

Appendix A Ecological Institute of Australia and New Zealand (2018) guideline tables for marine species and habitats

Appendix A Table 1: Criteria for assigning ecological value to estuarine and marine species

Ecological Value	Species
Very High	Internationally or 'Nationally Threatened' species (Nationally Critical, Nationally Endangered, Nationally Vulnerable, Nationally Increasing) found in the ZOI* either permanently or seasonally.
High	Species listed as Internationally or Nationally 'At Risk' – Declining, found in the ZOI either permanently or seasonally.
Moderate	Locally uncommon or distinctive species; or Species listed as any other category of 'At Risk', found in the ZOI either permanently or seasonally.
Low	Nationally and locally common indigenous species.
Negligible	Exotic species, including pests, species having recreational value.

*In this case the Zone of Influence (ZOI) refers to all estuarine and marine water bodies and environments that could potentially be affected by the Project. It includes the Project Site and any environments beyond the Project Area where the 'indirect effects' of activities such as discharges may extend.

Appendix A Table 2: Qualitative and quantitative fine scale attributes for assigning ecological values for soft sediment benthic habitats⁸

Ecological Value	Attributes
Negligible	- Benthic invertebrate community degraded with very low species richness, diversity, and abundance for the habitat type. - Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant, and mud tolerant organisms with no sensitive taxa present. E.g. rated as 'Poor' using the Auckland Council⁹ or National Benthic Health Models (BHM)¹⁰ or similar indices. - Invasive¹¹, opportunistic and disturbance tolerant species highly dominant. - Marine sediments dominated by silt and clay grain sizes (> 80%) or rated as 'Poor' using a BHMmud or similar index.

⁸ Methodologies and considerations for measuring a number of these attributes can be found within the "National Estuary Monitoring Protocol" and "Managing Upstream" project reports. Go to <https://environment.govt.nz/publications/> to search for the latest versions.

⁹ Hewitt, J E., Lohrer, A M and Townsend, M (2012). Health of estuarine soft-sediment habitats: continued testing and refinement of state of the environment indicators. Prepared by NIWA for Auckland Council. Auckland Council technical report, TR2012/012

¹⁰ D.E. Clark, J.E. Hewitt, C.A. Pilditch, J.I. Ellis (2020). The development of a national approach to monitoring estuarine health based on multivariate analysis. Marine Pollution Bulletin, Volume 150.

¹¹ <https://www.marinebiosecurity.org.nz/>

Ecological Value	Attributes
	• Surface sediment anoxic (lacking oxygen)¹². • Annual average sedimentation rates typically greater than 10 mm above background levels¹³. • Elevated contaminant concentrations in surface sediment, above ANZG Guideline Values – High (GV-High) effects threshold concentrations¹⁴. • Where shellfish are present, flesh has moderate-high contaminant concentrations present compared to natural background levels. • Water column contaminant concentrations typically at or worse than ANZWQG 80% species protection levels and/or scored as ‘Poor’ on a recognised WQI. • Fish community¹⁵ depleted with very low species richness, diversity and abundance¹⁶. • Native estuarine vegetation or macroalgae absent or so sparse as to provide very limited ecological value. • Nuisance phytoplankton or macroalgal blooms may occur frequently over a large spatial scale. • No Threatened or At Risk marine species¹⁷ present. • No Threatened ecosystems¹⁸ present. • Physical habitat extremely modified.
Low	• Benthic invertebrate community degraded with low species richness, diversity and abundance for the habitat type. • Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant and mud tolerant organisms with few/no sensitive taxa present e.g. rated as ‘Marginal’ using the Auckland Council⁹ or National Benthic Health Models (BHM)¹⁰ or similar index. • Invasive¹¹, opportunistic and/or disturbance-tolerant species dominant. • Marine sediments dominated by silt and clay grain sizes (> 70%) or rated as ‘Marginal’ using the Auckland Council BHMmud or similar index. • Surface sediment predominantly anoxic (lacking oxygen)¹². • Annual average sedimentation rates typically less than 10 mm above background levels¹³. • Elevated contaminant concentrations in surfaces sediment, between ANZG Default Guideline Values (DGV) and GV-High effects threshold concentrations¹⁴. • Where shellfish are present, flesh has moderate contaminant concentrations present compared to natural background levels. • Water column contaminant concentrations typically between ANZWQG 80% and 90% species protection levels and/or scored as ‘Marginal’ on a recognised WQI. • Fish community¹⁵ depleted with low species richness, diversity and abundance¹⁶.

¹² Robertson, B.M, Stevens, L., Robertson, B., Zeldis, J., Green, M., Madarasz-Smith, A., Plew, D., Storey, R., Oliver, M. 2016. NZ Estuary Trophic Index Screening Tool 2. Determining Monitoring Indicators and Assessing Estuary Trophic State. Prepared for Envirolink Tools Project: Estuarine Trophic Index, MBIE/NiWA Contract No: C01X1420. 68p.

¹³ Townsend and Lohrer (2015). ANZECC Guidance for Estuary Sedimentation. Prepared for Ministry for the Environment by NIWA

¹⁴ ANZG (2018) Australian and New Zealand Guidelines for Freshwater and Marine Water Quality (replaced previous ANZECC guidelines)

¹⁵ <https://www.mpi.govt.nz/legal/legislation-standards-and-reviews/fisheries-legislation/maps-of-nz-fisheries/>

¹⁶ Species of fish and other large fauna can be separated into individual values assessment, depending on the scale of the activity and the species present

¹⁷ Marine mammals and coastal birds have been excluded as a characteristic of marine habitats as separate specialist experts in marine mammals and coastal birds should be engaged. Marine mammals and coastal birds can form part of the characteristics around presence of ‘Threatened’ or ‘At Risk’ species when supported by relevant experts

¹⁸ As per (Holdaway et al., 2012) for this parameter in all levels of ecological value.

Ecological Value	Attributes
	• Native estuarine vegetation and/or macroalgae community provides minimal/limited habitat for native fauna. • Nuisance phytoplankton or macroalgal blooms may occur commonly over a moderate scale. • No Threatened or At Risk marine species¹⁷ present. • No Threatened ecosystem¹⁸ present. • Physical habitat highly modified.
Moderate	• Benthic invertebrate community typically has moderate species richness, diversity and abundance for the habitat type. • Benthic invertebrate community has taxa both tolerant and sensitive to organic enrichment, contaminants and mud present E.g. rated as 'Fair' using the Auckland Council⁹ or National Benthic Health Model (BHM)¹⁰ or similar index. • Few invasive¹¹ opportunistic and/or disturbance tolerant species present. • Marine sediments typically comprise less than < 60% silt and clay grain sizes or rated as 'Fair' using the Auckland Council BHMmud or similar index. • Shallow dept of oxygenated surface sediment to 1-2 cm depth¹². • Annual average sedimentation rates typically less than 5 mm above background levels¹³. • Contaminant concentrations in surface sediment generally below ANZG Default Guideline Values (DGV)¹⁴ and Auckland Council ERC-Red effects threshold concentrations¹⁹. • Where shellfish are present, flesh has low to moderate contaminant concentrations present compared to natural background levels. • Water column contaminant concentrations typically between ANZWQG 90% and 95% species protection levels and/or scored as 'Fair' on a recognised WQI. • Fish community¹⁵ typically has moderate species richness, diversity and abundance¹⁶. • Native estuarine vegetation and macroalgae community dominated by native species and provides moderate habitat for native fauna. • Nuisance phytoplankton or macroalgae blooms may occur sporadically over a moderate spatial scale. • Few Threatened or At Risk marine species¹⁷ present. • Few Threatened ecosystems¹⁸ present. • Physical habitat moderately modified.
High	• Benthic invertebrate community typically has high diversity, species richness and abundance for the habitat type. • Benthic invertebrate community contains many taxa that are sensitive to organic enrichment, contaminants and mud. E.g. rated as 'Good' using the Auckland Council⁹ or National Benthic Health Model (BHM)¹⁰ or similar index. • Invasive¹¹ opportunistic and/or disturbance tolerant species largely absent. • Marine sediments typically comprise < 40% silt and clay grain sizes or rated as 'Good' using the Auckland Council BHMmud or a similar index. • Surface sediment oxygenated up to 5cm depth¹². • Annual average sedimentation rates typically less than 2 mm above background levels¹³.

¹⁹ Auckland Council's Environmental Response Criteria contaminant threshold concentrations (Auckland Regional Council TP168, 2004).

Ecological Value	Attributes
	- Contaminant concentrations in surface sediment rarely exceed ANZG Default Guideline Values (DGV)¹⁴ concentrations and AC ERC-Orange effects threshold concentrations¹⁹. - Where shellfish are present, flesh has contaminant concentrations close to natural background levels or not above conservative laboratory detection limits. - Water column contaminant concentrations typically between ANZWQG 95% and 99% species protection levels and/or scored as 'Good' on a recognised WQI. - Fish community¹⁵ typically has high diversity, species richness and abundance¹⁶. - Native estuarine vegetation or macroalgae community dominated by native species and provides high quality habitat for native fauna. - Nuisance phytoplankton or macroalgal blooms may occur infrequently at a limited spatial scale. - Threatened or At Risk marine species¹⁷ present. - Threatened ecosystem¹⁸ present. - Physical habitat largely unmodified.
Very High	- Benthic invertebrate community typically has very high diversity, species richness and abundance for the habitat type. - Benthic invertebrate community is dominated by taxa that are sensitive to organic enrichment, contaminants and mud e.g. rated as 'Excellent' using the Auckland Council⁹ or National Benthic Health Model (BHM)¹⁰ or similar index. - Invasive¹¹ opportunistic and disturbance tolerant species absent. - Marine sediments typically comprise < 20% silt and clay grain sizes (mud) or rated as 'Excellent' using the Auckland Council BHM¹⁰ or similar index. - Surface sediment oxygenated to >5 cm depth¹² with no anoxic sediment present. - Annual average sedimentation rates typically less than 1 mm above background levels¹³. - Contaminant concentrations in surface sediment significantly below ANZG Default Guideline Values (DGV)¹⁴ and Auckland Council ERC-Orange effects threshold concentrations¹⁹. - Contaminant concentrations in shellfish at or below natural background levels or not above conservative laboratory detection limits. - Water column contaminant concentrations typically at or better than ANZWQG 99% species protection level and/or scored as 'Excellent' on a recognised WQI. - Fish community¹⁵ typically has very high diversity, species richness and abundance¹⁶. - Native estuarine vegetation or macroalgae community intact and provides significant habitat for native fauna. - No evidence of nuisance phytoplankton or macroalgal blooms. - Threatened or At Risk marine species¹⁷ present. - Threatened ecosystems¹⁸ present. - Physical habitat unmodified.

