flowing water.

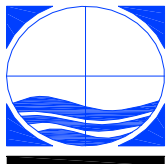
The water sampler comes in 3 sizes, 2 - 3 or 5 litres. All samplers are equipped with integrated direction fins for stabilization in flowing water.

<b>Dimensions:</b>	2,0 litres	3,0 litres	5,0 litres
Diameter of tube (O.D./I.D.):	110/100mm	110/100mm	110/100mm
Drop messenger brass:	500 g	500 g	500 g
Length:	450 mm	580 mm	830 mm
Total weight:	4,4 kg	5,1 kg	7,2 kg

### FOR FURTHER INFORMATION PLEASE CONTACT:

OSIL, Culkin House, C7/8 Endeavour Business Park, Penner Road, Havant, Hampshire PO9 1QN

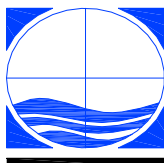
T: +44 (0) 2392 488240 F: +44 (0) 2392 488241 E: [osil@osil.co.uk](mailto:osil@osil.co.uk) W: [www.osil.co.uk](http://www.osil.co.uk)



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## **APPENDIX C AQUA TROLL® 500 MULTIPARAMETER SONDE**



## Aqua TROLL® 500 Multiparameter Sonde

**REDUCE MONITORING COSTS AND GET BETTER DATA FASTER WITH THE AQUA TROLL 500, A COST-EFFECTIVE MULTIPARAMETER SONDE IDEAL FOR BOTH SPOT CHECKS AND LONG-TERM MONITORING. THIS WIRELESS-ENABLED INSTRUMENT STREAMLINES DATA COLLECTION, SAVING HOURS IN THE FIELD WHILE DELIVERING MORE RELIABLE DATA.**

The customizable sonde comes with sensors that include:

- RDO® Optical Dissolved Oxygen
- Actual and specific conductivity
- pH/ORP
- Salinity
- Total dissolved solids (TDS)
- Resistivity
- Density
- Turbidity
- Temperature and pressure
- Ion Selective Electrodes
- Fluorometers

Connect the Aqua TROLL 500 to a Wireless TROLL Com and use it as a handheld, or connect the sonde to control systems or telemetry for remote monitoring.

### BE SMART

- Lower cost of ownership: Rugged multiparameter sonde with wet-mateable sensors replaces single parameter instruments and requires minimal maintenance and calibration.
- Data you can count on: The corrosion-resistant multiparameter sonde withstands harsh environments. Highly stable sensors with simple calibration. LCD readout of sensor health and connectivity gives you confidence in your deployment.

[www.in-situ.com](http://www.in-situ.com)

CALL OR CLICK TO PURCHASE OR RENT  
1-800-446-7488 (toll-free in U.S.A. and Canada)  
1-970-498-1500 (U.S.A. and international)

- Simple setup: Connect easily with telemetry, PLC/SCADA or dataloggers, or download real-time data wirelessly via mobile app for spot checks and profiling. The app walks you through instrument setup, just click to download and share data—no training or post-processing required.

### BE MOBILE

- Save time in the field: Auto-configuration and fast sensor response speed up sampling, while automated data collection eliminates the need to record data in field logs.
- Use the Aqua TROLL 500 anywhere: Flexible multiparameter sonde works for spot checks and low-flow sampling as well as long-term deployments. Anti-fouling wiper and titanium construction provide reliability even in challenging conditions.
- Take your data with you: VuSitu Mobile App records data directly from the probe. Log Setup Assistant simplifies instrument setup and reduces errors. Optimize your data with Panoramic Live Data.

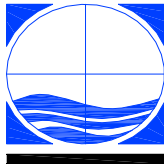
### TOTAL FIELD SUPPORT

- Get free 24/7 tech support and application guidance in the field
- Guaranteed 7-day maintenance turnaround
- Top rated for customer service for over 40 years

### Applications:

- SURFACE WATER SPOT SAMPLING AND PROFILING
- REMOTE MONITORING VIA TELEMETRY
- LONG-TERM DRINKING WATER, WASTEWATER OR STORMWATER MONITORING
- AQUACULTURE
- WIRED OR WIRELESS WATER QUALITY NETWORKS





YJP SURVEYORS PTE LTD

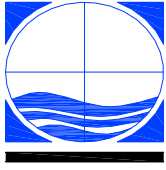


## Aqua TROLL® 500 Multiparameter Sonde

GENERAL		AQUA TROLL 500 MULTIPARAMETER SONDE					
OPERATING TEMP. (NON-FREEZING)	-5 to 50°C (23 to 122°F) ISE: Ammonium and Nitrate 0 - 40°C, Chloride 0 - 50°C	EXTERNAL POWER VOLTAGE	8-36 VDC; Required for normal operation			EXTERNAL POWER CURRENT <sup>1</sup>	Sleep: < 0.2 mA typical; Measurement: 40 mA typical, 75 mA Max
STORAGE TEMP.	Components Without Fluid: -40°C to + 65°C (Non Freezing Water) pH/ORP Sensors: 0°C to + 65°C Ammonium/Nitrate: 0 - 40°C Chloride: 0 - 50°C	INTERNAL MEMORY AND DATA LOGGING	Use external datalogger or telemetry				
DIMENSIONS	Length: 46 cm (18.143") (includes connector), With bail: 59 cm (23.23") Diameter: 4.7 cm (1.860")	READING RATES	1 reading every 2 seconds				
WEIGHT	0.978 kg / 2.15 lbs. (excludes instrument, sensors, restrictor and bumper)	COMMUNICATION DEVICE	Wireless TROLL Com				
WETTED MATERIALS (SONDE AND SENSORS)	PC, PC alloy, Delrin, Santoprene, Inconel, Titan, Titanium, Platinum, Ceramic, Nylon, PVC, Graphite	CABLE OPTIONS	Vented or non-vented polyurethane or vented Tefzel®				
SENSOR HEX SCREW DRIVER	0.050, 1.3 mm	LCD DISPLAY	Integrated display shows status of sonde, sensor ports, power voltage and connectivity, enable/disable BT.				
ENVIRONMENTAL RATING	IP68 with all sensors and cable attached IP67 without the sensors or cable attached	SOFTWARE	Android: In-Situ through Google Play Windows: Win-Situ 5 Data Services: HydroVu				
MAX PRESSURE RATING	Up to 150 PSI Ammonium/Nitrate up to 30PSI	INTERFACE	Android 4.4, requires Bluetooth 2.0				
OUTPUT OPTIONS	RS-485/MODBUS, SD-12, Bluetooth	CERTIFICATIONS	CE, FCC, WEEE, RoHS Compliant				
STANDARD SENSORS	ACCURACY	RANGE	RESOLUTION / PRECISION	RESPONSE TIME	UNITS OF MEASURE	METHODOLOGY	
TEMPERATURE <sup>2</sup>	±0.1°C	-5 to 50°C (23 to 122°F)	0.01°C	T63<2s, T90<15s, T95<30s	Celsius or Fahrenheit	EPA 170.1	
BAROMETRIC PRESSURE (VENTED MODELS ORDER)	±0.1 mBar	300 - 1100 mBar	0.1 mBar	T63<1s, T90<1s, T95<1s	Pressure: psi, kPa, bar, mbar, inHg, mmHg.	Silicon strain gauge	
pH <sup>3</sup>	±0.1 pH unit or better	0-14 pH	0.01 pH	T63<3s, T90<15s, T95<30s	pH, mV	Std. Methods 4500-H+, EPA 150.2	
ORP <sup>4</sup>	±0.5 mV	±1400 mV	0.1 mV	T63<3s, T90<15s, T95<30s	mV	Std. Methods 2580	
CONDUCTIVITY <sup>5</sup> TDS (TOTAL DISSOLVED SOLIDS) SALINITY	±0.5% of reading plus 1 µS/cm from 0 to 100,000 µS/cm; ±1.0% of reading from 100,000 to 200,000 µS/cm; ±2.0% of reading from 200,000 to 350,000 µS/cm	0 to 350,000 µS/cm 0-350 ppt 0-350 PSU	0.1 µS/cm 0.1 ppt 0.1 PSU	T63<1s, T90<3s, T95<5s	Actual conductivity (µS/cm, mS/cm), Specific conductivity (µS/cm, mS/cm), Salinity (PSU, ppt), Total dissolved solids (ppt, ppm), Resistivity (Ohm-cm), Density (g/cm3)	Std. Methods 2510, EPA 120.1, Std. Methods 2520A	
RUGGED DISSOLVED OXYGEN (RDO) WITH RDO-X OR FAST CAP <sup>6</sup>	±0.1 mg/L +/-2% of reading	0 to 20 mg/L 20 to 60 mg/L	0.01 mg/L	RDO-X: T63<15s, T90<45s, T95<60s Fast Cap: T63<1s, T90<15s, T95<30s	mg/L, Saturation, ppm	EPA-approved In-Situ Methods: 1003-B-2009, 1003-B-2009, 1004-B-2009	
TURBIDITY - TSS (TOTAL SUSPENDED SOLIDS) <sup>7</sup>	+/-2% of reading or +/-2 NTU, FNU, u.s.g. <sup>8</sup>	0 - 4,000 NTU 0-1,500 mg/L	0.01 NTU (0-1,000) 0.1 NTU (1,000-4,000) 0.1 mg/L	T63<1s, T90<1s, T95<1s	NTU, FNU ppt, mg/L	ISO 7027	
AMMONIUM (NH4+ - N) <sup>9</sup> RATED TO 25 M DEPTH (Un-ionized Ammonia, Total Ammonia (requires salinity, temperature and pH))	±10% or ±2 mg/L, u.s.g. <sup>10</sup> (freshwater only)	0-10,000 mg/L as N	0.01 mg/L	T63<1s, T90<10s, T95<30s	mg/L, ppm, mV	N/A	
NITRATE (NO3- - N) <sup>11</sup> RATED TO 25 M DEPTH	±10% or ±2 mg/L, u.s.g. <sup>12</sup> (freshwater only)	0-40,000 mg/L as N	0.01 mg/L	T63<1s, T90<1s, T95<1s	mg/L, ppm, mV	Std. Methods 4500-NO3 D	
CHLORIDE (CL-) <sup>13</sup>	±10% or ±2 mg/L, u.s.g. <sup>14</sup> (freshwater only)	0-150,000 mg/L	0.01 mg/L	T63<1s, T90<10s, T95<30s	mg/L, ppm, mV	Std. Methods 4500-CL D	
PRESSURE (OPTIONAL) <sup>15</sup>	±0.1% FS from -5 to 50°C	Non-Vented or Vented 9.0 m (30 ft.) - Burst: 27 m (90 ft.) 30 m (100 ft.) - Burst: 40 m (130 ft.) 76 m (250 ft.) - Burst: 107 m (350 ft.) 100 m (325 ft.) - Burst: 200 m (650 ft.)	0.01% full scale	T63<1s, T90<1s, T95<1s	Pressure: psi, kPa, bar, mbar, inHg, mmHg; Level: in, ft, mm, cm, m; Level: in, ft, mm, cm, m	Piezoresistive; Ceramic	
WARRANTY <sup>16</sup>	2 year - Sonde, RDO and sensor cap, temperature/conductivity, temperature only, turbidity (excluding pH/ORP); 1 year - pH/ORP, chloride ISE, accessories 90 Days - Nitrate and Ammonium ISE sensors; See warranty policy ( <a href="http://www.in-situ.com/warranty">www.in-situ.com/warranty</a> )						
NOTES	<sup>1</sup> External power current dependent on display and wiping. <sup>2</sup> Typical system response with instrument, sensors and restrictor when changing approximately 15°C in moderate flow. <sup>3</sup> pH sensor response time at thermal equilibrium. <sup>4</sup> ORP sensor accuracy from calibration standard @ 25°C, response at thermal equilibrium immediately following calibration in Zobell's measuring from air to +400 mV. <sup>5</sup> Conductivity Accuracy at calibration points. <sup>6</sup> RDO sensor full range 0-50mg/L, 0-500% sat. EPA-approved under the Alternative Test Procedure process. <sup>7</sup> TSS filter defined reference. <sup>8</sup> Between 2 calibration points immediately following proper conditioning and calibration. <sup>9</sup> Varies on site conditions and environmental interferences. See sensor summary sheet for potential interferences. <sup>10</sup> Ammonia Average response, can be longer with increasing concentrations of ammonium. <sup>11</sup> Pressure typical performance across full temperature and pressure calibrated range. <sup>12</sup> Warranty Extended warranty option for sonde only (1-3 year extension for up to 5 years total). <sup>13</sup> Whichever is greater.						

