APPENDIX C

Tonkin and Taylor Sediment Quality Assessment

Job No: 30276.0100
21 December 2021

Whanganui District Council
PO Box 637
Whanganui 4500

Attention: Rosemary Fletcher

Dear Rosemary

Te Puwaha - Sediment Characterisation - Wharf Reconstruction

1 Introduction

Whanganui District Council ("WDC") propose to remove and reinstate "Wharf 2" and "Wharf 3" as part of the Te Puwaha Project (refer to Appendix A)[1]. WDC engaged Tonkin & Taylor Limited ("T+T") to characterise the sediment within the "Priority Dredge Area" located in the sub-tidal zone of the Whanganui River adjacent to the "Wharves 1-3, the Hardstand and Boat Ramp Access" It is noted that the Priority Dredging component of the Te Puwaha Project will be the subject of a separate resource consent application. However, the wharf reconstruction will result in disturbance to the seabed to remove the existing structure and erect the new structure, so this assessment covers the area identified as the Priority Dredging area.

Characterisation of the sediment for heavy metals, mercury, tributyl tin, organochlorine pesticides ("OCP") and polycyclic aromatic hydrocarbons ("PAH") is required. This is because the proposed demolition, pile replacement and rock revetment construction works (hereafter referred to as "the construction works") within the Coastal Marine Area ("CMA") could mobilise and expose contaminants contained within the sediment.

WDC is interested in understanding the levels of the potential contaminants in the sediment for the following reasons:

- To share information with Te Mata Puau.
- To inform an assessment of effects on water quality in the CMA during the construction works.
- To inform the development of any specific mitigation measures required for undertaking the construction works.

This report sets out T+T's advice to WDC and has been prepared under the contract between T+T and WDC dated 19 October 2021.

The results and implications presented in this report are based on a western science construct. We understand Te Mata Puau are providing advice to WDC relating to the construction works in a maatauranga maaori construct.

[1] WDC Figure *Te Puwaha – Port Project- Dredging Option v6*annexed as Appendix A.

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2 Summary of findings

Laboratory testing has confirmed that heavy metals, mercury, tributyl tin, OCP and PAH in the sediment are present at low concentrations, below guidelines for the protection of the environment in all 9 samples tested. Consequently, if the construction works do mobilise and expose contaminants contained within the sediment, then under ANZG 2018[2] and the Guidelines for Dredging[3]:

1 There are unlikely to be any unacceptable effects on water quality and marine organisms.

2 No specific mitigation is required, in so far as sediment contamination matters are concerned.

Further detail is provided in the balance of this report below.

3 Sampling methods and sampling programme

WDC supplied T+T with the target dredge depth of -4.5 m Chart Datum ("CD") for Wharves 1 and 2 and -2.5 m CD for Wharves 3, the Hardstand and Boat Ramp Access Areas.

Discovery Marine Limited ("DML") undertook a bathymetric survey of the Te Puwaha Project area in August 2021. DML provided a schedule of estimated quantities of sediment (as solid cut volumes) proposed for dredging, based on the target dredge depths referred to above, to WDC in August 2021.

T+T used the information provided by WDC and DML and referred to above to develop a sampling method and programme in general accordance with the recommended approach for sampling as set out in Appendix D of the Guidelines for Dredging. Specifically, we have assumed:

1 "Maintenance4" dredging will be undertaken.

2 The project is a "small sized project" (approximately 39,000 m³ of material will be disturbed measured as a solid cut volume).

3 The disturbance site is "potentially contaminated".

T+T proposed that seven (7) sediment cores of variable length were to be retrieved from the locations shown on Figure 3.1.

Commercial Dive Services NZ Limited ("CDSNZ") used an SDI "Vibecore Mini" Vibracorer to collect seven (7) sediment cores from the Priority Dredge Area on 4 November 2021 and 23 November 2021.

[2] ANZG 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
[3] *National Assessment Guidelines for Dredging*, Commonwealth of Australia, Canberra, 2009
[4] Defined in the Guidelines for Dredging as "Dredging to ensure that channels, berths or other port areas are maintained at their designed dimensions".