Appendix A Table 3: Summary of the criteria for describing the magnitude of effect.

Magnitude	Description
Very High	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Appendix A Table 4: Criteria for describing overall level of ecological effects.

Magnitude of effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very low	Very Low
Negligible	Low	Very low	Very low	Very low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Overall level-of-effect categories are used to determine if residual effects management is required over and above measures to reduce the severity of effects through efforts to avoid, remedy or mitigate adverse effects. Usually, if the level of residual effect is assessed as being "Moderate" or greater, this warrants efforts to offset or compensate for these effects.

Appendix B Site sample photos



Photograph Appendix B.1: Example of macroinvertebrate core at Ocean discharge site



Photograph Appendix B.2: Example of 20 m east of the discharge



Photograph Appendix B.3: Example of 50 m east of the discharge



Photograph Appendix B.4: Example of 10 m north of the discharge



Photograph Appendix B.5: Example of 40 m north of the discharge



Photograph Appendix B.6: Example of 10 m south of the discharge



Photograph Appendix B.7: Example of 40 m south of the discharge



Photograph Appendix B.8: Example of 20 m west of the discharge



Photograph Appendix B.9: Example of 50 m west of the discharge

Appendix C Infauna and laboratory results

C1 Benthic infauna

Beachlands 2026

GenGroup	Taxa	Common Name	D-1	D-2	D-3	E-20-1	E-20-2	E-20-3	E-50-1	E-50-2	E-50-3	N-10-1	N-10-2	N-10-3	N-40-1	N-40-2	N-40-3	S-10-1	S-10-2	S-10-3	S-40-1	S-40-2	S-40-3	W-20-1	W-20-2	W-20-3	W-50-1	W-50-2	W-50-3
Nemertea	Nemertea	Proboscis worms	1											1															
Nematoda	Nematoda	Roundworm									1																		
Opisthobranchia	Philine auriformis	White Slug			1																								
Bivalvia	Arthritica bifurca	Small bivalve																											1
Bivalvia	Ostreidae (spat)	True oyster															1												
Bivalvia	Theora lubrica	Window shell	22	7	12	7	12	10	5	16	7	24	10	7	13	29	16	19	8	8	7	8	16	5	5	5	22	28	14
Oligochaeta	Oligochaeta	Oligochaete worms					1		1	2																			
Polychaeta: Nereididae	Neanthes sp.	Rag worm	2		1	2	2	1	1	1		1	1		1			1					1	1					
Polychaeta: Nereididae	Nereidae (juvenile)	Rag worms	3	2																			1						
Polychaeta: Orbiniidae	Phylo novazealandiae	Polychaete worm														1							1	1					
Polychaeta: Paraonidae	Paraonidae	Polychaete worm	2	1	1		1	2	1				1	2		1				2	2						2	1	
Polychaeta: Paraonidae	Aricidea sp.	Polychaete worm												1															
Polychaeta: Cossuridae	Cossura consimilis	Polychaete worm								1					1														
Polychaeta: Spionidae	Prionospio multicristata	Polychaete worm											1		1														
Polychaeta: Spionidae	Prionospio sp.	Polychaete worm		1			1												3			1			1	1		1	1
Polychaeta: Spionidae	Prionospio wambiri	Polychaete worm		2	1									1				1		1					2			1	2
Polychaeta: Spionidae	Prionospio yuriel	Polychaete worm		1	1	1	3	1	1	6				1		1	1		2				2			3	2	1	1
Polychaeta: Spionidae	Pseudopolydora sp.	Polychaete worm	3			1		1		1		1		1	4	3	1		1		3	2			5	4			
Polychaeta: Capitellidae	Capitella spp.	Polychaete worm					1																						
Polychaeta: Capitellidae	Heteromastus filiformis	Polychaete worm	16	8	8	6	8	5	8	9	0	7		3	1	7	23	9	6	3		5		1	1		2	11	
Polychaeta: Maldanidae	Maldanidae	Bamboo Worms														1										1			
Polychaeta: Opheliidae	Armandia maculata	Polychaete worm															1												
Polychaeta: Sigalionidae	Sigalionidae	Polychaete worm		1				1									1						1				1		
Polychaeta: Glyceridae	Glyceridae	Polychaete worm						1						1					1										
Polychaeta: Goniadidae	Goniadidae	Polychaete worm											1												1				
Polychaeta: Nephtyidae	Aglaophamus sp.	Polychaete worm				1						1																	
Polychaeta: Lumbrineridae	Lumbrineridae	Polychaete worm	2	2		1	1	1	1	1	2			1	2	2	3				1	2			2	1	1	1	2
Polychaeta: Dorvilleidae	Dorvilleidae	Polychaete worm	1																1										
Polychaeta: Cirratulidae	Cirratulidae	Polychaete worm			1							1														1			
Polychaeta: Pectinariidae	Lagis australis	Ice cream cone worm																									1	1	
Polychaeta: Terebellidae	Terebellidae	Polychaete worm				2		1			1		2						1	1	1		1		3				
Polychaeta: Trichobranchidae	Terebellides narribri	Polychaete worm																1											
Polychaeta: Sabellidae	Sabellidae	Umbrella worms			1																								
Mysida	Mysida	Opposum shrimp																							1				
Cumacea	Cumacea	Cumaceans																	1										
Amphipoda	Corophiidae	Amphipod (family)										1				1			1										
Amphipoda	Oedicerotidae	Amphipod (family)	3										1										1			1			
Amphipoda	Phoxocephalidae	Amphipod (family)	3	3			2						2	1		2		3	2	1								2	
Amphipoda	Amphipoda Unid.	Amphipod					1									2			1	2									
Decapoda	Alpheus sp.	Snapping shrimp														1				1					2			1	
Decapoda	Hemiplax hirtipes	Stalk-eyed Mud Crab			1																	1						1	
Ostracoda	Cypridinoides sp.	Ostracod								1																			
Ostracoda	Diasterope grisea	Ostracod								1						1													
Ostracoda	Metavargula iota	Ostracod	1			2				2	1							1										1	
Ostracoda	Parasterope quadrata	Ostracod								1					3	1					1						1	1	
Ostracoda	Phylctenophora zealandica	Ostracod							1																				
Ostracoda	Scleroconcha sp.	Ostracod	8	5	3	7	2	4	3	6	1	7	5	2	2	6	4	1	2	7	4	1	3	2	3	3	3	3	4
	Count: No of Individuals		67	33	31	30	35	28	22	48	13	43	24	22	25	61	52	39	27	26	19	20	27	11	25	20	32	57	22
	Count: No of Taxa		13	11	11	10	12	11	9	13	7	8	9	12	8	15	10	9	12	9	7	7	9	6	10	9	7	15	7
	SW_Diversity		2.02	2.11	1.83	2.00	2.02	1.97	1.82	2.03	1.41	1.35	1.77	2.20	1.55	1.93	1.54	1.55	2.13	1.86	1.69	1.62	1.48	1.54	2.15	1.99	1.15	1.80	1.29
	SW_Evenness		0.79	0.88	0.76	0.87	0.81	0.82	0.83	0.79	0.79	0.65	0.80	0.88	0.75	0.71	0.67	0.71	0.86	0.85	0.87	0.83	0.67	0.86	0.93	0.90	0.59	0.66	0.66

C2 Laboratory scripts

Certificate of Analysis

Page 1 of 3

Client:	Tonkin & Taylor	Lab No:	4217223	SPV2
Contact:	Susan Jackson C/- Tonkin & Taylor PO Box 5271 Auckland 1141	Date Received:	18-May-2026	
		Date Reported:	19-Jun-2026	
		Quote No:	145083	
		Order No:	Melanie Tupe	
		Client Reference:		
		Submitted By:	Melanie Tupe	

Sample Type: Sediment

Sample Name:	Discharge 18-May-2026 10:40 am	N-10 18-May-2026 11:10 am	N-40 18-May-2026 11:40 am	W-20 18-May-2026 2:10 pm	W-50 18-May-2026 2:30 pm
Lab Number:	4217223.1	4217223.2	4217223.3	4217223.4	4217223.5

Individual Tests

Dry Matter	g/100g as rcvd	56	53	56	61	55
Particle size analysis**		See attached report	See attached report	See attached report	See attached report	See attached report
Total Recoverable Phosphorus	mg/kg dry wt	280	300	280	310	290
Total Nitrogen*	g/100g dry wt	0.07	0.06	0.07	0.07	0.06
Total Organic Carbon*	g/100g dry wt	0.53	0.47	0.52	0.51	0.48
Chlorophyll a**	mg/kg as rcvd	4.2	6.0	3.7	3.5	5.6
Pheophytin a**	mg/kg as rcvd	6.4	8.7	4.5	4.6	6.7

Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg

Total Recoverable Arsenic	mg/kg dry wt	5.4	5.2	5.1	5.3	4.7
Total Recoverable Cadmium	mg/kg dry wt	0.033	0.030	0.032	0.035	0.029
Total Recoverable Chromium	mg/kg dry wt	14.0	14.5	13.8	12.5	11.9
Total Recoverable Copper	mg/kg dry wt	4.7	4.6	4.6	4.4	4.0
Total Recoverable Lead	mg/kg dry wt	9.2	9.2	9.1	8.9	8.3
Total Recoverable Mercury	mg/kg dry wt	0.06	0.06	0.06	0.06	0.05
Total Recoverable Nickel	mg/kg dry wt	5.4	6.2	5.4	5.3	4.7
Total Recoverable Zinc	mg/kg dry wt	40	39	39	38	36

Polycyclic Aromatic Hydrocarbons Trace in Soil*

Total of Reported PAHs in Soil	mg/kg dry wt	0.12	< 0.08	< 0.08	< 0.07	< 0.08
1-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
2-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Acenaphthene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Acenaphthylene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Anthracene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Benzo[a]anthracene	mg/kg dry wt	0.005	< 0.004	0.004	< 0.003	0.004
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.008	0.005	0.006	0.004	0.006
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.012	0.006	0.007	0.005	0.007
Benzo[e]pyrene	mg/kg dry wt	0.006	0.003	0.004	< 0.003	0.004
Benzo[g,h,i]perylene	mg/kg dry wt	0.005	0.004	0.004	0.003	0.004
Benzo[k]fluoranthene	mg/kg dry wt	0.004	< 0.004	< 0.003	< 0.003	< 0.003
Chrysene	mg/kg dry wt	0.008	< 0.004	0.003	< 0.003	0.004
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Fluoranthene	mg/kg dry wt	0.024	0.009	0.009	0.006	0.011
Fluorene	mg/kg dry wt	< 0.003	< 0.004	< 0.003	< 0.003	< 0.003
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.004	0.004	0.004	0.003	0.004
Naphthalene	mg/kg dry wt	< 0.015	< 0.016	< 0.015	< 0.014	< 0.015