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## **APPENDIX D IN SITU SURFACE WATER SAMPLING RESULTS**



SW 7 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
09/12/2022 09:12	28.53	6.21	8.34	3.39	29.07	1.26
09/12/2022 09:12	28.53	6.21	8.34	3.38	29.07	1.27
09/12/2022 09:12	28.53	6.22	8.34	3.47	29.07	1.25
09/12/2022 09:12	28.53	6.20	8.34	3.36	29.07	1.26
09/12/2022 09:12	28.53	6.20	8.34	3.35	29.07	1.26
09/12/2022 09:12	28.50	6.20	8.34	3.41	29.07	1.21
09/12/2022 09:12	28.50	6.22	8.34	3.36	29.08	1.14
09/12/2022 09:12	28.49	6.22	8.34	3.36	29.08	1.13
09/12/2022 09:12	28.54	6.21	8.34	3.38	29.08	1.14
09/12/2022 09:12	28.55	6.21	8.34	3.38	29.08	1.13
09/12/2022 09:12	28.61	6.19	8.34	3.47	29.08	1.17
09/12/2022 09:12	28.47	6.17	8.34	3.42	29.09	1.15
09/12/2022 09:12	28.46	6.16	8.34	3.41	29.09	1.15
09/12/2022 09:12	28.52	6.18	8.34	3.44	29.09	1.13
09/12/2022 09:12	28.47	6.16	8.34	3.40	29.09	1.14



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### SW 8 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 9:25	28.49	6.21	8.35	3.44	29.10	1.21
12/9/2022 9:25	28.51	6.23	8.34	3.42	29.09	1.22
12/9/2022 9:25	28.51	6.23	8.34	3.42	29.09	1.22
12/9/2022 9:25	28.47	6.22	8.34	3.36	29.09	1.25
12/9/2022 9:25	28.50	6.21	8.34	3.43	29.10	1.23
12/9/2022 9:26	28.51	6.21	8.34	3.43	29.10	1.23
12/9/2022 9:26	28.48	6.21	8.34	3.46	29.10	1.22
12/9/2022 9:26	28.54	6.18	8.34	3.42	29.11	1.20
12/9/2022 9:26	28.55	6.18	8.34	3.41	29.11	1.19
12/9/2022 9:26	28.50	6.17	8.34	3.38	29.10	1.22
12/9/2022 9:26	28.48	6.19	8.34	3.44	29.09	1.16
12/9/2022 9:26	28.48	6.19	8.34	3.45	29.09	1.15
12/9/2022 9:26	28.52	6.18	8.34	3.40	29.10	1.19
12/9/2022 9:26	28.51	6.19	8.34	3.41	29.11	1.21
12/9/2022 9:26	28.51	6.19	8.34	3.41	29.11	1.21
12/9/2022 9:26	28.57	6.17	8.34	3.37	29.11	1.21
12/9/2022 9:26	28.46	6.17	8.34	3.39	29.11	1.06
12/9/2022 9:26	28.45	6.17	8.34	3.39	29.11	1.05



SW 9 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 9:36	28.52	6.33	8.36	3.52	29.08	0.99
12/9/2022 9:36	28.52	6.34	8.36	3.54	29.08	0.98
12/9/2022 9:36	28.56	6.33	8.36	3.39	29.08	1.04
12/9/2022 9:36	28.54	6.35	8.36	3.41	29.08	1.08
12/9/2022 9:36	28.54	6.35	8.36	3.41	29.08	1.08
12/9/2022 9:36	28.51	6.36	8.35	3.42	29.08	1.09
12/9/2022 9:36	28.54	6.34	8.35	3.41	29.09	1.10
12/9/2022 9:36	28.54	6.34	8.35	3.41	29.10	1.10
12/9/2022 9:36	28.58	6.35	8.36	3.42	29.09	1.14
12/9/2022 9:36	28.51	6.33	8.35	3.40	29.09	1.17
12/9/2022 9:36	28.51	6.32	8.35	3.40	29.09	1.17
12/9/2022 9:36	28.51	6.33	8.35	3.45	29.09	1.19
12/9/2022 9:36	28.50	6.33	8.35	3.45	29.09	1.19
12/9/2022 9:36	28.49	6.32	8.35	3.44	29.09	1.17
12/9/2022 9:36	28.53	6.30	8.35	3.44	29.10	1.16
12/9/2022 9:36	28.53	6.30	8.35	3.44	29.10	1.15
12/9/2022 9:36	28.54	6.28	8.35	3.39	29.11	1.15
12/9/2022 9:36	28.48	6.28	8.35	3.48	29.11	1.18
12/9/2022 9:36	28.48	6.28	8.35	3.48	29.11	1.19
12/9/2022 9:36	28.51	6.28	8.35	3.41	29.11	1.12
12/9/2022 9:36	28.53	6.29	8.35	3.42	29.10	1.15
12/9/2022 9:36	28.54	6.29	8.35	3.42	29.10	1.15



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<b>12/9/2022 9:37</b>	28.58	6.29	8.35	3.54	29.10	1.13
<b>12/9/2022 9:37</b>	28.58	6.29	8.35	3.50	29.10	1.13

**SW 4 (Spring Tide, Flood)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/9/2022 9:58</b>	28.50	6.43	8.36	3.46	29.09	1.12
<b>12/9/2022 9:58</b>	28.66	6.43	8.36	3.52	29.11	1.10
<b>12/9/2022 9:58</b>	28.66	6.42	8.36	3.50	29.11	1.08
<b>12/9/2022 9:58</b>	28.67	6.42	8.36	3.50	29.11	1.07
<b>12/9/2022 9:58</b>	28.76	6.42	8.37	3.47	29.11	1.11
<b>12/9/2022 9:58</b>	28.77	6.43	8.37	3.48	29.11	1.14
<b>12/9/2022 9:58</b>	28.78	6.43	8.37	3.48	29.11	1.14
<b>12/9/2022 9:58</b>	28.71	6.44	8.37	3.44	29.12	1.17
<b>12/9/2022 9:58</b>	28.65	6.43	8.36	3.47	29.12	1.16
<b>12/9/2022 9:58</b>	28.64	6.43	8.36	3.48	29.12	1.16
<b>12/9/2022 9:58</b>	28.56	6.43	8.36	3.45	29.11	1.17
<b>12/9/2022 9:58</b>	28.62	6.43	8.36	3.47	29.11	1.15
<b>12/9/2022 9:58</b>	28.63	6.43	8.36	3.47	29.11	1.15
<b>12/9/2022 9:59</b>	28.62	6.43	8.36	3.44	29.12	1.15
<b>12/9/2022 9:59</b>	28.62	6.42	8.36	3.44	29.12	1.15
<b>12/9/2022 9:59</b>	28.69	6.42	8.36	3.48	29.12	1.15
<b>12/9/2022 9:59</b>	28.70	6.42	8.36	3.52	29.12	1.15
<b>12/9/2022 9:59</b>	28.70	6.41	8.36	3.53	29.11	1.16



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### SW 5 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 10:10	28.61	6.46	8.37	3.48	29.11	1.09
12/9/2022 10:10	28.60	6.47	8.37	3.47	29.11	1.08
12/9/2022 10:10	28.57	6.48	8.38	3.49	29.09	1.08
12/9/2022 10:10	28.70	6.53	8.38	3.51	29.08	1.09
12/9/2022 10:10	28.71	6.54	8.38	3.52	29.08	1.09
12/9/2022 10:10	28.63	6.56	8.38	3.52	29.10	1.08
12/9/2022 10:10	28.72	6.56	8.38	3.50	29.11	1.10
12/9/2022 10:10	28.73	6.57	8.38	3.49	29.11	1.10
12/9/2022 10:10	28.72	6.57	8.38	3.50	29.12	1.14
12/9/2022 10:10	28.77	6.57	8.37	3.47	29.12	1.14
12/9/2022 10:10	28.77	6.57	8.37	3.47	29.13	1.14
12/9/2022 10:10	28.53	6.53	8.37	3.59	29.11	1.12
12/9/2022 10:10	28.51	6.53	8.37	3.60	29.11	1.12
12/9/2022 10:10	28.66	6.52	8.37	3.69	29.11	1.10
12/9/2022 10:10	28.62	6.52	8.37	3.53	29.11	1.11
12/9/2022 10:10	28.62	6.52	8.37	3.52	29.11	1.11
12/9/2022 10:10	28.58	6.54	8.37	3.47	29.10	1.12
12/9/2022 10:10	28.69	6.56	8.38	3.48	29.10	1.11



SW 6 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 10:23	28.68	6.55	8.38	3.50	29.12	1.04
12/9/2022 10:24	28.71	6.58	8.38	3.46	29.11	1.06
12/9/2022 10:24	28.63	6.57	8.38	3.49	29.10	1.07
12/9/2022 10:24	28.62	6.57	8.38	3.49	29.10	1.08
12/9/2022 10:24	28.63	6.58	8.38	3.56	29.11	1.08
12/9/2022 10:24	28.72	6.57	8.38	3.53	29.12	1.08
12/9/2022 10:24	28.72	6.57	8.38	3.53	29.12	1.08
12/9/2022 10:24	28.80	6.58	8.38	3.58	29.12	1.07
12/9/2022 10:24	28.69	6.57	8.38	3.62	29.12	1.07
12/9/2022 10:24	28.68	6.57	8.38	3.62	29.12	1.07
12/9/2022 10:24	28.60	6.58	8.38	3.51	29.10	1.07
12/9/2022 10:24	28.73	6.60	8.38	3.52	29.11	1.10
12/9/2022 10:24	28.74	6.60	8.38	3.52	29.11	1.10
12/9/2022 10:24	28.68	6.61	8.38	3.54	29.11	1.13
12/9/2022 10:24	28.72	6.60	8.38	3.58	29.12	1.15
12/9/2022 10:24	28.72	6.60	8.38	3.59	29.12	1.15
12/9/2022 10:24	28.68	6.60	8.38	3.53	29.11	1.13
12/9/2022 10:24	28.68	6.60	8.38	3.52	29.11	1.13
12/9/2022 10:24	28.70	6.60	8.38	3.55	29.11	1.09





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### SW 3 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 10:48	28.90	6.46	8.39	4.07	29.12	1.15
12/9/2022 10:48	28.83	6.48	8.39	3.83	29.11	1.12
12/9/2022 10:48	28.85	6.49	8.39	3.86	29.12	1.13
12/9/2022 10:48	28.85	6.49	8.39	3.86	29.12	1.13
12/9/2022 10:48	28.85	6.48	8.38	3.78	29.13	1.12
12/9/2022 10:48	28.83	6.44	8.38	3.89	29.14	1.15
12/9/2022 10:48	28.83	6.44	8.38	3.90	29.14	1.15
12/9/2022 10:48	28.72	6.45	8.38	3.83	29.12	1.20
12/9/2022 10:48	28.71	6.45	8.38	3.82	29.12	1.21
12/9/2022 10:48	28.65	6.45	8.38	3.81	29.11	1.20
12/9/2022 10:48	28.58	6.45	8.38	3.78	29.12	1.20
12/9/2022 10:48	28.57	6.45	8.38	3.78	29.12	1.20
12/9/2022 10:48	28.60	6.46	8.38	3.82	29.10	1.23
12/9/2022 10:48	28.62	6.46	8.38	3.85	29.10	1.22
12/9/2022 10:48	28.62	6.46	8.38	3.85	29.10	1.22
12/9/2022 10:49	28.77	6.44	8.38	3.86	29.12	1.22
12/9/2022 10:49	28.79	6.42	8.38	4.16	29.13	1.20
12/9/2022 10:49	28.79	6.42	8.38	4.19	29.14	1.20
12/9/2022 10:49	28.82	6.44	8.40	3.93	29.12	1.16
12/9/2022 10:49	28.83	6.44	8.40	3.92	29.12	1.15



SW 2 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 11:01	28.88	6.89	8.40	3.55	29.12	1.06
12/9/2022 11:01	28.68	6.87	8.40	3.53	29.11	1.07
12/9/2022 11:01	28.77	6.87	8.40	3.57	29.11	1.07
12/9/2022 11:01	28.78	6.87	8.40	3.58	29.10	1.07
12/9/2022 11:01	28.78	6.86	8.40	3.59	29.11	1.07
12/9/2022 11:01	28.78	6.86	8.40	3.59	29.11	1.06
12/9/2022 11:01	28.78	6.86	8.40	3.52	29.10	1.04
12/9/2022 11:01	28.87	6.87	8.41	3.61	29.10	1.06
12/9/2022 11:01	28.87	6.87	8.41	3.61	29.10	1.06
12/9/2022 11:01	28.77	6.88	8.40	3.53	29.11	1.08
12/9/2022 11:01	28.85	6.86	8.40	3.58	29.12	1.09
12/9/2022 11:02	28.86	6.85	8.40	3.58	29.12	1.09
12/9/2022 11:02	28.81	6.85	8.40	3.56	29.12	1.07
12/9/2022 11:02	28.64	6.83	8.40	3.54	29.12	1.06
12/9/2022 11:02	28.61	6.82	8.40	3.54	29.12	1.06
12/9/2022 11:02	28.78	6.85	8.40	3.58	29.10	1.07
12/9/2022 11:02	28.85	6.83	8.40	3.55	29.13	1.08
12/9/2022 11:02	28.86	6.83	8.40	3.55	29.13	1.08