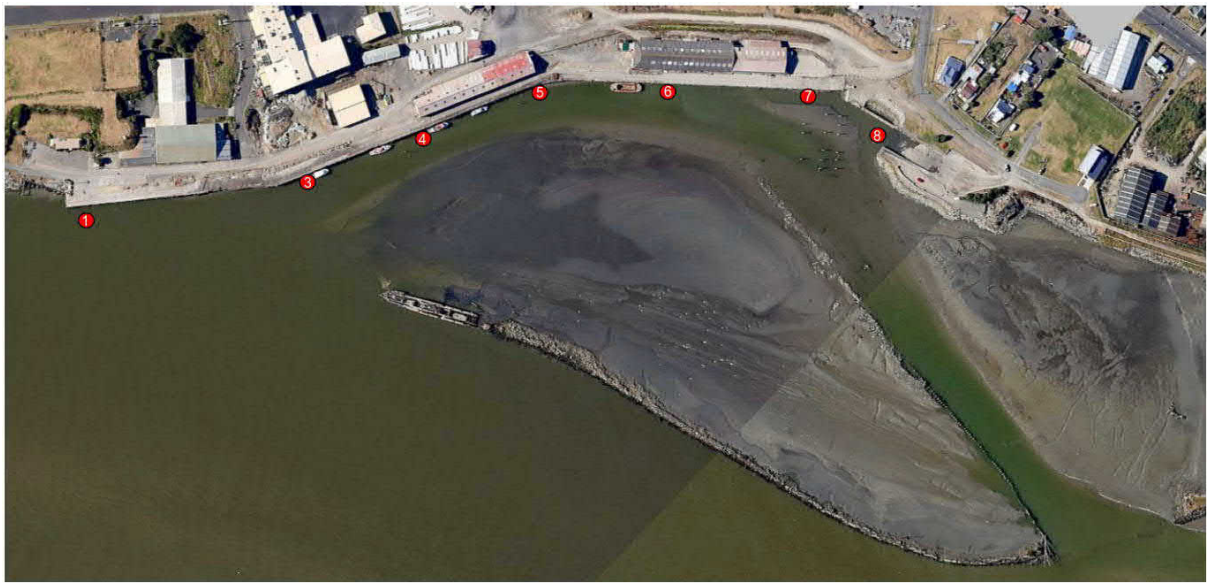

Figure 3.1: Sediment core locations

4 Analysis of samples

The samples were sent to an International Accreditation New Zealand Laboratory (Hill Laboratories Ltd, Hamilton) for analysis for a suite of metals, mercury, tributyl tin, OCP, PAH and total organic carbon.

Surficial samples were analysed as discrete samples. All other samples were composited (by depth in m CD) by Hill Laboratories and then analysed. Table 5.2 sets out which samples were analysed as single samples and which samples were composited prior to analysis.

5 Results

Relevant details pertaining to the individual sediment samples extracted from the sediment cores are presented in Table 5.1.

Table 5.1: Sediment sample details

Vibracore location number	Coordinates (Lat-Long)	Depth of seabed (m CD)	Dredge depth (m CD)	Sample ID	Sample depth from seabed (m)	Sample depth (m CD)
1	39° 56.720' S 174° 59.391'E	-4.2	-4.5	VC01-0.1	0.1	-4.3
3	39° 56.700' S 174° 59.550' E	-0.5	-2.5	VC03-0.1	0.1	-0.6
				VC03-1.0	1	-1.5
4	39° 56.690' S 174° 59.550' E	-0.3	-2.5	VC04-0.1	0.1	-0.4
				VC04-1.0	1	-1.3

5	39° 56.680' S 174° 59.610' E	0.2	-2.5	VC05-0.1	0.1	0.1
				VC05-1.0	1	-0.8
6	39° 56.676' S 174° 59.701' E	-0.7	-2.5	VC06-0.1	0.1	-0.8
7	39° 56.600' S 174° 59.750' E	0	-2.5	VC07-0.1	0.1	-0.1
				VC07-1.0	1	-1.0
8	39° 56.695' S 174° 59.799' E	0	-2.5	VC08-0.1	0.1	-0.1

The analytical results are tabulated in Table 5.2 in comparison to relevant environmental (ANZG 2018)[2] and dredging[3] guidelines. Only those OCPs that are listed as being substantially used in New Zealand in the past (MFE, 1998)[5], and for which relevant guidelines are available, are included in Table 5.2.