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Sediment						
Sample Name:		Discharge 18-May-2026 10:40 am	N-10 18-May-2026 11:10 am	N-40 18-May-2026 11:40 am	W-20 18-May-2026 2:10 pm	W-50 18-May-2026 2:30 pm
Lab Number:		4217223.1	4217223.2	4217223.3	4217223.4	4217223.5
Polycyclic Aromatic Hydrocarbons Trace in Soil*						
Perylene	mg/kg dry wt	0.003	< 0.004	< 0.003	< 0.003	< 0.003
Phenanthrene	mg/kg dry wt	0.013	0.005	0.004	< 0.003	< 0.003
Pyrene	mg/kg dry wt	0.026	0.010	0.010	0.008	0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.0105	< 0.0076	0.0075	< 0.0066	0.0081
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.0102	< 0.0076	0.0075	< 0.0066	0.0080
Sample Name:		E-20 18-May-2026 1:30 pm	E-50 18-May-2026 1:50 pm	S-10 18-May-2026 12:00 pm	S-40 18-May-2026 12:15 pm	
Lab Number:		4217223.6	4217223.7	4217223.8	4217223.9	
Individual Tests						
Dry Matter	g/100g as rcvd	56	54	54	63	
Particle size analysis**		See attached report	See attached report	See attached report	See attached report	
Total Recoverable Phosphorus	mg/kg dry wt	320	340	310	340	
Total Nitrogen*	g/100g dry wt	0.07	0.07	0.07	0.07	
Total Organic Carbon*	g/100g dry wt	0.61	0.54	0.53	0.52	
Chlorophyll a**	mg/kg as rcvd	6.1	5.1	6.3	4.9	
Pheophytin a**	mg/kg as rcvd	7.5	6.9	8.5	5.0	
Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	4.9	5.1	5.5	5.7	
Total Recoverable Cadmium	mg/kg dry wt	0.029	0.030	0.031	0.029	
Total Recoverable Chromium	mg/kg dry wt	14.5	13.5	14.9	13.4	
Total Recoverable Copper	mg/kg dry wt	4.7	4.7	4.9	4.7	
Total Recoverable Lead	mg/kg dry wt	9.6	9.2	9.5	9.6	
Total Recoverable Mercury	mg/kg dry wt	0.06	0.06	0.06	0.07	
Total Recoverable Nickel	mg/kg dry wt	5.4	5.3	5.6	5.3	
Total Recoverable Zinc	mg/kg dry wt	40	41	41	42	
Polycyclic Aromatic Hydrocarbons Trace in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.08	< 0.08	0.17	< 0.07	
1-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.004	< 0.004	< 0.003	
2-Methylnaphthalene	mg/kg dry wt	< 0.003	< 0.004	< 0.004	< 0.003	
Acenaphthene	mg/kg dry wt	< 0.003	< 0.004	0.003	< 0.003	
Acenaphthylene	mg/kg dry wt	< 0.003	< 0.004	< 0.004	< 0.003	
Anthracene	mg/kg dry wt	< 0.003	< 0.004	0.005	< 0.003	
Benzo[a]anthracene	mg/kg dry wt	0.004	< 0.004	0.010	< 0.003	
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.006	0.003	0.012	0.003	
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.007	0.004	0.012	0.005	
Benzo[e]pyrene	mg/kg dry wt	0.004	< 0.004	0.006	< 0.003	
Benzo[g,h,i]perylene	mg/kg dry wt	0.004	0.004	0.006	< 0.003	
Benzo[k]fluoranthene	mg/kg dry wt	< 0.003	< 0.004	0.006	< 0.003	
Chrysene	mg/kg dry wt	0.003	< 0.004	0.010	< 0.003	
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.003	< 0.004	< 0.004	< 0.003	
Fluoranthene	mg/kg dry wt	0.009	0.006	0.032	0.007	
Fluorene	mg/kg dry wt	< 0.003	< 0.004	< 0.004	< 0.003	
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.005	0.004	0.006	0.003	
Naphthalene	mg/kg dry wt	< 0.015	< 0.016	< 0.016	< 0.014	
Perylene	mg/kg dry wt	0.004	< 0.004	0.004	< 0.003	
Phenanthrene	mg/kg dry wt	0.003	< 0.004	0.026	0.003	
Pyrene	mg/kg dry wt	0.010	0.006	0.028	0.008	
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.0077	< 0.0074	0.0153	< 0.0064	
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.0076	< 0.0073	0.0150	< 0.0064	

Analyst's Comments

* Analysis subcontracted to an external provider. Refer to the Summary of Methods section for more details.

Appendix No.1 - University of Waikato Report

Appendix No.2 - ESNZ Report

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sediment			
Test	Method Description	Default Detection Limit	Sample No
Chlorophyll a and Pheophytin a*		0.1 mg/kg as rcvd	1-9
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-9
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-9
Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, trace level.	0.010 - 0.8 mg/kg dry wt	1-9
Polycyclic Aromatic Hydrocarbons Trace in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.03 mg/kg dry wt	1-9
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-9
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2 (modified), APHA 3125 B: Online Edition.	-	1-9
Particle size analysis*	Malvern Laser Sizer particle size analysis from 0.05 microns to 3.4 mm. Samples are measured in volume %. Subcontracted to Earth Sciences Department, Waikato University, Hamilton.	-	1-9
Total Recoverable Phosphorus	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified), APHA 3125 B: Online Edition.	40 mg/kg dry wt	1-9
Total Nitrogen*	Catalytic Combustion (900°C, O ₂), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1-9
Total Organic Carbon*	Acid pretreatment to remove carbonates present followed by Catalytic Combustion (O ₂), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1-9
Chlorophyll a*	Extraction with 95% Ethanol, Spectroscopy. Subcontracted to Earth Sciences NZ, Hamilton. In-house.	0.1 mg/kg as rcvd	1-9
Pheophytin a*	Extraction with 95% Ethanol, Spectroscopy. Subcontracted to Earth Sciences NZ, Hamilton. In-house.	0.1 mg/kg as rcvd	1-9

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 20-May-2026 and 19-Jun-2026. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



Kim Harrison MSc
Client Services Manager - Environmental

Analysis - Under

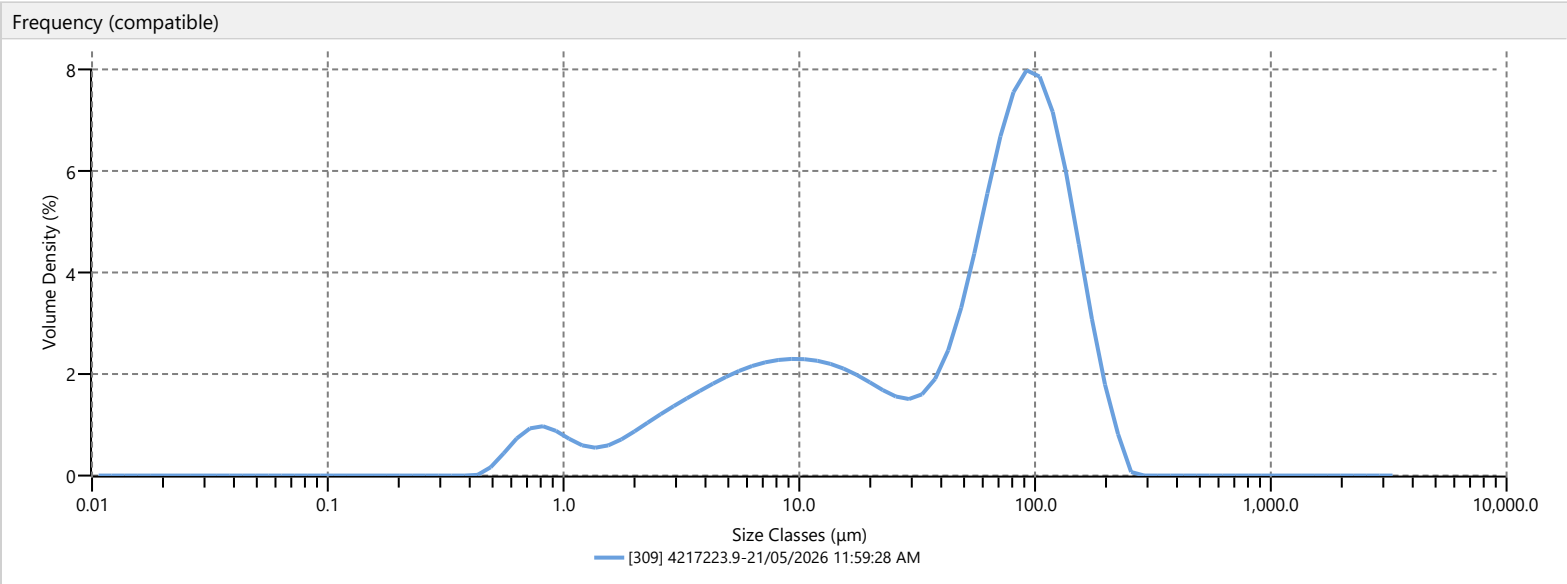
University of Waikato

Measurement Details
Sample Name 4217223.9
SOP File Name Sediment.msop
Lab Number 2026175/9
Operator Name Instrument Login

Analysis
Particle Name Sediment
Particle Refractive Index 1.500
Particle Absorption Index 0.200
Dispersant Name Water
Dispersant Refractive Index 1.330
Scattering Model Mie
Analysis Model General Purpose
Weighted Residual 0.63 %
Laser Obscuration 19.94 %

Measurement Details
Analysis Date Time 21/05/2026 11:59:28 AM
Measurement Date Time 21/05/2026 11:59:28 AM
Result Source Measurement

Result
Span 2.350
Uniformity 0.791
Specific Surface Area 292.3 m²/kg
D [3,2] 7.89 µm
D [4,3] 62.6 µm
Dv (10) 3.18 µm
Dv (50) 57.6 µm
Dv (90) 139 µm
Dv (95) 162 µm
Volume Below (10) µm 25.02 %
Volume Below (20) µm 34.69 %
Volume Below (30) µm 38.98 %



Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	21.30	88.0	68.17	350	100.00	1410	100.00
0.0600	0.00	15.6	31.49	105	77.38	420	100.00	1680	100.00
0.120	0.00	31.0	39.30	125	85.86	500	100.00	2000	100.00
0.240	0.00	37.0	41.22	149	92.53	590	100.00	2380	100.00
0.490	0.06	44.0	43.68	177	96.89	710	100.00	2830	100.00
0.980	3.39	53.0	47.64	210	99.27	840	100.00	3360	100.00
2.00	6.45	63.0	53.09	250	100.00	1000	100.00		
3.90	12.11	74.0	59.69	300	100.00	1190	100.00		



Analysis - Under

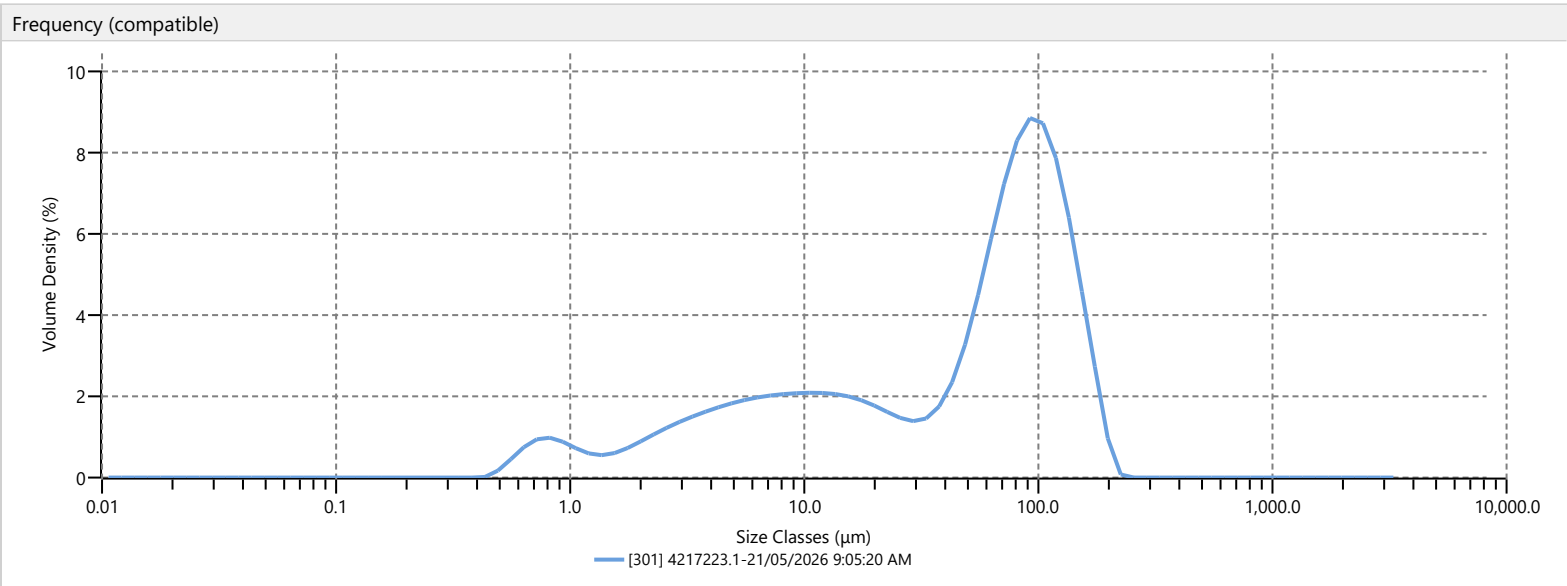
University of Waikato

Measurement Details
Sample Name 4217223.1
SOP File Name Sediment.msop
Lab Number 2026175/1
Operator Name Instrument Login

Analysis
Particle Name Sediment
Particle Refractive Index 1.500
Particle Absorption Index 0.200
Dispersant Name Water
Dispersant Refractive Index 1.330
Scattering Model Mie
Analysis Model General Purpose
Weighted Residual 0.89 %
Laser Obscuration 16.69 %

Measurement Details
Analysis Date Time 21/05/2026 9:05:20 AM
Measurement Date Time 21/05/2026 9:05:20 AM
Result Source Measurement

Result
Span 2.131
Uniformity 0.712
Specific Surface Area 290.3 m²/kg
D [3,2] 7.95 µm
D [4,3] 62.4 µm
Dv (10) 3.14 µm
Dv (50) 61.1 µm
Dv (90) 133 µm
Dv (95) 153 µm
Volume Below (10) µm 24.08 %
Volume Below (20) µm 33.15 %
Volume Below (30) µm 37.22 %



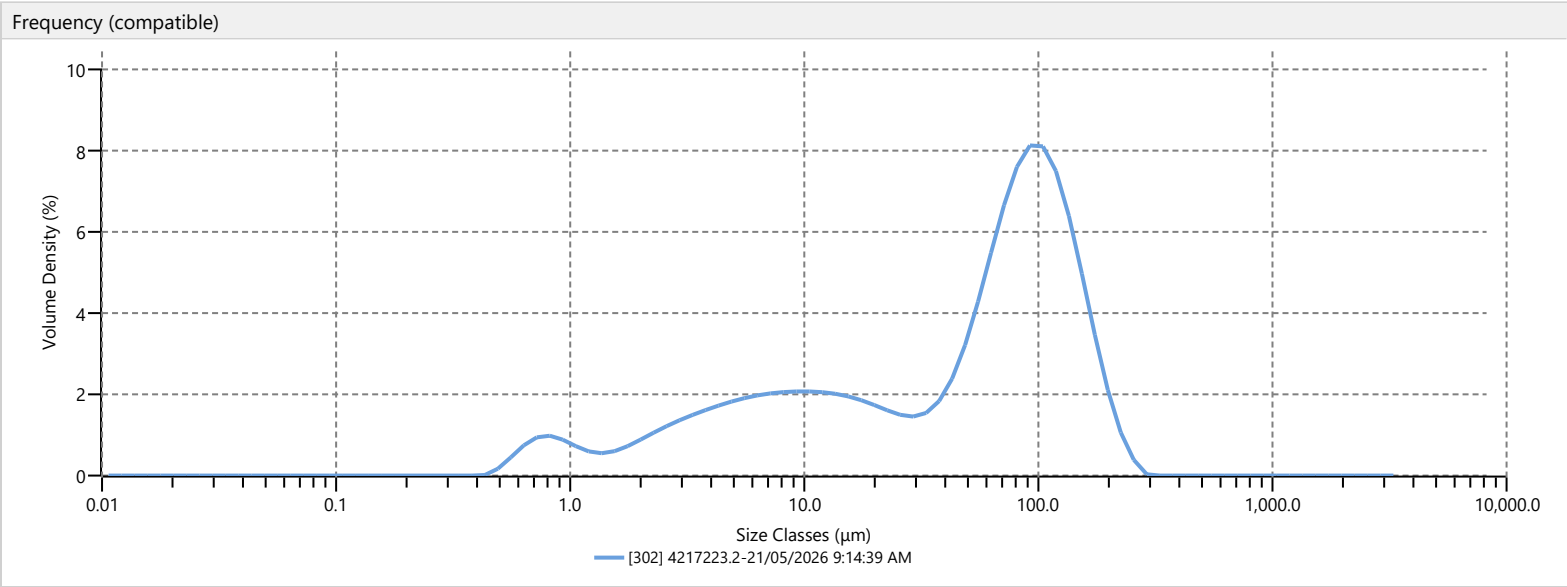
Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	20.72	88.0	67.55	350	100.00	1410	100.00
0.0600	0.00	15.6	30.08	105	77.77	420	100.00	1680	100.00
0.120	0.00	31.0	37.51	125	87.13	500	100.00	2000	100.00
0.240	0.00	37.0	39.26	149	94.21	590	100.00	2380	100.00
0.490	0.07	44.0	41.56	177	98.40	710	100.00	2830	100.00
0.980	3.44	53.0	45.47	210	99.97	840	100.00	3360	100.00
2.00	6.53	63.0	51.15	250	100.00	1000	100.00		
3.90	12.19	74.0	58.23	300	100.00	1190	100.00		



Analysis - Under

University of Waikato

Measurement Details	Measurement Details
Sample Name 4217223.2 SOP File Name Sediment.msop Lab Number 2026175/2 Operator Name Instrument Login	Analysis Date Time 21/05/2026 9:14:39 AM Measurement Date Time 21/05/2026 9:14:39 AM Result Source Measurement
Analysis	Result
Particle Name Sediment Particle Refractive Index 1.500 Particle Absorption Index 0.200 Dispersant Name Water Dispersant Refractive Index 1.330 Scattering Model Mie Analysis Model General Purpose Weighted Residual 0.60 % Laser Obscuration 17.18 %	Span 2.276 Uniformity 0.762 Specific Surface Area 288.9 m²/kg D [3,2] 7.99 µm D [4,3] 66.1 µm Dv (10) 3.15 µm Dv (50) 61.7 µm Dv (90) 144 µm Dv (95) 169 µm Volume Below (10) µm 24.02 % Volume Below (20) µm 32.90 % Volume Below (30) µm 37.01 %



Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	20.66	88.0	65.84	350	100.00	1410	100.00
0.0600	0.00	15.6	29.91	105	75.26	420	100.00	1680	100.00
0.120	0.00	31.0	37.32	125	84.08	500	100.00	2000	100.00
0.240	0.00	37.0	39.17	149	91.21	590	100.00	2380	100.00
0.490	0.07	44.0	41.55	177	96.02	710	100.00	2830	100.00
0.980	3.44	53.0	45.39	210	98.77	840	100.00	3360	100.00
2.00	6.51	63.0	50.74	250	99.80	1000	100.00		
3.90	12.14	74.0	57.29	300	100.00	1190	100.00		