SW 1 (Spring Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 11:15	28.84	7.01	8.41	4.05	29.10	0.91
12/9/2022 11:15	28.84	7.01	8.41	4.10	29.10	0.91
12/9/2022 11:15	28.89	6.99	8.41	3.62	29.12	0.92
12/9/2022 11:15	28.86	6.99	8.41	3.69	29.12	0.91
12/9/2022 11:16	28.86	6.99	8.41	3.68	29.12	0.91
12/9/2022 11:16	28.84	6.98	8.41	3.58	29.12	0.89
12/9/2022 11:16	28.87	6.96	8.41	3.58	29.12	0.90
12/9/2022 11:16	28.87	6.96	8.41	3.58	29.12	0.90
12/9/2022 11:16	28.93	6.96	8.41	3.57	29.12	0.88
12/9/2022 11:16	28.86	6.94	8.41	3.59	29.11	0.84
12/9/2022 11:16	28.85	6.94	8.41	3.60	29.11	0.83
12/9/2022 11:16	28.81	6.96	8.42	3.71	29.10	0.81
12/9/2022 11:16	28.88	7.02	8.43	3.65	29.09	0.84
12/9/2022 11:16	28.88	7.02	8.43	3.64	29.09	0.84
12/9/2022 11:16	28.82	7.07	8.43	3.72	29.07	0.92
12/9/2022 11:16	28.89	7.07	8.42	3.61	29.10	0.96
12/9/2022 11:16	28.90	7.07	8.42	3.61	29.10	0.97



SW 1 (Spring Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 13:31	28.94	7.16	8.44	4.14	30.45	1.00
12/9/2022 13:31	28.91	7.22	8.44	4.19	30.41	0.88
12/9/2022 13:31	28.91	7.23	8.44	4.19	30.41	0.86
12/9/2022 13:31	28.91	7.29	8.44	4.16	30.42	0.93
12/9/2022 13:31	28.90	7.30	8.44	4.16	30.42	0.93
12/9/2022 13:31	28.84	7.30	8.43	4.20	30.46	0.98
12/9/2022 13:31	28.95	7.31	8.44	4.18	30.44	0.97
12/9/2022 13:31	28.96	7.31	8.44	4.17	30.43	0.97
12/9/2022 13:31	29.01	7.31	8.44	4.16	30.45	0.95
12/9/2022 13:31	28.94	7.30	8.44	4.18	30.45	0.97
12/9/2022 13:31	28.94	7.29	8.44	4.18	30.45	0.97
12/9/2022 13:31	28.80	7.31	8.44	4.18	30.45	0.98
12/9/2022 13:31	28.90	7.28	8.44	4.15	30.46	1.00
12/9/2022 13:31	28.91	7.27	8.44	4.15	30.46	1.00
12/9/2022 13:31	28.90	7.27	8.43	4.18	30.46	0.98
12/9/2022 13:31	28.89	7.25	8.43	4.23	30.47	0.96
12/9/2022 13:31	28.89	7.25	8.43	4.24	30.47	0.96
12/9/2022 13:31	28.98	7.29	8.45	4.24	30.46	0.81



SW 2 (Spring Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 13:42	29.02	6.94	8.45	4.06	30.49	1.08
12/9/2022 13:42	28.89	6.91	8.44	4.32	30.50	1.13
12/9/2022 13:42	28.91	6.89	8.44	4.08	30.51	1.11
12/9/2022 13:42	28.91	6.89	8.44	4.07	30.52	1.11
12/9/2022 13:42	28.91	6.89	8.44	4.07	30.50	1.12
12/9/2022 13:42	28.92	6.89	8.44	4.06	30.50	1.12
12/9/2022 13:42	28.97	6.90	8.44	4.08	30.50	1.17
12/9/2022 13:43	28.96	6.90	8.44	4.08	30.51	1.16
12/9/2022 13:43	28.96	6.90	8.44	4.08	30.51	1.16
12/9/2022 13:43	29.00	6.88	8.44	4.04	30.52	1.11
12/9/2022 13:43	28.96	6.85	8.44	4.12	30.52	1.09
12/9/2022 13:43	28.96	6.84	8.44	4.13	30.52	1.09
12/9/2022 13:43	28.93	6.84	8.44	4.09	30.52	1.03
12/9/2022 13:43	28.97	6.89	8.45	4.11	30.48	1.05
12/9/2022 13:43	28.98	6.90	8.45	4.11	30.47	1.05
12/9/2022 13:43	28.91	6.91	8.45	4.06	30.49	1.15
12/9/2022 13:43	28.91	6.92	8.45	4.06	30.49	1.16



SW 3 (Spring Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 13:56	29.02	6.84	8.44	4.16	30.52	1.06
12/9/2022 13:56	29.07	6.86	8.45	4.07	30.52	1.05
12/9/2022 13:56	29.08	6.86	8.45	4.06	30.52	1.05
12/9/2022 13:56	29.10	6.85	8.45	4.16	30.52	1.01
12/9/2022 13:56	29.12	6.88	8.45	4.15	30.52	1.05
12/9/2022 13:56	29.12	6.88	8.45	4.15	30.51	1.05
12/9/2022 13:56	29.01	6.87	8.45	4.36	30.52	1.02
12/9/2022 13:56	28.78	6.89	8.44	4.14	30.51	1.09
12/9/2022 13:56	28.76	6.89	8.44	4.13	30.51	1.09
12/9/2022 13:56	28.85	6.86	8.44	4.10	30.51	1.09
12/9/2022 13:56	28.85	6.85	8.44	4.09	30.51	1.09
12/9/2022 13:56	28.97	6.85	8.44	4.21	30.53	0.96
12/9/2022 13:56	28.99	6.81	8.44	4.12	30.53	0.98
12/9/2022 13:56	29.00	6.81	8.44	4.12	30.53	0.98
12/9/2022 13:56	28.94	6.82	8.44	4.09	30.53	1.02
12/9/2022 13:56	28.99	6.81	8.44	4.11	30.54	1.06
12/9/2022 13:56	28.99	6.81	8.44	4.11	30.54	1.06
12/9/2022 13:56	28.99	6.80	8.44	4.19	30.54	1.05
12/9/2022 13:56	28.99	6.79	8.44	4.11	30.54	1.02



SW 6 (Spring Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 14:09	29.05	6.99	8.46	4.10	30.56	1.22
12/9/2022 14:09	29.01	7.00	8.46	4.02	30.56	1.22
12/9/2022 14:09	28.97	6.99	8.45	4.09	30.57	1.24
12/9/2022 14:09	28.97	6.99	8.45	4.10	30.57	1.24
12/9/2022 14:09	28.94	6.98	8.45	4.02	30.57	1.18
12/9/2022 14:09	28.99	6.99	8.45	3.99	30.58	1.13
12/9/2022 14:09	29.00	6.99	8.45	3.98	30.59	1.12
12/9/2022 14:09	29.04	6.98	8.45	4.06	30.59	0.96
12/9/2022 14:09	28.81	6.97	8.45	4.01	30.56	1.02
12/9/2022 14:09	28.79	6.96	8.44	4.01	30.56	1.02
12/9/2022 14:09	28.81	6.93	8.45	4.07	30.57	1.02
12/9/2022 14:09	28.80	6.93	8.45	4.08	30.57	1.02
12/9/2022 14:09	28.96	6.95	8.45	4.06	30.58	1.05
12/9/2022 14:09	29.04	6.94	8.45	4.06	30.60	1.07
12/9/2022 14:09	29.05	6.93	8.45	4.06	30.60	1.08
12/9/2022 14:09	28.98	6.93	8.45	4.15	30.60	1.16
12/9/2022 14:10	29.03	6.95	8.45	4.05	30.60	1.18
12/9/2022 14:10	29.03	6.95	8.45	4.05	30.60	1.18
12/9/2022 14:10	28.99	6.94	8.45	4.08	30.60	1.19
12/9/2022 14:10	28.98	6.94	8.45	4.02	30.60	1.21
12/9/2022 14:10	28.97	6.94	8.45	4.02	30.60	1.21



**YJP SURVEYORS PTE LTD**

<b>12/9/2022 14:10</b>	28.96	6.93	8.45	4.08	30.60	1.21
<b>12/9/2022 14:10</b>	28.95	6.93	8.45	4.08	30.60	1.21
<b>12/9/2022 14:10</b>	28.99	6.93	8.45	4.13	30.60	1.14
<b>12/9/2022 14:10</b>	29.06	6.94	8.45	4.08	30.59	1.13

**SW 5 (Spring Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/9/2022 14:23</b>	28.98	6.76	8.45	4.26	30.54	1.13
<b>12/9/2022 14:23</b>	29.00	6.76	8.45	4.26	30.54	1.13
<b>12/9/2022 14:23</b>	28.90	6.76	8.46	4.28	30.54	1.17
<b>12/9/2022 14:23</b>	28.89	6.76	8.46	4.28	30.54	1.17
<b>12/9/2022 14:23</b>	28.93	6.77	8.45	4.25	30.54	1.18
<b>12/9/2022 14:23</b>	28.93	6.77	8.45	4.25	30.54	1.18
<b>12/9/2022 14:23</b>	28.99	6.74	8.45	4.27	30.54	1.14
<b>12/9/2022 14:23</b>	28.98	6.73	8.45	4.24	30.55	1.13
<b>12/9/2022 14:23</b>	28.98	6.72	8.45	4.24	30.55	1.13
<b>12/9/2022 14:23</b>	29.05	6.70	8.45	4.28	30.55	1.10
<b>12/9/2022 14:23</b>	29.05	6.73	8.45	4.24	30.55	1.07
<b>12/9/2022 14:23</b>	29.05	6.73	8.46	4.23	30.55	1.07
<b>12/9/2022 14:23</b>	29.05	6.76	8.46	4.25	30.54	1.08
<b>12/9/2022 14:23</b>	29.05	6.79	8.46	4.24	30.52	1.09
<b>12/9/2022 14:23</b>	29.05	6.80	8.46	4.24	30.52	1.09
<b>12/9/2022 14:23</b>	29.00	6.80	8.46	4.26	30.53	1.10





**YJP SURVEYORS PTE LTD**

<b>12/9/2022 14:23</b>	29.02	6.82	8.46	4.24	30.54	1.13
<b>12/9/2022 14:23</b>	29.02	6.82	8.46	4.24	30.54	1.13
<b>12/9/2022 14:23</b>	29.03	6.80	8.46	4.34	30.55	1.14

**SW 4 (Spring Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/9/2022 14:34</b>	29.09	6.87	8.46	3.98	30.54	1.08
<b>12/9/2022 14:34</b>	29.10	6.87	8.46	3.98	30.54	1.07
<b>12/9/2022 14:34</b>	29.12	6.87	8.46	3.94	30.54	1.07
<b>12/9/2022 14:34</b>	29.13	6.87	8.47	4.00	30.55	1.09
<b>12/9/2022 14:34</b>	29.13	6.87	8.47	4.00	30.55	1.10
<b>12/9/2022 14:34</b>	29.00	6.87	8.46	3.96	30.55	1.11
<b>12/9/2022 14:34</b>	29.06	6.88	8.46	4.05	30.55	1.12
<b>12/9/2022 14:34</b>	29.06	6.88	8.46	4.05	30.55	1.12
<b>12/9/2022 14:34</b>	29.08	6.87	8.46	4.20	30.56	1.10
<b>12/9/2022 14:34</b>	29.09	6.87	8.46	4.22	30.56	1.10
<b>12/9/2022 14:35</b>	29.08	6.87	8.46	3.95	30.56	1.02
<b>12/9/2022 14:35</b>	29.12	6.85	8.46	3.98	30.55	0.98
<b>12/9/2022 14:35</b>	29.13	6.85	8.46	3.97	30.55	0.97
<b>12/9/2022 14:35</b>	29.18	6.86	8.47	4.01	30.54	0.95
<b>12/9/2022 14:35</b>	29.11	6.93	8.47	4.05	30.51	0.97
<b>12/9/2022 14:35</b>	29.10	6.93	8.48	4.06	30.50	0.97
<b>12/9/2022 14:35</b>	29.16	6.96	8.47	4.00	30.52	1.02