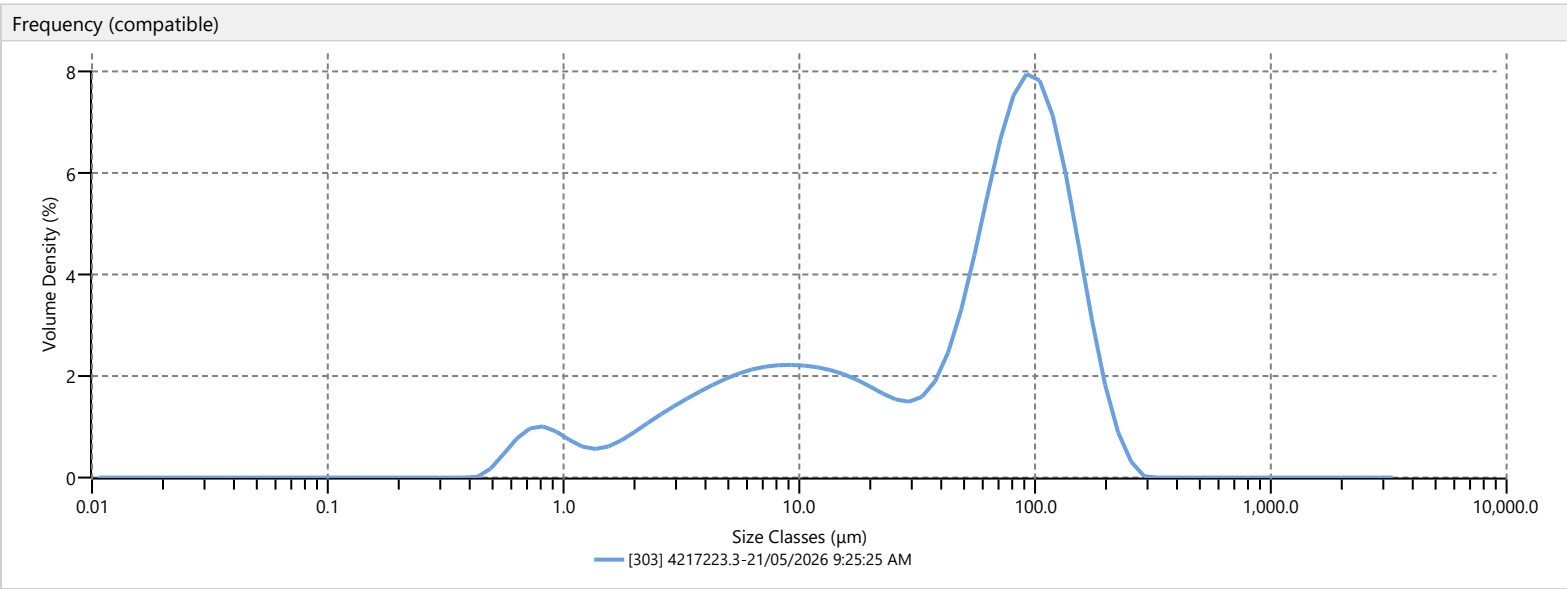
Analysis - Under

Measurement Details
Sample Name 4217223.3
SOP File Name Sediment.msop
Lab Number 2026175/3
Operator Name Instrument Login

Analysis
Particle Name Sediment
Particle Refractive Index 1.500
Particle Absorption Index 0.200
Dispersant Name Water
Dispersant Refractive Index 1.330
Scattering Model Mie
Analysis Model General Purpose
Weighted Residual 0.61 %
Laser Obscuration 20.61 %

Measurement Details
Analysis Date Time 21/05/2026 9:25:25 AM
Measurement Date Time 21/05/2026 9:25:25 AM
Result Source Measurement

Result
Span 2.356
Uniformity 0.795
Specific Surface Area 298.9 m²/kg
D [3,2] 7.72 µm
D [4,3] 63.2 µm
Dv (10) 3.07 µm
Dv (50) 58.0 µm
Dv (90) 140 µm
Dv (95) 164 µm
Volume Below (10) µm 25.23 %
Volume Below (20) µm 34.56 %
Volume Below (30) µm 38.79 %



Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	21.63	88.0	67.93	350	100.00	1410	100.00
0.0600	0.00	15.6	31.45	105	77.10	420	100.00	1680	100.00
0.120	0.00	31.0	39.11	125	85.53	500	100.00	2000	100.00
0.240	0.00	37.0	41.02	149	92.19	590	100.00	2380	100.00
0.490	0.07	44.0	43.48	177	96.55	710	100.00	2830	100.00
0.980	3.54	53.0	47.43	210	98.98	840	100.00	3360	100.00
2.00	6.68	63.0	52.88	250	99.84	1000	100.00		
3.90	12.49	74.0	59.47	300	100.00	1190	100.00		



Hills 2025 F

Instrument Serial No: MAL1148099

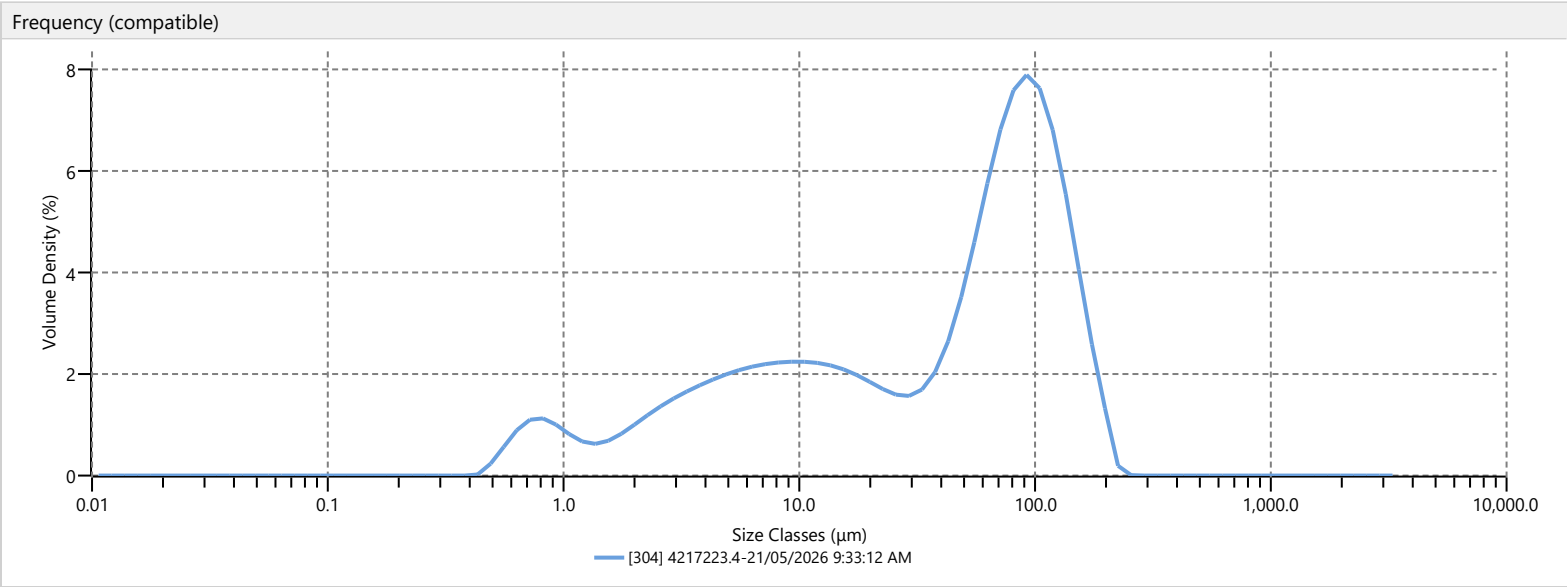
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Record Number: 309

Analysis - Under

University of Waikato

Measurement Details	Measurement Details
Sample Name 4217223.4 SOP File Name Sediment.msop Lab Number 2026175/4 Operator Name Instrument Login	Analysis Date Time 21/05/2026 9:33:12 AM Measurement Date Time 21/05/2026 9:33:12 AM Result Source Measurement
Analysis	Result
Particle Name Sediment Particle Refractive Index 1.500 Particle Absorption Index 0.200 Dispersant Name Water Dispersant Refractive Index 1.330 Scattering Model Mie Analysis Model General Purpose Weighted Residual 0.67 % Laser Obscuration 22.38 %	Span 2.421 Uniformity 0.819 Specific Surface Area 327.9 m²/kg D [3,2] 7.04 μm D [4,3] 58.6 μm Dv (10) 2.72 μm Dv (50) 53.2 μm Dv (90) 131 μm Dv (95) 153 μm Volume Below (10) μm 26.76 % Volume Below (20) μm 36.32 % Volume Below (30) μm 40.69 %

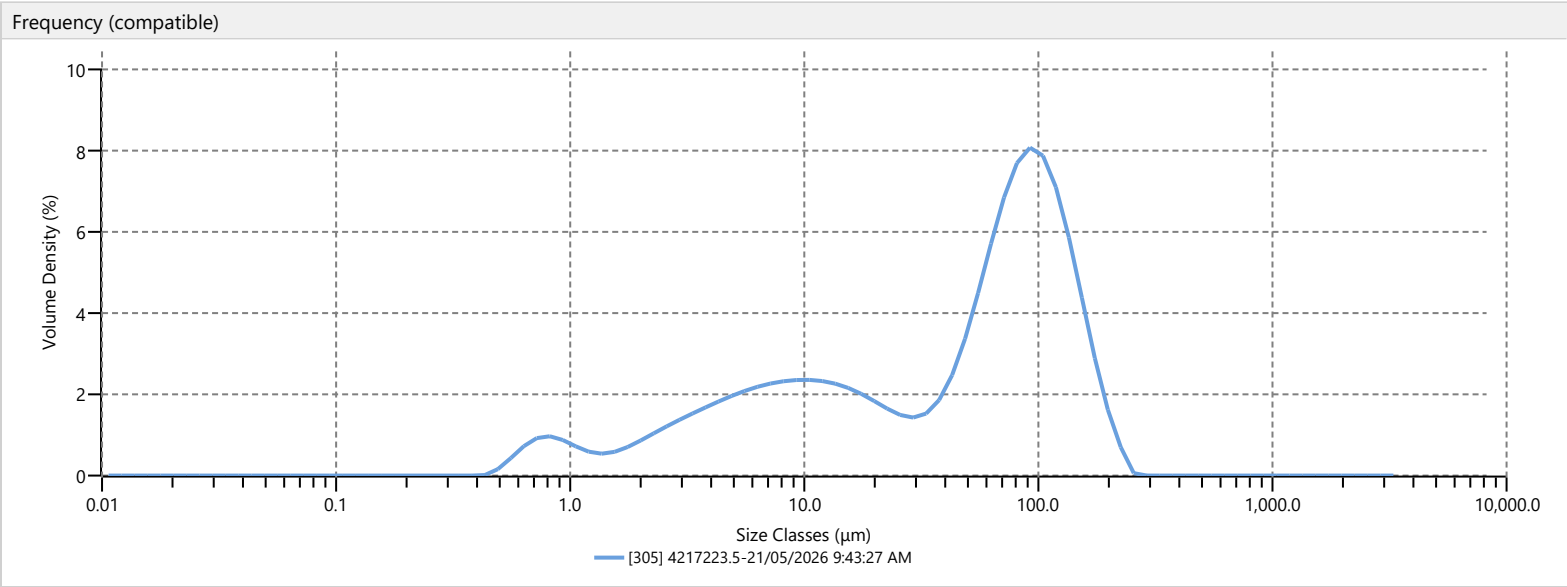


Result									
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0500	0.00	7.80	23.13	88.0	70.91	350	100.00	1410	100.00
0.0600	0.00	15.6	33.12	105	79.95	420	100.00	1680	100.00
0.120	0.00	31.0	41.03	125	88.07	500	100.00	2000	100.00
0.240	0.00	37.0	43.06	149	94.22	590	100.00	2380	100.00
0.490	0.09	44.0	45.71	177	98.00	710	100.00	2830	100.00
0.980	4.06	53.0	49.91	210	99.87	840	100.00	3360	100.00
2.00	7.55	63.0	55.61	250	100.00	1000	100.00		
3.90	13.84	74.0	62.38	300	100.00	1190	100.00		

Analysis - Under

University of Waikato

Measurement Details	Measurement Details
Sample Name 4217223.5 SOP File Name Sediment.msop Lab Number 2026175/5 Operator Name Instrument Login	Analysis Date Time 21/05/2026 9:43:27 AM Measurement Date Time 21/05/2026 9:43:27 AM Result Source Measurement
Analysis	Result
Particle Name Sediment Particle Refractive Index 1.500 Particle Absorption Index 0.200 Dispersant Name Water Dispersant Refractive Index 1.330 Scattering Model Mie Analysis Model General Purpose Weighted Residual 0.63 % Laser Obscuration 16.56 %	Span 2.331 Uniformity 0.786 Specific Surface Area 291.5 m²/kg D [3,2] 7.92 µm D [4,3] 61.7 µm Dv (10) 3.20 µm Dv (50) 57.1 µm Dv (90) 136 µm Dv (95) 159 µm Volume Below (10) µm 25.15 % Volume Below (20) µm 35.04 % Volume Below (30) µm 39.20 %



Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	21.35	88.0	68.83	350	100.00	1410	100.00
0.0600	0.00	15.6	31.80	105	78.11	420	100.00	1680	100.00
0.120	0.00	31.0	39.50	125	86.55	500	100.00	2000	100.00
0.240	0.00	37.0	41.34	149	93.06	590	100.00	2380	100.00
0.490	0.06	44.0	43.78	177	97.20	710	100.00	2830	100.00
0.980	3.36	53.0	47.81	210	99.38	840	100.00	3360	100.00
2.00	6.38	63.0	53.41	250	100.00	1000	100.00		
3.90	12.06	74.0	60.18	300	100.00	1190	100.00		

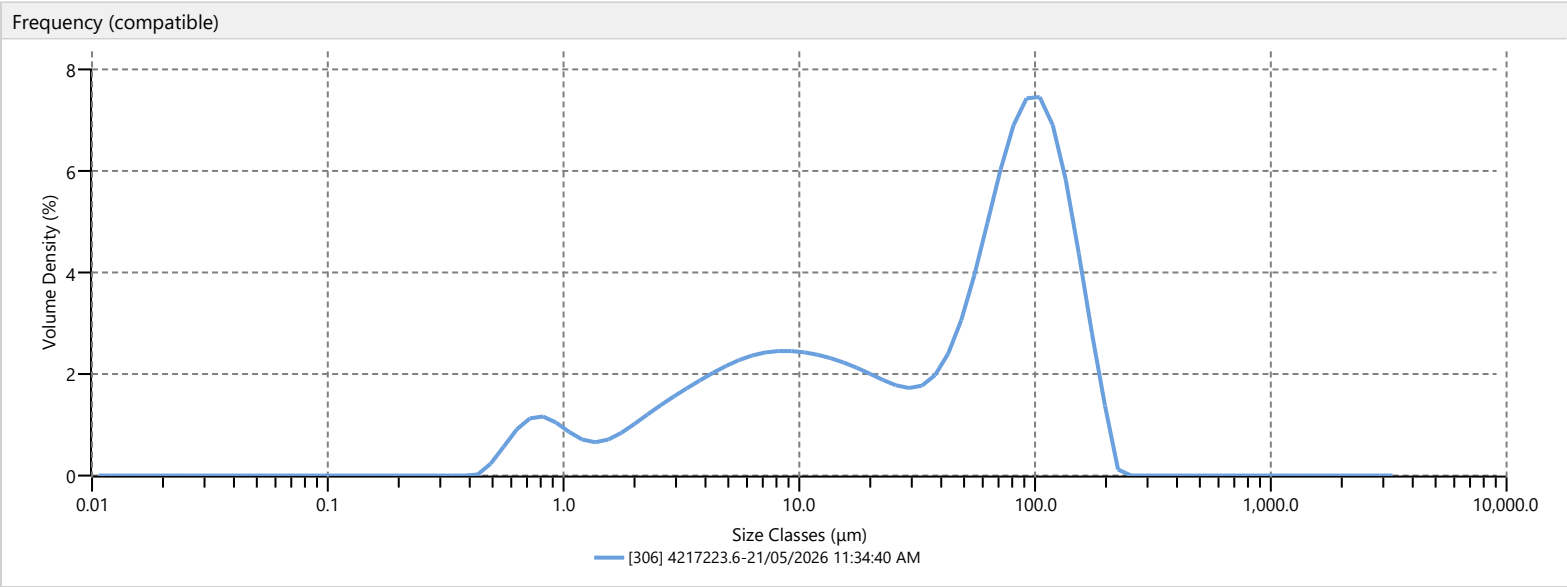
Analysis - Under

Measurement Details
Sample Name 4217223.6
SOP File Name Sediment.msop
Lab Number 2026175/6
Operator Name Instrument Login

Analysis
Particle Name Sediment
Particle Refractive Index 1.500
Particle Absorption Index 0.200
Dispersant Name Water
Dispersant Refractive Index 1.330
Scattering Model Mie
Analysis Model General Purpose
Weighted Residual 1.05 %
Laser Obscuration 25.28 %

Measurement Details
Analysis Date Time 21/05/2026 11:34:40 AM
Measurement Date Time 21/05/2026 11:34:40 AM
Result Source Measurement

Result
Span 2.720
Uniformity 0.929
Specific Surface Area 339.5 m²/kg
D [3,2] 6.80 µm
D [4,3] 57.5 µm
Dv (10) 2.64 µm
Dv (50) 48.1 µm
Dv (90) 133 µm
Dv (95) 155 µm
Volume Below (10) µm 28.36 %
Volume Below (20) µm 38.61 %
Volume Below (30) µm 43.46 %



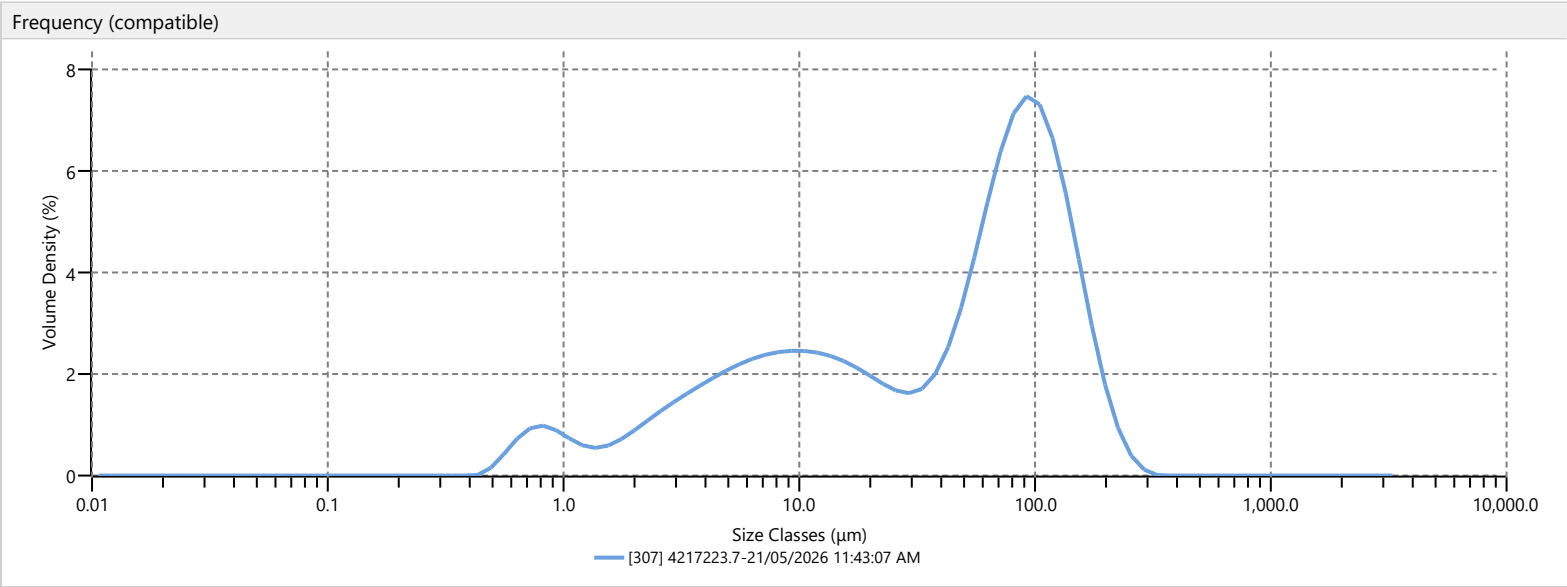
Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	24.38	88.0	70.63	350	100.00	1410	100.00
0.0600	0.00	15.6	35.18	105	79.26	420	100.00	1680	100.00
0.120	0.00	31.0	43.83	125	87.40	500	100.00	2000	100.00
0.240	0.00	37.0	45.92	149	93.87	590	100.00	2380	100.00
0.490	0.09	44.0	48.39	177	97.97	710	100.00	2830	100.00
0.980	4.17	53.0	52.06	210	99.95	840	100.00	3360	100.00
2.00	7.79	63.0	56.96	250	100.00	1000	100.00		
3.90	14.25	74.0	62.88	300	100.00	1190	100.00		



Analysis - Under

University of Waikato

Measurement Details	Measurement Details
Sample Name 4217223.7 SOP File Name Sediment.msop Lab Number 2026175/7 Operator Name Instrument Login	Analysis Date Time 21/05/2026 11:43:07 AM Measurement Date Time 21/05/2026 11:43:07 AM Result Source Measurement
Analysis	Result
Particle Name Sediment Particle Refractive Index 1.500 Particle Absorption Index 0.200 Dispersant Name Water Dispersant Refractive Index 1.330 Scattering Model Mie Analysis Model General Purpose Weighted Residual 0.66 % Laser Obscuration 10.50 %	Span 2.558 Uniformity 0.870 Specific Surface Area 297.9 m²/kg D [3,2] 7.75 µm D [4,3] 61.1 µm Dv (10) 3.13 µm Dv (50) 52.9 µm Dv (90) 139 µm Dv (95) 164 µm Volume Below (10) µm 26.16 % Volume Below (20) µm 36.52 % Volume Below (30) µm 41.13 %