**YJP SURVEYORS PTE LTD**

<b>12/9/2022 14:35</b>	28.99	6.98	8.47	3.95	30.53	1.12
<b>12/9/2022 14:35</b>	28.98	6.98	8.47	3.94	30.54	1.13

**SW 9 (Spring Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/9/2022 14:58</b>	29.04	6.88	8.46	3.93	30.56	1.01
<b>12/9/2022 14:58</b>	29.08	6.88	8.47	4.04	30.55	0.95
<b>12/9/2022 14:58</b>	29.02	6.90	8.47	3.90	30.56	0.94
<b>12/9/2022 14:58</b>	29.02	6.90	8.47	3.89	30.56	0.93
<b>12/9/2022 14:58</b>	29.03	6.93	8.47	3.90	30.56	0.91
<b>12/9/2022 14:58</b>	29.01	6.92	8.47	3.96	30.56	0.90
<b>12/9/2022 14:58</b>	29.01	6.92	8.47	3.96	30.56	0.90
<b>12/9/2022 14:58</b>	29.10	6.92	8.47	3.98	30.56	0.93
<b>12/9/2022 14:58</b>	29.11	6.91	8.47	3.98	30.56	0.93
<b>12/9/2022 14:58</b>	28.97	6.95	8.47	3.95	30.54	1.02
<b>12/9/2022 14:58</b>	29.01	6.95	8.47	4.01	30.55	1.03
<b>12/9/2022 14:58</b>	29.01	6.95	8.47	4.01	30.55	1.03
<b>12/9/2022 14:59</b>	29.06	6.92	8.47	3.95	30.56	0.99
<b>12/9/2022 14:59</b>	29.08	6.99	8.48	4.03	30.54	0.99
<b>12/9/2022 14:59</b>	29.08	6.99	8.48	4.04	30.54	0.99
<b>12/9/2022 14:59</b>	29.11	6.98	8.47	3.96	30.57	1.01
<b>12/9/2022 14:59</b>	28.95	7.02	8.47	3.95	30.54	1.00
<b>12/9/2022 14:59</b>	28.93	7.02	8.47	3.95	30.54	1.01

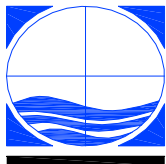


**YJP SURVEYORS PTE LTD**

<b>12/9/2022 14:59</b>	29.00	7.01	8.48	3.99	30.54	1.00
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**SW 8 (Spring Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/9/2022 15:11</b>	29.04	6.96	8.48	4.11	30.56	1.17
<b>12/9/2022 15:11</b>	29.03	6.96	8.48	4.12	30.56	1.17
<b>12/9/2022 15:11</b>	29.08	6.97	8.47	4.04	30.56	1.18
<b>12/9/2022 15:11</b>	29.11	6.96	8.47	4.07	30.56	1.18
<b>12/9/2022 15:12</b>	29.11	6.96	8.47	4.07	30.56	1.18
<b>12/9/2022 15:12</b>	29.14	6.94	8.48	4.05	30.57	1.20
<b>12/9/2022 15:12</b>	29.05	6.94	8.48	4.12	30.57	1.16
<b>12/9/2022 15:12</b>	29.05	6.94	8.48	4.13	30.57	1.16
<b>12/9/2022 15:12</b>	29.00	6.94	8.48	4.12	30.56	1.11
<b>12/9/2022 15:12</b>	29.05	6.97	8.48	4.03	30.53	1.08
<b>12/9/2022 15:12</b>	29.05	6.97	8.48	4.02	30.52	1.08
<b>12/9/2022 15:12</b>	28.97	6.98	8.48	4.03	30.53	1.02
<b>12/9/2022 15:12</b>	28.96	6.98	8.48	4.03	30.53	1.02
<b>12/9/2022 15:12</b>	29.16	6.99	8.48	4.09	30.54	0.99
<b>12/9/2022 15:12</b>	29.22	6.99	8.48	4.03	30.55	1.00
<b>12/9/2022 15:12</b>	29.24	6.99	8.48	4.03	30.56	1.01
<b>12/9/2022 15:12</b>	29.22	7.00	8.48	4.30	30.56	1.05



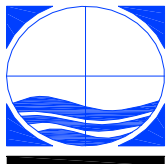
SW 7 (Spring Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/9/2022 15:23	29.21	6.89	8.49	3.90	30.57	1.09
12/9/2022 15:23	29.22	6.89	8.49	3.90	30.57	1.09
12/9/2022 15:23	29.15	6.85	8.48	3.86	30.58	1.09
12/9/2022 15:24	29.15	6.85	8.48	3.85	30.59	1.09
12/9/2022 15:24	29.20	6.85	8.48	3.83	30.59	1.09
12/9/2022 15:24	29.13	6.84	8.48	3.83	30.59	1.11
12/9/2022 15:24	29.12	6.83	8.48	3.82	30.59	1.11
12/9/2022 15:24	29.11	6.83	8.48	3.86	30.59	1.11
12/9/2022 15:24	29.16	6.83	8.48	3.85	30.59	1.10
12/9/2022 15:24	29.17	6.83	8.48	3.85	30.59	1.10
12/9/2022 15:24	29.16	6.83	8.48	3.85	30.59	1.09
12/9/2022 15:24	29.06	6.83	8.48	3.77	30.59	1.10
12/9/2022 15:24	29.05	6.83	8.48	3.77	30.59	1.10
12/9/2022 15:24	29.06	6.83	8.48	3.79	30.59	1.11
12/9/2022 15:24	29.05	6.83	8.48	3.90	30.59	1.11
12/9/2022 15:24	29.05	6.83	8.48	3.91	30.59	1.11
12/9/2022 15:24	29.08	6.85	8.49	3.89	30.57	1.11
12/9/2022 15:24	29.09	6.85	8.49	3.89	30.56	1.11



SW 7 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
16/12/2022 09:01	29.13	6.50	8.21	3.33	28.84	1.05
16/12/2022 09:02	29.11	6.51	8.21	3.28	28.84	1.08
16/12/2022 09:02	29.10	6.51	8.21	3.27	28.84	1.08
16/12/2022 09:02	29.13	6.49	8.21	3.20	28.84	1.11
16/12/2022 09:02	29.17	6.48	8.21	3.28	28.84	1.09
16/12/2022 09:02	29.18	6.48	8.21	3.28	28.84	1.09
16/12/2022 09:02	29.22	6.46	8.22	3.45	28.84	1.06
16/12/2022 09:02	29.23	6.46	8.22	3.47	28.84	1.06
16/12/2022 09:02	29.09	6.49	8.21	3.30	28.84	1.05
16/12/2022 09:02	29.20	6.49	8.22	3.28	28.83	1.05
16/12/2022 09:02	29.21	6.50	8.22	3.28	28.83	1.05
16/12/2022 09:02	29.23	6.53	8.21	3.62	28.85	1.04
16/12/2022 09:02	29.20	6.49	8.21	3.30	28.85	1.03
16/12/2022 09:02	29.19	6.49	8.21	3.28	28.85	1.03
16/12/2022 09:02	29.19	6.49	8.21	3.28	28.85	1.03
16/12/2022 09:02	29.22	6.49	8.22	3.24	28.85	1.05
16/12/2022 09:02	29.22	6.49	8.22	3.23	28.85	1.06
16/12/2022 09:02	29.10	6.51	8.21	3.28	28.85	1.02



SW 8 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 9:16	29.19	6.64	8.24	3.39	28.82	0.95
12/16/2022 9:16	29.22	6.72	8.24	3.32	28.80	0.97
12/16/2022 9:16	29.23	6.73	8.24	3.31	28.80	0.97
12/16/2022 9:16	29.15	6.75	8.23	3.21	28.82	0.99
12/16/2022 9:16	29.14	6.75	8.23	3.19	28.83	0.99
12/16/2022 9:16	29.24	6.75	8.22	3.30	28.83	0.98
12/16/2022 9:16	29.22	6.73	8.24	3.30	28.82	0.99
12/16/2022 9:16	29.22	6.73	8.24	3.31	28.82	0.99
12/16/2022 9:16	29.20	6.74	8.23	3.23	28.82	0.99
12/16/2022 9:16	29.30	6.76	8.23	3.26	28.82	1.00
12/16/2022 9:16	29.31	6.77	8.23	3.26	28.82	1.00
12/16/2022 9:16	29.34	6.77	8.23	3.23	28.82	1.04
12/16/2022 9:16	29.28	6.76	8.23	3.29	28.83	1.02
12/16/2022 9:16	29.27	6.76	8.23	3.29	28.83	1.02
12/16/2022 9:16	29.25	6.77	8.23	3.26	28.83	1.09
12/16/2022 9:16	29.04	6.76	8.22	3.36	28.84	1.12
12/16/2022 9:16	29.02	6.76	8.22	3.37	28.84	1.13
12/16/2022 9:16	29.01	6.67	8.22	3.30	28.83	1.13



SW 9 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 9:27	29.26	6.50	8.23	3.31	28.84	1.03
12/16/2022 9:27	29.25	6.51	8.23	3.36	28.84	1.01
12/16/2022 9:27	29.25	6.51	8.23	3.36	28.84	1.01
12/16/2022 9:27	29.21	6.55	8.24	3.38	28.84	1.01
12/16/2022 9:27	29.17	6.56	8.24	3.59	28.83	1.02
12/16/2022 9:27	29.16	6.57	8.24	3.61	28.83	1.02
12/16/2022 9:27	29.17	6.58	8.23	3.57	28.83	1.06
12/16/2022 9:27	29.07	6.55	8.22	3.47	28.83	1.04
12/16/2022 9:27	29.06	6.55	8.22	3.45	28.83	1.04
12/16/2022 9:27	29.24	6.52	8.23	3.34	28.83	1.01
12/16/2022 9:27	29.25	6.52	8.23	3.32	28.83	1.01
12/16/2022 9:27	29.30	6.55	8.23	3.38	28.83	1.00
12/16/2022 9:27	29.27	6.59	8.24	3.33	28.84	0.99
12/16/2022 9:27	29.27	6.59	8.24	3.32	28.84	0.99
12/16/2022 9:27	29.24	6.60	8.23	3.34	28.84	0.97
12/16/2022 9:27	29.12	6.58	8.23	3.50	28.84	0.96



SW 4 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 9:48	29.26	6.71	8.24	3.33	28.84	1.02
12/16/2022 9:48	29.23	6.70	8.24	3.27	28.85	1.03
12/16/2022 9:48	29.10	6.70	8.23	3.32	28.85	1.06
12/16/2022 9:48	29.08	6.70	8.23	3.33	28.85	1.06
12/16/2022 9:48	29.25	6.62	8.23	3.24	28.85	1.10
12/16/2022 9:48	29.27	6.63	8.23	3.31	28.86	1.09
12/16/2022 9:48	29.27	6.62	8.23	3.32	28.86	1.09
12/16/2022 9:48	29.26	6.61	8.24	3.24	28.86	1.09
12/16/2022 9:48	29.26	6.61	8.24	3.24	28.86	1.09
12/16/2022 9:48	29.26	6.60	8.23	3.26	28.85	1.06
12/16/2022 9:49	29.30	6.62	8.24	3.33	28.85	1.04
12/16/2022 9:49	29.30	6.62	8.24	3.34	28.85	1.04
12/16/2022 9:49	29.25	6.62	8.24	3.30	28.85	1.04
12/16/2022 9:49	29.26	6.63	8.24	3.29	28.85	1.03
12/16/2022 9:49	29.26	6.63	8.24	3.29	28.85	1.03
12/16/2022 9:49	29.28	6.63	8.24	3.26	28.85	1.00
12/16/2022 9:49	29.26	6.66	8.24	3.28	28.85	1.05
12/16/2022 9:49	29.26	6.66	8.24	3.28	28.85	1.06





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### SW 5 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 10:01	29.25	6.54	8.24	3.34	28.86	1.06
12/16/2022 10:01	29.26	6.54	8.24	3.33	28.86	1.06
12/16/2022 10:01	29.23	6.55	8.24	3.50	28.86	1.11
12/16/2022 10:01	29.24	6.53	8.23	3.27	28.86	1.13
12/16/2022 10:01	29.25	6.53	8.23	3.25	28.86	1.14
12/16/2022 10:01	29.23	6.49	8.23	3.32	28.86	1.17
12/16/2022 10:01	29.16	6.45	8.23	3.43	28.86	1.17
12/16/2022 10:01	29.15	6.44	8.22	3.45	28.86	1.17
12/16/2022 10:01	29.09	6.38	8.22	3.36	28.86	1.13
12/16/2022 10:01	29.28	6.36	8.22	3.34	28.86	1.06
12/16/2022 10:01	29.29	6.36	8.22	3.33	28.86	1.05
12/16/2022 10:01	29.29	6.42	8.24	3.73	28.85	1.04
12/16/2022 10:01	29.24	6.46	8.25	3.28	28.84	1.01
12/16/2022 10:01	29.23	6.46	8.25	3.25	28.84	1.01
12/16/2022 10:01	29.31	6.53	8.25	3.29	28.84	1.00



YJP SURVEYORS PTE LTD

SW 6 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 10:14	29.26	6.60	8.23	3.21	28.89	1.10
12/16/2022 10:14	29.28	6.62	8.24	3.23	28.88	1.09
12/16/2022 10:14	29.28	6.62	8.24	3.23	28.88	1.09
12/16/2022 10:14	29.31	6.65	8.24	3.25	28.87	1.07
12/16/2022 10:14	29.27	6.68	8.25	3.28	28.86	1.07
12/16/2022 10:14	29.27	6.69	8.25	3.28	28.85	1.07
12/16/2022 10:14	29.20	6.73	8.24	3.28	28.86	1.07
12/16/2022 10:14	29.29	6.72	8.24	3.24	28.86	1.07
12/16/2022 10:14	29.30	6.72	8.24	3.24	28.86	1.07
12/16/2022 10:14	29.30	6.74	8.24	3.28	28.86	1.10
12/16/2022 10:14	29.28	6.75	8.25	3.32	28.86	1.10
12/16/2022 10:14	29.27	6.75	8.25	3.33	28.86	1.11
12/16/2022 10:14	29.28	6.78	8.25	3.24	28.86	1.13
12/16/2022 10:14	29.30	6.76	8.24	3.62	28.87	1.12
12/16/2022 10:14	29.31	6.76	8.24	3.66	28.87	1.12
12/16/2022 10:14	29.32	6.75	8.24	3.29	28.87	1.11
12/16/2022 10:14	29.32	6.74	8.24	3.27	28.87	1.11
12/16/2022 10:14	29.37	6.71	8.24	3.28	28.86	1.08



SW 3 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 10:37	29.32	6.62	8.25	3.68	28.91	0.93
12/16/2022 10:37	29.31	6.62	8.24	3.58	28.92	0.96
12/16/2022 10:37	29.23	6.61	8.24	3.66	28.92	0.98
12/16/2022 10:37	29.22	6.61	8.24	3.67	28.92	0.98
12/16/2022 10:37	29.21	6.60	8.24	3.66	28.91	1.01
12/16/2022 10:38	29.30	6.61	8.25	3.62	28.91	1.04
12/16/2022 10:38	29.31	6.61	8.25	3.62	28.91	1.05
12/16/2022 10:38	29.30	6.60	8.24	3.59	28.92	1.03
12/16/2022 10:38	29.30	6.60	8.24	3.58	28.92	1.03
12/16/2022 10:38	29.31	6.55	8.23	3.54	28.93	1.01
12/16/2022 10:38	29.33	6.51	8.24	3.57	28.91	0.99
12/16/2022 10:38	29.33	6.50	8.24	3.58	28.91	0.99
12/16/2022 10:38	29.39	6.54	8.25	3.87	28.91	0.99
12/16/2022 10:38	29.38	6.60	8.25	3.59	28.90	0.99
12/16/2022 10:38	29.38	6.60	8.25	3.57	28.90	0.98
12/16/2022 10:38	29.36	6.59	8.25	3.62	28.91	0.98
12/16/2022 10:38	29.35	6.61	8.24	3.60	28.91	1.01



SW 2 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 10:48	29.37	6.67	8.24	3.65	28.92	0.99
12/16/2022 10:49	29.35	6.67	8.24	3.59	28.92	1.01
12/16/2022 10:49	29.36	6.69	8.24	3.61	28.92	1.02
12/16/2022 10:49	29.36	6.69	8.24	3.61	28.92	1.02
12/16/2022 10:49	29.34	6.68	8.24	3.56	28.92	1.01
12/16/2022 10:49	29.34	6.68	8.24	3.55	28.92	1.01
12/16/2022 10:49	29.32	6.65	8.23	3.60	28.94	1.00
12/16/2022 10:49	29.31	6.65	8.23	3.61	28.94	1.01
12/16/2022 10:49	29.31	6.65	8.23	3.61	28.94	1.01
12/16/2022 10:49	29.26	6.62	8.23	3.79	28.94	1.01
12/16/2022 10:49	29.24	6.59	8.23	3.60	28.94	0.98
12/16/2022 10:49	29.24	6.59	8.23	3.58	28.93	0.98
12/16/2022 10:49	29.33	6.60	8.23	3.57	28.93	0.93
12/16/2022 10:49	29.38	6.61	8.24	3.78	28.93	0.91
12/16/2022 10:49	29.39	6.61	8.24	3.81	28.93	0.91



SW 1 (Neap Tide, Flood)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
16/12/2022 10:59	29.32	6.68	8.24	3.46	28.89	0.83
16/12/2022 10:59	29.32	6.68	8.24	3.45	28.89	0.83
16/12/2022 10:59	29.33	6.70	8.25	3.53	28.88	0.84
16/12/2022 10:59	29.29	6.72	8.25	3.48	28.88	0.82
16/12/2022 10:59	29.29	6.72	8.25	3.48	28.88	0.82
16/12/2022 10:59	29.40	6.74	8.25	3.47	28.88	0.81
16/12/2022 10:59	29.41	6.74	8.25	3.47	28.88	0.81
16/12/2022 10:59	29.41	6.74	8.24	3.53	28.88	0.85
16/12/2022 10:59	29.37	6.72	8.25	3.56	28.89	0.88
16/12/2022 10:59	29.36	6.72	8.25	3.56	28.89	0.88
16/12/2022 10:59	29.33	6.75	8.25	3.53	28.89	0.91
16/12/2022 11:00	29.38	6.71	8.24	3.45	28.89	0.91
16/12/2022 11:00	29.38	6.71	8.24	3.44	28.89	0.91
16/12/2022 11:00	29.43	6.67	8.24	3.42	28.89	0.91
16/12/2022 11:00	29.37	6.69	8.24	3.53	28.88	0.93
16/12/2022 11:00	29.36	6.69	8.24	3.54	28.88	0.94
16/12/2022 11:00	29.38	6.69	8.24	3.54	28.88	0.94
16/12/2022 11:00	29.38	6.69	8.24	3.55	28.88	0.94
16/12/2022 11:00	29.32	6.68	8.24	3.46	28.87	0.92



**SW 1 (Neap Tide, Ebb)**

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 13:15	29.38	6.80	8.16	2.78	29.66	0.96
12/16/2022 13:15	29.38	6.80	8.16	2.78	29.66	0.96
12/16/2022 13:16	29.36	6.81	8.16	2.82	29.66	0.95
12/16/2022 13:16	29.38	6.81	8.16	2.91	29.65	0.95
12/16/2022 13:16	29.38	6.82	8.16	2.92	29.65	0.95
12/16/2022 13:16	29.43	6.82	8.15	2.78	29.66	0.93
12/16/2022 13:16	29.39	6.75	8.16	2.85	29.65	0.93
12/16/2022 13:16	29.39	6.74	8.16	2.85	29.65	0.93
12/16/2022 13:16	29.39	6.76	8.16	2.86	29.66	0.93
12/16/2022 13:16	29.41	6.78	8.16	2.86	29.66	0.94
12/16/2022 13:16	29.41	6.78	8.16	2.86	29.66	0.94
12/16/2022 13:16	29.35	6.79	8.16	2.84	29.66	0.95
12/16/2022 13:16	29.33	6.80	8.16	2.84	29.66	0.96
12/16/2022 13:16	29.33	6.80	8.16	2.84	29.67	0.97
12/16/2022 13:16	29.34	6.79	8.16	2.86	29.66	0.99

**SW 2 (Neap Tide, Ebb)**

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 13:26	29.36	6.81	8.16	2.84	29.69	0.98
12/16/2022 13:26	29.31	6.82	8.16	2.86	29.69	1.00
12/16/2022 13:26	29.30	6.82	8.16	2.86	29.69	1.00



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<b>12/16/2022 13:26</b>	29.36	6.84	8.16	2.88	29.69	1.01
<b>12/16/2022 13:26</b>	29.36	6.84	8.16	2.89	29.69	1.01
<b>12/16/2022 13:26</b>	29.35	6.82	8.16	2.80	29.69	1.03
<b>12/16/2022 13:26</b>	29.36	6.84	8.16	2.92	29.69	1.02
<b>12/16/2022 13:26</b>	29.35	6.84	8.15	2.92	29.69	1.02
<b>12/16/2022 13:26</b>	29.37	6.82	8.15	3.10	29.69	1.02
<b>12/16/2022 13:26</b>	29.33	6.80	8.15	3.04	29.69	1.02
<b>12/16/2022 13:26</b>	29.33	6.80	8.15	3.04	29.69	1.01
<b>12/16/2022 13:26</b>	29.46	6.75	8.14	2.97	29.69	1.01
<b>12/16/2022 13:26</b>	29.47	6.74	8.14	2.97	29.69	1.01
<b>12/16/2022 13:26</b>	29.47	6.75	8.15	2.88	29.69	1.01
<b>12/16/2022 13:26</b>	29.41	6.75	8.15	2.88	29.69	1.01
<b>12/16/2022 13:26</b>	29.40	6.75	8.15	2.87	29.69	1.01

**SW 3 (Neap Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/16/2022 13:38</b>	29.47	6.74	8.15	3.01	29.68	1.04
<b>12/16/2022 13:38</b>	29.33	6.74	8.15	2.88	29.69	1.05
<b>12/16/2022 13:38</b>	29.32	6.74	8.15	2.88	29.69	1.05
<b>12/16/2022 13:38</b>	29.19	6.72	8.14	2.82	29.69	1.04
<b>12/16/2022 13:38</b>	29.17	6.72	8.14	2.80	29.70	1.04
<b>12/16/2022 13:38</b>	29.31	6.70	8.14	2.77	29.69	1.03
<b>12/16/2022 13:38</b>	29.24	6.66	8.14	2.78	29.68	1.03



**YJP SURVEYORS PTE LTD**

<b>12/16/2022 13:38</b>	29.24	6.66	8.14	2.78	29.68	1.03
<b>12/16/2022 13:38</b>	29.30	6.65	8.15	2.76	29.69	1.04
<b>12/16/2022 13:38</b>	29.14	6.66	8.14	2.87	29.68	1.04
<b>12/16/2022 13:38</b>	29.13	6.66	8.14	2.88	29.68	1.04
<b>12/16/2022 13:38</b>	29.22	6.61	8.14	2.98	29.67	1.04
<b>12/16/2022 13:38</b>	29.34	6.60	8.14	2.85	29.69	1.04
<b>12/16/2022 13:39</b>	29.36	6.60	8.14	2.84	29.69	1.04
<b>12/16/2022 13:39</b>	29.34	6.61	8.15	2.93	29.69	1.03
<b>12/16/2022 13:39</b>	29.34	6.61	8.15	2.93	29.69	1.03

**SW 6 (Neap Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/16/2022 14:02</b>	28.74	6.79	8.15	3.06	29.60	1.00
<b>12/16/2022 14:02</b>	28.52	6.81	8.15	3.02	29.59	0.94
<b>12/16/2022 14:02</b>	28.51	6.81	8.15	3.00	29.59	0.93
<b>12/16/2022 14:02</b>	28.34	6.84	8.13	3.07	29.57	0.87
<b>12/16/2022 14:02</b>	28.32	6.84	8.13	3.08	29.57	0.86
<b>12/16/2022 14:02</b>	28.35	6.81	8.13	3.14	29.55	0.89
<b>12/16/2022 14:02</b>	28.33	6.78	8.14	3.10	29.56	0.91
<b>12/16/2022 14:02</b>	28.33	6.78	8.14	3.10	29.56	0.91
<b>12/16/2022 14:02</b>	28.53	6.81	8.15	3.09	29.57	0.90
<b>12/16/2022 14:02</b>	28.46	6.88	8.16	3.10	29.57	0.89
<b>12/16/2022 14:02</b>	28.47	6.88	8.16	3.10	29.58	0.89





**YJP SURVEYORS PTE LTD**

<b>12/16/2022 14:03</b>	28.30	6.98	8.15	3.06	29.56	0.89
<b>12/16/2022 14:03</b>	28.31	6.97	8.15	3.10	29.54	0.90
<b>12/16/2022 14:03</b>	28.30	6.97	8.15	3.11	29.54	0.90
<b>12/16/2022 14:03</b>	28.38	6.97	8.15	3.10	29.54	0.94
<b>12/16/2022 14:03</b>	28.29	6.94	8.14	3.15	29.54	0.94
<b>12/16/2022 14:03</b>	28.28	6.94	8.14	3.16	29.55	0.95
<b>12/16/2022 14:03</b>	28.24	6.90	8.13	3.11	29.54	0.95