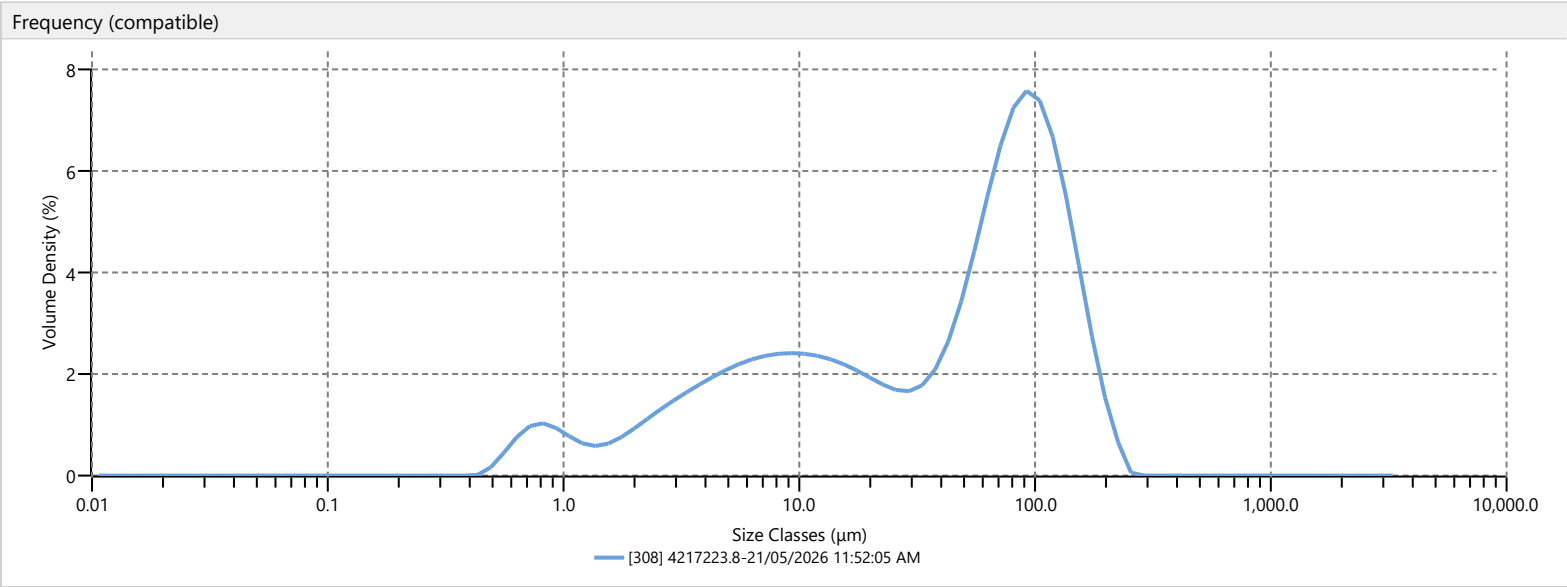


Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	22.19	88.0	69.69	350	100.00	1410	100.00
0.0600	0.00	15.6	33.09	105	78.29	420	100.00	1680	100.00
0.120	0.00	31.0	41.48	125	86.15	500	100.00	2000	100.00
0.240	0.00	37.0	43.52	149	92.34	590	100.00	2380	100.00
0.490	0.06	44.0	46.07	177	96.44	710	100.00	2830	100.00
0.980	3.38	53.0	50.03	210	98.79	840	100.00	3360	100.00
2.00	6.45	63.0	55.35	250	99.70	1000	100.00		
3.90	12.41	74.0	61.67	300	99.98	1190	100.00		

Analysis - Under

University of Waikato

Measurement Details	Measurement Details
Sample Name 4217223.8 SOP File Name Sediment.msop Lab Number 2026175/8 Operator Name Instrument Login	Analysis Date Time 21/05/2026 11:52:05 AM Measurement Date Time 21/05/2026 11:52:05 AM Result Source Measurement
Analysis	Result
Particle Name Sediment Particle Refractive Index 1.500 Particle Absorption Index 0.200 Dispersant Name Water Dispersant Refractive Index 1.330 Scattering Model Mie Analysis Model General Purpose Weighted Residual 0.69 % Laser Obscuration 15.17 %	Span 2.530 Uniformity 0.857 Specific Surface Area 307.7 m²/kg D [3,2] 7.50 µm D [4,3] 59.2 µm Dv (10) 2.99 µm Dv (50) 52.0 µm Dv (90) 134 µm Dv (95) 158 µm Volume Below (10) µm 26.62 % Volume Below (20) µm 36.71 % Volume Below (30) µm 41.33 %



Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	22.71	88.0	70.64	350	100.00	1410	100.00
0.0600	0.00	15.6	33.36	105	79.35	420	100.00	1680	100.00
0.120	0.00	31.0	41.68	125	87.27	500	100.00	2000	100.00
0.240	0.00	37.0	43.80	149	93.42	590	100.00	2380	100.00
0.490	0.06	44.0	46.47	177	97.34	710	100.00	2830	100.00
0.980	3.55	53.0	50.58	210	99.42	840	100.00	3360	100.00
2.00	6.80	63.0	56.04	250	100.00	1000	100.00		
3.90	12.91	74.0	62.49	300	100.00	1190	100.00		



ESNZ - NIWA Water Quality Laboratory

Gate 10 Silverdale Road Hamilton, WKO 3216

Analytical Results Report

Client: Hill Laboratories**Attn:** Heron, Ara (Hill Laboratories)**Address:** 28 Duke Street

Hamilton, WKO 3204

Work Order Number: 2026000197**Project:** Hills Sediment Chlorophylls**Purchase Order:** PO113798/ HLZ 145**Report Date:** 19/06/2026

Field Sample ID	Laboratory Sample ID	Matrix	Collection Date	Receive Date
4217223.1	2026000197-001	Sediment		21/05/2026
4217223.2	2026000197-002	Sediment		21/05/2026
4217223.3	2026000197-003	Sediment		21/05/2026
4217223.4	2026000197-004	Sediment		21/05/2026
4217223.5	2026000197-005	Sediment		21/05/2026
4217223.6	2026000197-006	Sediment		21/05/2026
4217223.7	2026000197-007	Sediment		21/05/2026
4217223.8	2026000197-008	Sediment		21/05/2026
4217223.9	2026000197-009	Sediment		21/05/2026

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Approved
By:

Margaret McMonagle

Sample Number

2026000197-001

Field Sample ID

4217223.1

Work Order Number

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	4.2	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	6.4	ug/g	0.0 ug/g

Sample Number

2026000197-002

Field Sample ID

4217223.2

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	6.0	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	8.7	ug/g	0.0 ug/g

Sample Number

2026000197-003

Field Sample ID

4217223.3

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	3.7	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	4.5	ug/g	0.0 ug/g

Sample Number

2026000197-004

Field Sample ID

4217223.4

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	3.5	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	4.6	ug/g	0.0 ug/g

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Approved
By:



Margaret McMonagle

Sample Number

2026000197-005

Field Sample ID

4217223.5

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	5.6	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	6.7	ug/g	0.0 ug/g

Sample Number

2026000197-006

Field Sample ID

4217223.6

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	6.1	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	7.5	ug/g	0.0 ug/g

Sample Number

2026000197-007

Field Sample ID

4217223.7

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	5.1	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	6.9	ug/g	0.0 ug/g

Sample Number

2026000197-008

Field Sample ID

4217223.8

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	6.3	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	8.5	ug/g	0.0 ug/g

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Approved
By:



Margaret McMonagle

Sample Number
2026000197-009

Field Sample ID
4217223.9

2026000197 (CI 2617)

Parameter	Analytical Method		Result	Units	Detection Limit
Chla	Chlorophyll - Sediments	In-House Sed Chla	4.9	ug/g	0.1 ug/g
Phaeo	Chlorophyll - Sediments	In-House Sed Chla	5.0	ug/g	0.0 ug/g

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Approved
By:


Margaret McMonagle

Certificate of Analysis

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Client:	Tonkin & Taylor	Lab No:	4218847	SPv1
Contact:	Susan Jackson C/- Tonkin & Taylor PO Box 5271 Auckland 1141	Date Received:	20-May-2026	
		Date Reported:	27-May-2026	
		Quote No:	145083	
		Order No:	Melanie Tupe	
		Client Reference:		
		Submitted By:	Melanie Tupe	

Sample Type: Saline

Sample Name:	Discharge 18-May-2026 10:25 am
Lab Number:	4218847.1

Individual Tests

Total Arsenic	g/m ³	< 0.0042
Total Cadmium	g/m ³	< 0.00021
Total Chromium	g/m ³	< 0.0021
Total Copper	g/m ³	< 0.0011
Total Lead	g/m ³	< 0.0011
Total Nickel	g/m ³	< 0.0070
Total Zinc	g/m ³	< 0.0042
Total Nitrogen*	g/m ³	< 0.3
Nitrate-N + Nitrite-N	g/m ³	< 0.010
Total Kjeldahl Nitrogen (TKN)*	g/m ³	< 0.2
Total Phosphorus	g/m ³	0.017
Chlorophyll a	g/m ³	0.0011

Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq*

Acenaphthene*	g/m ³	< 0.0005
Acenaphthylene*	g/m ³	< 0.0005
Anthracene*	g/m ³	< 0.0005
Benzo[a]anthracene*	g/m ³	< 0.0005
Benzo[a]pyrene (BAP)*	g/m ³	< 0.0005
Benzo[b]fluoranthene + Benzo[j]fluoranthene*	g/m ³	< 0.0005
Benzo[g,h,i]perylene*	g/m ³	< 0.0005
Benzo[k]fluoranthene*	g/m ³	< 0.0005
Chrysene*	g/m ³	< 0.0005
Dibenzo[a,h]anthracene*	g/m ³	< 0.0005
Fluoranthene*	g/m ³	< 0.0005
Fluorene*	g/m ³	< 0.0005
Indeno(1,2,3-c,d)pyrene*	g/m ³	< 0.0005
Naphthalene*	g/m ³	< 0.003
Phenanthrene*	g/m ³	< 0.0005
Pyrene*	g/m ³	< 0.0005