**SW 5 (Neap Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/16/2022 14:14</b>	27.82	6.79	8.11	3.15	29.50	0.96
<b>12/16/2022 14:14</b>	27.81	6.71	8.11	3.10	29.48	0.96
<b>12/16/2022 14:14</b>	27.80	6.70	8.11	3.09	29.48	0.96
<b>12/16/2022 14:14</b>	27.95	6.74	8.13	3.11	29.48	0.96
<b>12/16/2022 14:15</b>	27.88	6.78	8.13	3.14	29.49	0.97
<b>12/16/2022 14:15</b>	27.88	6.78	8.14	3.14	29.49	0.97
<b>12/16/2022 14:15</b>	27.66	6.75	8.11	3.11	29.47	0.98
<b>12/16/2022 14:15</b>	27.63	6.75	8.11	3.11	29.46	0.98
<b>12/16/2022 14:15</b>	27.92	6.75	8.12	3.09	29.48	0.98
<b>12/16/2022 14:15</b>	28.05	6.80	8.14	3.11	29.49	0.98
<b>12/16/2022 14:15</b>	28.08	6.81	8.14	3.11	29.49	0.98
<b>12/16/2022 14:15</b>	28.04	6.83	8.13	3.19	29.50	0.99
<b>12/16/2022 14:15</b>	28.25	6.87	8.14	3.15	29.52	1.00
<b>12/16/2022 14:15</b>	28.27	6.88	8.14	3.15	29.52	1.00



**YJP SURVEYORS PTE LTD**

<b>12/16/2022 14:15</b>	28.64	6.91	8.16	3.13	29.54	1.01
<b>12/16/2022 14:15</b>	29.03	6.94	8.16	3.08	29.59	1.02
<b>12/16/2022 14:15</b>	29.08	6.95	8.16	3.07	29.60	1.02

**SW 4 (Neap Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>12/16/2022 14:27</b>	27.99	6.72	8.13	3.04	29.53	0.99
<b>12/16/2022 14:27</b>	27.97	6.67	8.13	3.19	29.52	0.99
<b>12/16/2022 14:27</b>	27.96	6.67	8.13	3.20	29.51	0.99
<b>12/16/2022 14:27</b>	27.93	6.67	8.13	3.10	29.51	1.00
<b>12/16/2022 14:27</b>	27.86	6.67	8.13	3.13	29.49	1.00
<b>12/16/2022 14:27</b>	27.85	6.67	8.13	3.13	29.49	1.00
<b>12/16/2022 14:27</b>	28.00	6.70	8.14	3.06	29.50	1.00
<b>12/16/2022 14:27</b>	28.04	6.70	8.14	3.12	29.50	1.00
<b>12/16/2022 14:27</b>	28.05	6.70	8.14	3.13	29.50	1.00
<b>12/16/2022 14:27</b>	28.08	6.69	8.14	3.17	29.51	0.99
<b>12/16/2022 14:27</b>	28.08	6.69	8.14	3.18	29.51	0.99
<b>12/16/2022 14:27</b>	28.20	6.72	8.14	3.08	29.52	1.00
<b>12/16/2022 14:27</b>	27.99	6.72	8.14	3.19	29.50	0.99
<b>12/16/2022 14:28</b>	27.97	6.72	8.14	3.20	29.49	0.99
<b>12/16/2022 14:28</b>	28.02	6.74	8.14	3.12	29.49	0.99
<b>12/16/2022 14:28</b>	27.87	6.77	8.14	3.24	29.47	0.99
<b>12/16/2022 14:28</b>	27.85	6.78	8.14	3.25	29.47	0.99

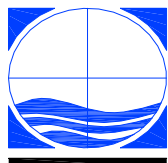


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<b>12/16/2022 14:28</b>	28.10	6.78	8.14	3.07	29.48	0.99
<b>12/16/2022 14:28</b>	28.33	6.76	8.15	3.10	29.53	1.00

**SW 9 (Neap Tide, Ebb)**

<b>Date Time</b>	<b>Salinity (PSU)</b>	<b>RDO Concentration (mg/L)</b>	<b>pH (pH)</b>	<b>Turbidity (NTU)</b>	<b>Temperature (°C)</b>	<b>Depth (m)</b>
<b>16/12/2022 14:51</b>	27.99	6.72	8.13	3.20	29.49	0.97
<b>16/12/2022 14:51</b>	28.08	6.73	8.16	3.07	29.50	0.98
<b>16/12/2022 14:51</b>	28.22	6.84	8.17	3.09	29.50	0.99
<b>16/12/2022 14:51</b>	28.24	6.86	8.17	3.09	29.50	0.99
<b>16/12/2022 14:52</b>	28.12	6.93	8.16	3.16	29.50	0.99
<b>16/12/2022 14:52</b>	28.12	6.93	8.16	3.02	29.50	0.99
<b>16/12/2022 14:52</b>	28.12	6.94	8.16	3.01	29.50	0.99
<b>16/12/2022 14:52</b>	28.01	6.99	8.17	3.04	29.49	0.99
<b>16/12/2022 14:52</b>	28.00	7.00	8.18	3.04	29.49	0.99
<b>16/12/2022 14:52</b>	27.97	7.06	8.18	3.12	29.48	0.98
<b>16/12/2022 14:52</b>	28.03	7.11	8.18	3.08	29.49	0.98
<b>16/12/2022 14:52</b>	28.04	7.12	8.18	3.08	29.50	0.98
<b>16/12/2022 14:52</b>	27.81	7.17	8.16	3.13	29.48	0.98
<b>16/12/2022 14:52</b>	27.44	7.20	8.15	3.08	29.43	0.98
<b>16/12/2022 14:52</b>	27.39	7.21	8.15	3.07	29.43	0.98
<b>16/12/2022 14:52</b>	27.66	7.12	8.16	3.14	29.44	0.98
<b>16/12/2022 14:52</b>	27.75	7.15	8.16	3.13	29.46	0.99
<b>16/12/2022 14:52</b>	27.77	7.15	8.16	3.13	29.46	0.99



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16/12/2022 14:52	27.89	7.16	8.17	3.10	29.47	0.99
16/12/2022 14:52	27.91	7.17	8.17	3.10	29.47	0.99
16/12/2022 14:52	28.03	7.19	8.18	3.13	29.48	0.99
16/12/2022 14:52	28.32	7.26	8.19	3.09	29.51	0.99
16/12/2022 14:52	28.35	7.27	8.19	3.08	29.51	0.99

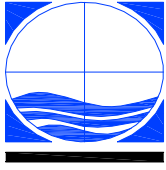
**SW 8 (Neap Tide, Ebb)**

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 15:04	28.13	6.84	8.19	3.12	29.50	0.99
12/16/2022 15:04	28.19	6.83	8.19	3.03	29.50	1.00
12/16/2022 15:05	28.00	6.80	8.18	3.08	29.50	1.00
12/16/2022 15:05	27.98	6.80	8.18	3.09	29.50	1.00
12/16/2022 15:05	27.96	6.83	8.18	3.11	29.49	1.00
12/16/2022 15:05	28.04	6.76	8.17	3.12	29.50	1.00
12/16/2022 15:05	28.05	6.75	8.17	3.13	29.50	1.00
12/16/2022 15:05	28.25	6.76	8.20	3.11	29.51	1.00
12/16/2022 15:05	28.67	6.82	8.21	3.07	29.53	0.99
12/16/2022 15:05	28.72	6.82	8.21	3.07	29.54	0.99
12/16/2022 15:05	28.66	7.01	8.23	3.14	29.53	0.99
12/16/2022 15:05	28.67	7.04	8.24	3.15	29.53	0.99
12/16/2022 15:05	28.40	7.13	8.24	3.08	29.53	0.99
12/16/2022 15:05	28.38	7.21	8.23	3.08	29.52	0.98
12/16/2022 15:05	28.37	7.22	8.23	3.08	29.52	0.98



SW 7 (Neap Tide, Ebb)

Date Time	Salinity (PSU)	RDO Concentration (mg/L)	pH (pH)	Turbidity (NTU)	Temperature (°C)	Depth (m)
12/16/2022 15:16	28.39	6.97	8.20	3.05	29.53	1.01
12/16/2022 15:17	28.41	6.97	8.21	3.04	29.53	1.01
12/16/2022 15:17	28.46	7.08	8.22	3.04	29.53	1.00
12/16/2022 15:17	28.40	7.10	8.22	3.07	29.54	1.00
12/16/2022 15:17	28.39	7.10	8.22	3.07	29.54	1.00
12/16/2022 15:17	28.27	7.17	8.21	3.03	29.51	1.00
12/16/2022 15:17	28.25	7.18	8.21	3.03	29.51	1.00
12/16/2022 15:17	28.08	7.16	8.20	3.07	29.50	0.99
12/16/2022 15:17	28.28	7.09	8.20	3.09	29.52	0.99
12/16/2022 15:17	28.29	7.08	8.20	3.09	29.53	0.99
12/16/2022 15:17	27.75	7.12	8.19	3.06	29.49	0.98
12/16/2022 15:17	27.80	7.08	8.19	3.05	29.48	0.99
12/16/2022 15:17	27.78	7.07	8.19	3.05	29.47	0.99
12/16/2022 15:17	28.34	7.03	8.21	3.13	29.51	0.99
12/16/2022 15:17	28.38	7.07	8.21	3.06	29.53	0.99
12/16/2022 15:17	28.41	7.07	8.22	3.06	29.54	0.99
12/16/2022 15:17	28.38	7.15	8.22	3.04	29.53	0.99
12/16/2022 15:17	28.58	7.19	8.23	3.11	29.55	0.99



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## **APPENDIX E WATER SAMPLING LABORATORY RESULTS**

## TEST REPORT

Our Reference No. : R226970  
Project Code / Ref. : -

Date Received : 18/10/2022  
Date Commenced : 18/10/2022  
Date Reported : 08/11/2022

Customer Ref. No. : 20220817 (Tembusu)  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 12 Water samples as per received.

**RESULTS:** Refer to Page 2 to Page 3



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**Tan Thuan Piang**  
**Technical Manager**



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- 2) The results in this report only apply to the sample received/analysed.
- 3) MLS agrees to use reasonable diligence in the performance of the service.

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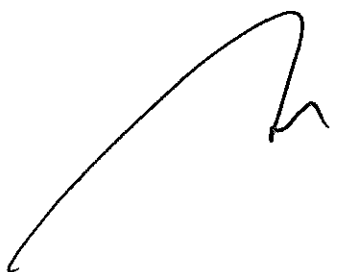
R226970

**RESULTS**

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
			MW 1 Flood Tide	MW 2 Flood Tide	MW 3 Flood Tide	MW 4 Flood Tide	MW 5 Flood Tide	MW 6 Flood Tide	Ebb Tide MW 6
			18/10/2022 1100hrs	18/10/2022 1110hrs	18/10/2022 1120hrs	18/10/2022 1130hrs	18/10/2022 1140hrs	18/10/2022 1150hrs	18/10/2022 1510hrs
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.25	0.34	0.37	0.20	0.074	0.086	0.13
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND
Chromium 6 as Cr (VI)	mg/L	APHA 3500-Cr (B)	ND	ND	ND	ND	ND	ND	ND
Copper as Cu	mg/L	APHA 3125B	0.0010	ND	0.0011	ND	0.0012	0.0011	ND
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND
Cyanide	mg/L	APHA Pt 4500-CN (N)	ND	ND	ND	ND	ND	ND	ND
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.48	0.60	0.64	0.54	0.36	0.20	0.41
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.070	0.076	0.076	0.070	0.062	0.059	0.063
Oil and Grease by FTIR	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	0.27	ND	ND	ND	ND	0.16	ND
Phenolic compounds (as Phenols)	mg/L	Accredited In-house Method MLS-SOP-WQ-009 Rev 2	ND	ND	ND	0.026	ND	ND	ND
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.11	0.18	0.17	0.12	0.039	0.035	0.077
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	19.3	12.1	12.4
Enterococcus	cfu/100mL	APHA 9230C	4	100	2	22	15	7	250
Faecal Coliform	cfu/100mL	APHA 9221D	260	600	80	13	70	26	90
Tributyltin (TBT)*	µg/L	GC-ICPMS (by UK lab)	0.02	ND	0.07	0.01	ND	0.04	0.06

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. \*ND\* = Not detected. The data reported is less than the LOR.
4. \* =The above testing were sub-contracted to external accredited laboratory.





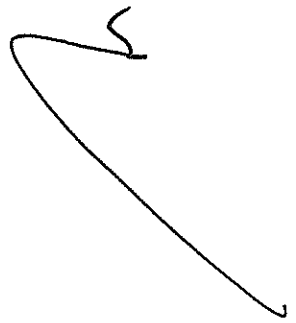
R226970

**RESULTS**

Test Parameter	Unit	Test Method	Sample					LOR	ASEAN Marine Water Quality Criteria
			Sample 8	Sample 9	Sample 10	Sample 11	Sample 12		
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	18/10/2022 1520hrs 0.17	18/10/2022 1530hrs 0.23	18/10/2022 1540hrs 0.29	18/10/2022 1550hrs 0.26	18/10/2022 1600hrs 0.055	0.01	70 µg L <sup>-1</sup>
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	0.0005	10 µg L <sup>-1</sup>
Chromium 6 as Cr (VI)	mg/L	APHA 3500-Cr (B)	ND	ND	ND	ND	ND	0.025	50 µg L <sup>-1</sup>
Copper as Cu	mg/L	APHA 3125B	ND	ND	ND	ND	ND	0.001	8 µg L <sup>-1</sup>
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	0.001	8.5 µg L <sup>-1</sup>
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	ND	ND	0.0001	0.16 µg L <sup>-1</sup>
Cyanide	mg/L	APHA Pt 4500-CN (N)	0.0064	ND	ND	0.0055	ND	0.005	7 µg L <sup>-1</sup>
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.47	0.50	0.50	0.36	0.21	0.015	60 µg L <sup>-1</sup>
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.070	0.072	0.068	0.073	0.062	0.02	55 µg L <sup>-1</sup>
Oil and Grease by FTIR	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	ND	ND	ND	ND	ND	0.1	0.14 mg/L
Phenolic compounds (as Phenols)	mg/L	Accredited In-house Method MLS-SOP-WQ-009 Rev 2	ND	ND	ND	ND	ND	0.025	0.12 mg L <sup>-1</sup>
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.10	0.12	0.15	0.12	0.025	0.005	15 µg L <sup>-1</sup> (coastal) 45 µg L <sup>-1</sup> (estuarine)
Total Suspended Solids, TSS	mg/L	APHA 2540D	11.4	10.1	ND	12.2	ND	10	Permissible 10% maximum increase over seasonal average concentration
Enterococcus	cfu/100mL	APHA 9230C	280	22	ND	320	2	1	100 faecal coliform 100 mL <sup>-1</sup>
Faecal Coliform	cfu/100mL	APHA 9221D	260	24	110	80	100	1	35 enterococci 100 mL <sup>-1</sup>
Tributyltin (TBT)*	µg/L	GC-ICPMS (by UK lab)	ND	ND	0.03	ND	0.01	0.01	10 ng L <sup>-1</sup>

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.
4. \* = The above testing were sub-contracted to external accredited laboratory.



## TEST REPORT


Our Reference No. : R227010  
Project Code / Ref. : -

Date Received : 20/10/2022  
Date Commenced : 20/10/2022  
Date Reported : 31/10/2022

Customer Ref. No. : -  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 18 Water samples as per received.

**RESULTS:** Refer to Page 2 to Page 4



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**Tan Thuan Piang**  
**Technical Manager**



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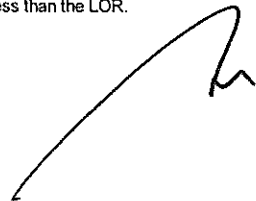
R227010

**RESULTS**

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
			SW1 Surface 20/10/2022 1145hrs	SW2 Surface 20/10/2022 1155hrs	SW3 Surface 20/10/2022 1205hrs	SW7 Surface 20/10/2022 0915hrs	SW8 Surface 20/10/2022 0925hrs	SW9 Surface 20/10/2022 0935hrs
Total Phosphorus, TP	mg/L	APHA Pt 4500-P (J)	0.14	0.14	0.15	0.27	0.25	0.17
Total Nitrogen, TN	mg/L	APHA Pt 4500-P (J)	1.26	1.27	1.22	1.30	1.44	1.59
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.52	0.48	0.52	0.46	0.58	0.82
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.12	0.13	0.14	0.13	0.14	0.15
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	10.5	ND	ND	ND
Total Dissolved Solids, TDS	mg/L	APHA 2540C	12,995	13,391	12,848	7,641	10,029	11,702
Total Organic Carbon, TOC	mg/L	APHA 5310B	3.15	3.31	3.71	3.35	3.28	3.74
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.38	0.35	0.30	0.57	0.58	0.55
Enterococcus	cfu/100mL	APHA 9230C	150	8	280	260	140	110
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Chromium as Cr	mg/L	APHA 3125B	0.0013	0.0014	0.0015	0.0014	0.0012	0.0017
Mercury as Hg	mg/L	APHA 3125B	0.00020	0.00011	0.00018	ND	0.00012	0.00030
Iron as Fe	mg/L	APHA 3125B	0.014	0.011	0.0053	0.024	0.010	0.014
Nickel as Ni	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Zinc as Zn	mg/L	APHA 3125B	0.0098	0.0072	0.0069	0.0088	0.0077	0.0068
Copper as Cu	mg/L	APHA 3125B	0.0016	0.0013	ND	0.0013	0.0012	0.0013
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Arsenic as As	mg/L	APHA 3125B	ND	ND	ND	0.017	0.013	ND
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	ND	ND	ND	ND	ND	ND
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	Accredited In-house Method MLS-SOP-WQ-029 Rev 1	ND	ND	ND	ND	ND	ND
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	HACH Method 8000 (Jul 2021)						
Turbidity	NTU	APHA 2130B	2.5	2.8	2.6	3.1	2.6	2.9

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.



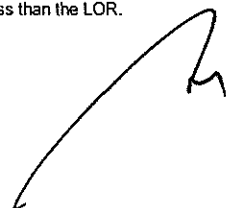
R227010

**RESULTS**

Test Parameter	Unit	Test Method	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
			SW4 Surface 20/10/2022 1000hrs	SW5 Surface 20/10/2022 1010hrs	SW6 Surface 20/10/2022 1020hrs	SW1 Surface 20/10/2022 1515hrs	SW2 Surface 20/10/2022 1525hrs	SW3 Surface 20/10/2022 1535hrs
Total Phosphorus, TP	mg/L	APHA Pt 4500-P (J)	0.47	0.36	0.31	0.15	0.16	0.18
Total Nitrogen, TN	mg/L	APHA Pt 4500-P (J)	12.2	5.12	3.70	1.08	1.29	1.30
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	9.29	3.30	2.15	0.47	0.65	0.73
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.27	0.26	0.30	0.15	0.11	0.17
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	ND	ND
Total Dissolved Solids, TDS	mg/L	APHA 2540C	476	8,655	11,272	14,908	12,994	12,495
Total Organic Carbon, TOC	mg/L	APHA 5310B	8.56	6.16	5.57	3.35	3.35	3.86
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	2.41	1.29	1.01	0.41	0.28	0.37
Enterococcus	cfu/100mL	APHA 9230C	690	570	440	110	60	260
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Chromium as Cr	mg/L	APHA 3125B	0.0033	0.0025	0.0023	0.0018	0.0016	0.0015
Mercury as Hg	mg/L	APHA 3125B	0.0030	0.0018	0.0012	0.00026	0.00046	0.00037
Iron as Fe	mg/L	APHA 3125B	0.075	0.048	0.021	0.017	0.013	0.016
Nickel as Ni	mg/L	APHA 3125B	0.010	0.0068	0.0045	ND	ND	0.0025
Zinc as Zn	mg/L	APHA 3125B	0.044	0.025	0.013	0.0068	0.0077	0.017
Copper as Cu	mg/L	APHA 3125B	0.0031	0.0021	0.0017	0.0013	0.0015	0.0020
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Arsenic as As	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	ND	ND	ND	ND	ND	ND
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	Accredited In-house Method MLS-SOP-WQ-029 Rev 1		ND	ND	ND	ND	ND
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	HACH Method 8000 (Jul 2021)	ND					
Turbidity	NTU	APHA 2130B	5.8	5.2	3.0	2.7	3.2	2.9

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.



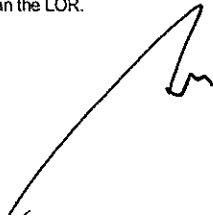
R227010

**RESULTS**

Test Parameter	Unit	Test Method	Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18	LOR
			SW4 Surface 20/10/2022 1555hrs	SW5 Surface 20/10/2022 1605hrs	SW6 Surface 20/10/2022 1615hrs	SW7 Surface 20/10/2022 1635hrs	SW8 Surface 20/10/2022 1645hrs	SW9 Surface 20/10/2022 1655hrs	
Total Phosphorus, TP	mg/L	APHA Pt 4500-P (J)	0.41	0.33	0.33	0.20	0.16	0.19	0.025
Total Nitrogen, TN	mg/L	APHA Pt 4500-P (J)	10.9	3.18	3.89	1.25	1.34	1.56	0.01
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	5.72	1.55	1.93	0.47	0.56	0.85	0.015
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.29	0.31	0.33	0.13	0.14	0.16	0.005
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	ND	ND	10
Total Dissolved Solids, TDS	mg/L	APHA 2540C	476	11,531	10,070	7,237	10,050	11,850	10
Total Organic Carbon, TOC	mg/L	APHA 5310B	9.21	5.07	5.73	3.53	3.39	3.83	1
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.14	0.95	1.20	0.57	0.59	0.56	0.01
Enterococcus	cfu/100mL	APHA 9230C	370	530	110	310	190	70	2
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	0.0005
Chromium as Cr	mg/L	APHA 3125B	0.0039	0.0020	0.0021	0.0014	0.0015	0.0013	0.001
Mercury as Hg	mg/L	APHA 3125B	0.0028	0.0011	0.0026	0.00014	ND	0.00030	0.0001
Iron as Fe	mg/L	APHA 3125B	0.087	0.031	0.024	0.016	0.010	0.011	0.002
Nickel as Ni	mg/L	APHA 3125B	0.011	0.0045	0.0051	ND	ND	ND	0.002
Zinc as Zn	mg/L	APHA 3125B	0.042	0.015	0.015	0.0074	0.0082	0.0070	0.001
Copper as Cu	mg/L	APHA 3125B	0.0032	0.0016	0.0013	0.0013	0.0017	ND	0.001
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	0.001
Arsenic as As	mg/L	APHA 3125B	ND	ND	ND	0.018	0.014	ND	0.01
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	ND	ND	ND	ND	ND	1.17	1
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	Accredited In-house Method MLS-SOP-WQ-029 Rev 1		ND	ND	ND	ND	ND	20
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	HACH Method 8000 (Jul 2021)	26						20
Turbidity	NTU	APHA 2130B	5.4	3.9	2.6	2.9	2.5	3.5	0.1

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.



## TEST REPORT

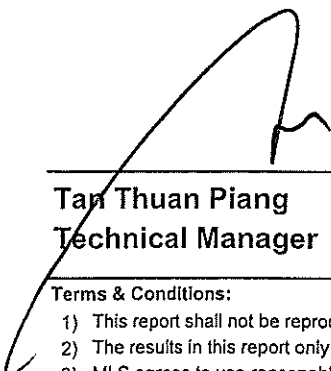
Our Reference No. : R227114/1  
Project Code / Ref. : -

Date Received : 27/10/2022  
Date Commenced : 27/10/2022  
Date Reported : 09/11/2022

Customer Ref. No. : 20220817 (Tembusu)  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 9 Water samples as per received.