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Saline			
Test	Method Description	Default Detection Limit	Sample No
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq*	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m ³	1



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Saline			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved*	Sample filtration through 0.45µm membrane filter.	-	1
Total Digestion of Saline Samples*	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1
Total Arsenic	Nitric acid digestion, ICP-MS, ultratrace. APHA 3125 B : Online Edition.	0.0042 g/m ³	1
Total Cadmium	Nitric acid digestion, ICP-MS, ultratrace level. APHA 3125 B : Online Edition.	0.00021 g/m ³	1
Total Chromium	Nitric acid digestion, ICP-MS, ultratrace. APHA 3125 B : Online Edition.	0.0021 g/m ³	1
Total Copper	Nitric acid digestion, ICP-MS, ultratrace. APHA 3125 B : Online Edition.	0.0011 g/m ³	1
Total Lead	Nitric acid digestion, ICP-MS, ultratrace level. APHA 3125 B : Online Edition.	0.0011 g/m ³	1
Total Nickel	Nitric acid digestion, ICP-MS, ultratrace level. APHA 3125 B : Online Edition.	0.0070 g/m ³	1
Total Zinc	Nitric acid digestion, ICP-MS, ultratrace. APHA 3125 B : Online Edition.	0.0042 g/m ³	1
Total Nitrogen*	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m ³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m ³ , the Default Detection Limit for Total Nitrogen will be 0.11 g/m ³ . In-house calculation.	0.05 g/m ³	1
Nitrate-N + Nitrite-N	Saline sample. Total oxidised nitrogen. Automated cadmium reduction, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.0010 g/m ³	1
Total Kjeldahl Nitrogen (TKN)*	Total Kjeldahl digestion, automated phenol/hypochlorite colorimetry. APHA 4500-N _{org} D (modified): Online Edition.	0.10 g/m ³	1
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Flow Injection Analyser. APHA 4500-P H (modified) : Online Edition.	0.004 g/m ³	1
Chlorophyll a	Acetone extraction. Fluorometer. APHA 10150 C (modified) : Online Edition.	0.0002 g/m ³	1

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 20-May-2026 and 27-May-2026. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Martin Cowell - BSc
Client Services Manager - Environmental

Appendix D Seabirds

Appendix D Table 1: Seabirds breeding in the Hauraki Gulf region, their New Zealand Threat Classification Status (Robertson et al., 2021) and endemism (from Gaskin and Rayner, 2017)

Common name	Species name	NZTCS	Endemism
Northern Blue Penguin	<i>Eudyptula minor iredalei</i>	At Risk - Declining	NZ endemic subspecies
Cook's Petrel	<i>Pterodroma cookii</i>	At Risk - Relict	NZ endemic
Pycroft's Petrel	<i>P. pycrofti</i>	At Risk - Recovering	NZ and regional endemic
Black-winged Petrel	<i>P. nigripennis</i>	Not Threatened	NZ native
Grey-faced Petrel	<i>P. (macroptera) gouldi</i>	Not Threatened	NZ native
Buller's Shearwater	<i>Puinus bulleri</i>	At Risk - Declining	NZ and regional endemic
Flesh-footed Shearwater	<i>P. carneipes</i>	At Risk - Relict	NZ native
Fluttering Shearwater	<i>P. gavia</i>	At Risk - Relict	NZ endemic
Little Shearwater	<i>P. assimilis haurakiensis</i>	At Risk - Recovering	NZ and regional endemic subspecies
Sooty Shearwater	<i>P. griseus</i>	At Risk - Declining	NZ native
Black Petrel	<i>Procellaria parkinsoni</i>	Threatened – Nationally vulnerable	NZ and regional endemic
Fairy Prion	<i>Pachyptila turtur</i>	At Risk - Relict	NZ endemic subspecies
Common Diving Petrel	<i>Pelecanoides urinatrix</i>	At Risk - Relict	NZ and regional endemic subspecies
White-faced Storm Petrel	<i>Pelagodroma marina maoriana</i>	At Risk - Relict	NZ endemic subspecies
New Zealand Storm Petrel	<i>Fregetta maoriana</i>	Threatened – Nationally vulnerable	NZ and regional endemic subspecies
Australasian Gannet	<i>Morus serrator</i>	Not Threatened	NZ native
Pied Shag	<i>Phalacrocorax varius</i>	At Risk - Recovering	NZ endemic subspecies
Little Shag	<i>P. melanoleucos brevirostris</i>	At Risk - Relict	NZ native
Black Shag	<i>P. carbo novaehollandiae</i>	At Risk - Relict	NZ native
Little Black Shag	<i>P. sulcirostris</i>	At Risk – Naturally uncommon	NZ native
Spotted Shag	<i>Stictocarbo punctatus punctatus</i>	Threatened – Nationally vulnerable	NZ endemic
Southern black-backed gull	<i>Larus dominicanus</i>	Not Threatened	NZ native
Red-billed gull	<i>L. scopulinus</i>	At Risk - Declining	NZ endemic
Black-billed gull	<i>L. bulleri</i>	At Risk - Declining	NZ endemic
White-fronted tern	<i>Sterna striata</i>	At Risk - Declining	NZ native

Common name	Species name	NZTCS	Endemism
Caspian tern	<i>Hydroprogne caspia</i>	Threatened – Nationally vulnerable	NZ native
NZ Fairy tern	<i>Sternula nereis davisae</i>	Threatened – Nationally critical	NZ and regional endemic

Appendix D Table 2: Fish likely to be present in Waikopua Creek and within the Whitford embayment based on species annual normal range distributions from the National Aquatic Biodiversity Information System (NABIS) (Data retrieved 13/07/2021)

Common name	Maori name ¹	Scientific name	NZ threat status ²	International threat status (IUCN) ³
Hammerhead shark	Mangoopare	<i>Sphyrna zygaena</i>	Not Threatened	Vulnerable
Yellow Belly Flounder	Patiki-totara	<i>Rhombosolea leporina</i>	-	Unknown
Barracouta	Mangaa, Makaa	<i>Thyrstites atun</i>	-	Unknown
Blue cod	Raawaru, Pakirikiri, Patutuki	<i>Parapercis colias</i>	-	Least Concern
Blue Mackerel	Tawatawa	<i>Scomber australasicus</i>	-	Least concern
Frostfish	Hikau, Paara, Taharangi	<i>Lepidopus caudatus</i>	-	Unknown
Garfish	Ihe, Takeke	<i>Hyporhamphus ihi</i>	-	Unknown
Horse Mackerel	Haature, Hauture	<i>Trachurus novaezelandiae</i>	-	Least Concern
John dory	pukeru	<i>Zeus faber</i>	-	Data deficient
Kingfish	Kuparu	<i>Seriola lalandi</i>	-	Unknown
Koheru	Koheru, Hature	<i>Decapterus koheru</i>	-	Least Concern
Porae	Pōrae	<i>Nemadactylus douglasii</i>	-	Unknown
Red gurnard	Kumu, Kumukumu	<i>Chelidonichthys kumu</i>	-	Unknown
Silver Warehou	-	<i>Seriola punctata</i>	-	Unknown
Spotted stargazer	Kourepoua	<i>Genyagnus monopterygius</i>	-	Least Concern
Sprats	Kuupae	<i>Sprattus muelleri</i>	-	Least Concern
Turbot	Patiki	<i>Colistium nudipinnis</i>	-	Unknown
White pointer shark	Mangō ururoa	<i>Carcharodon carcharias</i>	Threatened– Nationally Endangered	Vulnerable
Yellow-eyed mullet	Aua, Awa, Matakawhiti	<i>Aldrichetta forsteri</i>	-	Least Concern
Thresher shark	Mangō ripi	<i>Alopias vulpinus</i>	Not Threatened	Vulnerable

1 Maori names sourced from <https://www.mpi.govt.nz/dmsdocument/194/direct>

2 NZTCS - <https://www.doc.govt.nz/documents/science-and-technical/nztcs23entire.pdf>

3 Threat Status - IUCN list status of threatened species for sharks, rays and bony fishes (<https://www.iucnredlist.org/>)

Appendix E Marine mammals

Appendix E Table 1: Marine mammals observed in the inner Hauraki Gulf region (Waiheke Island surrounds and Firth of Thames), their New Zealand Threat Classification Status (Robertson et al., 2021), IUCN conservation status and residency status

Common name	Species name	NZTCS	IUCN	Resident in Hauraki Gulf
Arnoux's beaked whale	<i>Berardius arnuxii</i>	Data deficient	Least concern	
Bryde's whale	<i>Balaenoptera edeni brydei</i>	Threatened – Nationally critical	Least concern (<i>Balaenoptera edeni</i>)	Yes
Cuvier's beaked whale (goose-beaked whale)	<i>Ziphius cavirostris</i>	Data deficient	Least concern	
False killer whale	<i>Pseudorca crassidens</i>	At Risk – Naturally uncommon	Near threatened	
Gray's beaked whale	<i>Mesoplodon grayi</i>	Not Threatened	Least concern	
Humpback whale	<i>Megaptera novaeangliae</i>	Non-resident native - Migrant	Least concern	
Long finned pilot whale	<i>Globicephala melas</i>	Not Threatened	Least concern	
Pygmy sperm whale	<i>Kogia breviceps</i>	Data deficient	Least concern	
Southern bottlenose whale	<i>Hyperoodon planifrons</i>	Data deficient	Least concern	
Southern right whale	<i>Eubalaena australis</i>	At Risk - Recovering	Least concern	
Sperm whale	<i>Physeter macrocephalus</i>	Data deficient	Vulnerable	
Leopard seal	<i>Hydrurga leptonyx</i>	At Risk – Naturally uncommon	Least concern	
New Zealand fur seal	<i>Arctocephalus forsteri</i>	Not Threatened	Least concern	Yes
Sub Antarctic fur seal	<i>Arctocephalus gazella</i>	Non-resident native - vagrant	Least concern	
Hector's dolphin	<i>Cephalorhynchus hectori</i>	Threatened – Nationally Vulnerable	Endangered	
Bottlenose dolphin	<i>Tursiops truncatus</i>	Threatened – Nationally Endangered	Least concern	Yes
Common dolphin	<i>Delphinus delphis</i>	Not Threatened	Least concern	Yes
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	Not Threatened	Least concern	
Orca	<i>Orcinus orca</i>	Threatened – Nationally Critical	Data deficient	Yes

Note: Hector's dolphins are identified as being present in the Hauraki Gulf Marine Park based on a small number of confirmed sightings, however their predominant range is located in the South Island, with the sub species *C hectori maui* found only on the North Island west coast.