**RESULTS:** Refer to Page 2



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**Tan Thuan Piang**  
**Technical Manager**



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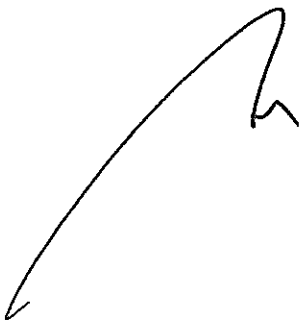
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**RESULTS**

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	LOR
			S5 SW9 Surface	S6 SW8 Surface	S7 SW7 Surface	S10 SW6 Surface	S11 SW5 Surface	S12 SW4 Surface	S13 SW3 Surface	S14 SW2 Surface	S15 SW1 Surface	
			27/10/2022 0940hrs	27/10/2022 0950hrs	27/10/2022 1000hrs	27/10/2022 1050hrs	27/10/2022 1100hrs	27/10/2022 1110hrs	27/10/2022 1140hrs	27/10/2022 1150hrs	27/10/2022 1200hrs	
Total Phosphorus, TP	mg/L	APHA Pt 4500-P (J)	0.16	0.17	0.17	0.88	0.62	4.79	0.89	0.97	0.79	0.025
Total Nitrogen, TN	mg/L	APHA Pt 4500-P (J)	1.17	1.15	1.14	3.05	2.12	8.68	3.24	3.21	3.19	0.01
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.29	0.27	0.30	1.21	0.90	5.06	1.49	1.57	1.23	0.015
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.16	0.16	0.16	0.81	0.59	4.70	0.87	0.94	0.76	0.005
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Total Dissolved Solids, TDS	mg/L	APHA 2540C	16,200	16,131	16,116	12,152	12,799	2,681	11,038	9,157	11,658	10
Total Organic Carbon, TOC	mg/L	APHA 5310B	2.44	2.53	2.62	3.37	3.20	7.62	3.53	3.63	3.84	1
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.58	0.59	0.59	1.30	0.96	2.02	1.43	1.35	1.39	0.01
Enterococcus	cfu/100mL	APHA 9230C	60	40	50	60	550	720	820	560	200	2
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0005
Chromium as Cr	mg/L	APHA 3125B	0.0013	0.0012	0.0012	0.0010	ND	ND	ND	ND	0.0010	0.001
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	0.00064	0.00041	0.0028	0.00073	0.00076	0.00076	0.0001
Iron as Fe	mg/L	APHA 3125B	0.0056	0.0044	0.0055	0.0081	0.0099	0.025	0.0078	0.013	0.0071	0.002
Nickel as Ni	mg/L	APHA 3125B	ND	ND	ND	0.0022	ND	0.0076	0.0023	0.0023	0.0032	0.002
Zinc as Zn	mg/L	APHA 3125B	0.0089	0.0061	0.010	0.0085	0.0069	0.030	0.017	0.013	0.027	0.001
Copper as Cu	mg/L	APHA 3125B	0.0022	0.0013	0.0026	0.0012	0.0011	0.0028	0.0014	0.0017	0.0031	0.001
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001
Arsenic as As	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	ND	ND	1.07	1.04	1.26	2.53	1.35	ND	1.80	1
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	Accredited In-house Method MLS-SOP-WQ-029 Rev 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Turbidity	NTU	APHA 2130B	2.1	2.3	2.2	2.5	2.2	9.3	3.1	4.2	2.9	0.1

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.



## TEST REPORT

Our Reference No. : R227114/2  
Project Code / Ref. : -

Date Received : 27/10/2022  
Date Commenced : 27/10/2022  
Date Reported : 22/11/2022

Customer Ref. No. : 20220817 (Tembusu)  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 6 Water samples as per received.

**RESULTS:** Refer to Page 2



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**Tan Thuan Piang**  
**Technical Manager**



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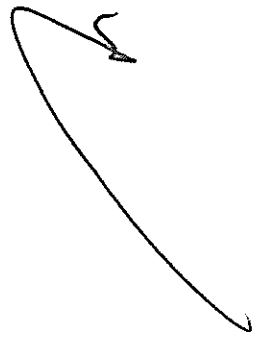
R227114/2

**RESULTS**

Test Parameter	Unit	Test Method	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Sample 6		LOR	ASEAN Marine Water Quality Criteria
			S1 MW6 MID	27/10/2022 0900hrs	S2 MW5 MID	27/10/2022 0910hrs	S3 MW4 MID	27/10/2022 0920hrs	S4 MW3 MID	27/10/2022 0930hrs	S5 MW2 MID	27/10/2022 1020hrs	S6 MW1 MID	27/10/2022 1035hrs		
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.47	0.59	0.58	0.61	0.51	0.53							0.01	70 µg L <sup>-1</sup>
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND							0.0005	10 µg L <sup>-1</sup>
Chromium as Cr6+ (VI)	mg/L	APHA 3500-Cr (B)	ND	ND	ND	ND	ND	ND							0.025	50 µg L <sup>-1</sup>
Copper as Cu	mg/L	APHA 3125B	0.0020	0.0021	0.0015	0.0013	ND	0.0010							0.001	8 µg L <sup>-1</sup>
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND							0.001	8.5 µg L <sup>-1</sup>
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND							0.0001	0.16 µg L <sup>-1</sup>
Cyanide	mg/L	APHA Pt 4500-CN (N)	0.0050	0.0051	0.011	ND	ND	ND							0.005	7 µg L <sup>-1</sup>
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.23	0.34	0.27	0.27	0.36	0.28							0.015	60 µg L <sup>-1</sup>
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.12	0.12	0.12	0.13	0.11	0.12							0.02	55 µg L <sup>-1</sup>
Oil and Grease by FTIR	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	0.14	ND	ND	ND	ND	ND							0.1	0.14 mg/L
Phenolic compounds (as Phenols)	mg/L	Accredited In-house Method MLS-SOP-WQ-009 Rev 2	ND	0.030	0.025	0.028	0.030	0.025							0.025	0.12 mg L <sup>-1</sup>
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.12	0.12	0.11	0.13	0.12	0.13							0.005	15 µg L <sup>-1</sup> (coastal) 45 µg L <sup>-1</sup> (estuarine)
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	ND	ND							10	Permissible 10% maximum increase over seasonal average concentration
Enterococcus	cfu/100mL	APHA 9230C	ND	200	ND	10	170	10							1	100 faecal coliform 100 mL <sup>-1</sup>
Faecal Coliform	cfu/100mL	APHA 9221D	230	800	600	500	280	240							1	35 enterococci 100 mL <sup>-1</sup>
Tributyltin (TBT)*	µg/L	GC-ICPMS (by UK lab)	0.05	ND	0.03	0.02	ND	ND							0.01	10 ng L <sup>-1</sup>

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. \*ND\* = Not detected. The data reported is less than the LOR.
4. \* = The above testing were sub-contracted to external laboratory.



## TEST REPORT

Our Reference No. : **R227115/1**  
Project Code / Ref. : -

Date Received : 27/10/2022  
Date Commenced : 27/10/2022  
Date Reported : 09/11/2022

Customer Ref. No. : 20220817 (Tembusu)  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 9 Water samples as per received.

**RESULTS:** Refer to Page 2

---



**Tan Thuan Piang**  
**Technical Manager**



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R227115/1

**RESULTS**

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	LOR
			S5 SW9 Surface 27/10/2022 1530hrs	S6 SW8 Surface 27/10/2022 1520hrs	S7 SW7 Surface 27/10/2022 1510hrs	S10 SW6 Surface 27/10/2022 1430hrs	S11 SW5 Surface 27/10/2022 1420hrs	S12 SW4 Surface 27/10/2022 1410hrs	S13 SW3 Surface 27/10/2022 1350hrs	S14 SW2 Surface 27/10/2022 1340hrs	S15 SW1 Surface 27/10/2022 1330hrs	
Total Phosphorus, TP	mg/L	APHA 4500-P (J)	0.17	0.18	0.16	0.92	0.70	4.86	1.07	0.87	0.83	0.025
Total Nitrogen, TN	mg/L	APHA 4500-P (J)	1.14	1.23	1.23	2.92	2.33	8.61	3.09	2.86	2.90	0.01
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.27	0.28	0.27	1.38	1.06	5.12	1.37	1.37	1.28	0.015
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.16	0.17	0.16	0.86	0.70	4.62	0.88	0.86	0.82	0.005
Total Suspended Solids, TSS	mg/L	APHA 2540D	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Total Dissolved Solids, TDS	mg/L	APHA 2540C	16,078	15,792	16,135	12,027	12,522	2,546	10,603	8,424	11,572	10
Total Organic Carbon, TOC	mg/L	APHA 5310B	2.40	2.41	2.58	3.47	3.23	7.41	3.33	3.44	3.50	1
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.57	0.59	0.60	1.25	1.00	2.23	1.38	1.27	1.30	0.01
Enterococcus	cfu/100mL	APHA 9230C	50	80	30	60	390	460	940	750	190	2
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0005
Chromium as Cr	mg/L	APHA 3125B	0.0012	0.0011	0.0011	ND	ND	ND	ND	ND	ND	0.001
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	0.00062	0.00048	0.0028	0.00056	0.00072	0.00062	0.0001
Iron as Fe	mg/L	APHA 3125B	0.0042	0.0040	0.0026	0.0093	0.0068	0.023	0.0095	0.010	0.010	0.002
Nickel as Ni	mg/L	APHA 3125B	ND	ND	ND	0.0020	ND	0.0074	ND	0.0021	ND	0.002
Zinc as Zn	mg/L	APHA 3125B	0.0050	0.0069	0.0043	0.0087	0.0085	0.029	0.011	0.014	0.013	0.001
Copper as Cu	mg/L	APHA 3125B	ND	0.0014	ND	0.0011	0.0010	0.0029	0.0014	0.0018	0.0016	0.001
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001
Arsenic as As	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	ND	1.12	1.20	1.00	1.01	2.01	1.08	ND	1.12	1
Chemical Oxygen Demand, COD	mg O <sub>2</sub> /L	Accredited In-house Method MLS-SOP-WQ-029 Rev 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	20
Turbidity	NTU	APHA 2130B	2.1	2.0	1.9	1.8	2.2	9.2	3.2	4.7	2.9	0.1

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.

## TEST REPORT


Our Reference No. : R227115/2  
Project Code / Ref. : -

Date Received : 27/10/2022  
Date Commenced : 27/10/2022  
Date Reported : 22/11/2022

Customer Ref. No. : 20220817 (Tembusu)  
Customer Name : TEMBUSU Asia Consulting Pte Ltd  
Customer Address : 1 Commonwealth Lane  
#06-06, One Commonwealth  
Singapore 149544

Attention To : Mr Eric Chng  
Sample Description : 6 Water samples as per received.

**RESULTS:** Refer to Page 2



---



**Tan Thuan Piang**  
**Technical Manager**



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R227115/2

**RESULTS**

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	LOR	ASEAN Marine Water Quality Criteria
			S1	S2	S3	S4	S8	S9		
			MW6 MID	MW5 MID	MW4 MID	MW3 MID	MW2 MID	MW1 MID		
			27/10/2022 1615hrs	27/10/2022 1605hrs	27/10/2022 1550hrs	27/10/2022 1540hrs	27/10/2022 1455hrs	27/10/2022 1445hrs		
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.48	0.47	0.62	0.58	0.41	0.50	0.01	70 µg L <sup>-1</sup>
Cadmium as Cd	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	0.0005	10 µg L <sup>-1</sup>
Chromium as Cr6+ (VI)	mg/L	APHA 3500-Cr (B)	ND	ND	ND	ND	ND	ND	0.025	50 µg L <sup>-1</sup>
Copper as Cu	mg/L	APHA 3125B	0.0018	ND	ND	ND	ND	0.0015	0.001	8 µg L <sup>-1</sup>
Lead as Pb	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	0.001	8.5 µg L <sup>-1</sup>
Mercury as Hg	mg/L	APHA 3125B	ND	ND	ND	ND	ND	ND	0.0001	0.16 µg L <sup>-1</sup>
Cyanide	mg/L	APHA Pt 4500-CN (N)	ND	ND	ND	0.0062	ND	0.0059	0.005	7 µg L <sup>-1</sup>
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.22	0.37	0.28	0.27	0.36	0.30	0.015	60 µg L <sup>-1</sup>
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.11	0.11	0.12	0.15	0.10	0.12	0.02	55 µg L <sup>-1</sup>
Oil and Grease by FTIR	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	ND	ND	ND	ND	ND	0.12	0.1	0.14 mg/L
Phenolic compounds (as Phenols)	mg/L	Accredited In-house Method MLS-SOP-WQ-009 Rev 2	ND	0.036	0.032	0.027	ND	ND	0.025	0.12 mg L <sup>-1</sup>
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.13	0.14	0.13	0.14	0.11	0.13	0.005	15 µg L <sup>-1</sup> (coastal) 45 µg L <sup>-1</sup> (estuarine)
Total Suspended Solids, TSS	mg/L	APHA 2540D	4.20	3.10	4.10	3.10	3.20	2.30	10	Permissible 10% maximum increase over seasonal average concentration
Enterococcus	cfu/100mL	APHA 9230C	10	30	ND	ND	120	20	1	100 faecal coliform 100 mL <sup>-1</sup>
Faecal Coliform	cfu/100mL	APHA 9221D	110	190	350	440	400	400	1	35 enterococci 100 mL <sup>-1</sup>
Tributyltin (TBT)*	µg/L	GC-ICPMS (by UK lab)	0.04	ND	ND	0.06	ND	0.02	0.01	10 ng L <sup>-1</sup>

**Note:**

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. LOR = Limit of Reporting.
3. "ND" = Not detected. The data reported is less than the LOR.
4. \* =The above testing were sub-contracted to external laboratory.