Overall, all analytes tested for were found to be in low concentrations and below guidelines for the protection of the environment in all 9 sediment samples tested. The laboratory transcripts are attached at Appendix B.

[5] *Reporting on Persistent Organochlorines in New Zealand*, Ministry for the Environment, 1998.

Table 5.2: Te Puwaha sediment sampling results – Priority dredge area

Core location, Sample No and depth	Total Organic Carbon (g/100g)	Tributyl Tin	Chromium	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	Mercury	Total PAH	Total DDT (2,4 DDT + 4,4 DDT)	Total DDD (2,4 DDD +4,4 DDD)	Total DDE (2,4 DDE + 4,4 DDE)	Dieldrin	Lindane	Endrin	Chlordane
VC01-0.1 ("BH1 4m" on lab transcript) (-4.3 m CD)	0.99	<0.004	15	<4	<0.2	9	7.4	12	45	<0.2	<0.4	<0.0008	<0.0008	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004
VC06-0.1 ("BH 6 surface" on laboratory transcript) (-0.8 m CD)	2	<0.002	16	6	<0.10	12	12.4	14	54	<0.1	<0.2	<0.0004	<0.0004	<0.0004	<0.0002	<0.0002	<0.0002	<0.0002
VC8-01 ("BH 8 surface" on laboratory transcript) (-0.1 m CD)	1.2	<0.003	13	4	<0.10	8	8.3	12	51	<0.1	<0.33	<0.0007	<0.0007	<0.0007	<0.0003	<0.0003	<0.0003	<0.0003
VC03-0.1 (-0.6 m CD)	1.79	<0.002	16	6	<0.10	11	9.5	14	54	<0.1	<0.2	<0.0004	<0.0004	<0.0004	<0.0002	<0.0002	<0.0002	<0.0002
VC04-0.1 (-0.4 m CD)	0.81	<0.005	15	4	<0.10	9	8.9	13	47	<0.1	<0.5	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
VC05-0.1 (0.1 m CD)	1.28	<0.003	17	5	<0.10	10	9.5	14	54	<0.1	<0.3	<0.0007	<0.0007	<0.0006	<0.0003	<0.0003	<0.0003	<0.0003
VC07-0.1 (-0.1 m CD)	0.67	<0.006	13	3	<0.10	8	13	10	58	<0.1	<0.6	<0.0012	<0.0012	<0.0012	<0.0006	<0.0006	<0.0006	<0.0006
Composite of VC03-1.0, VC04-1.0 (-1.5 m and -1.3 m CD)	1.63	<0.0002	29	13	<0.10	16	11	19	71	<0.1	<0.2	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Composite of VC05-1.0 and VC07-1.0 (-0.8 m and -1 m CD)	1.39	<0.003	18	6	<0.10	12	12.4	15	61	<0.1	<0.3	<0.0006	<0.0006	<0.0006	<0.0003	<0.0003	<0.0003	<0.0003
Australian 2009 Guidelines for Dredging Screening Level (ISQG Trigger Value)		0.009	80	20	1.5	65	50	21	200	0.15	10	0.0016	0.002	0.0022	0.28	0.00032	0.010	0.0005
ANZG 2018 toxicant default guideline values (DGV and GV-High)[6]	-	0.009 0.070	80 370	20 70	1.5 10	65 270	50 220	21 52	200 410	0.15 1.0	10 50	0.0012 0.005	0.0035 0.009	0.0014 0.007	0.0028 0.009	0.0009 0.0014	0.0027 0.060	0.0045 0.009

Notes to table:

1. Except where shown results are in mg/kg.
2. Heavy metals, mercury and PAH were analysed to screen levels. TBT was analysed to trace levels. OCP were analysed to ultra-trace levels.
3. OCP, PAH and TBT results have been normalised for 1% total organic carbon. Where concentrations of analytes are below the laboratory limit of reporting (LoR), the LoR has been assumed for normalisation.
4. Where guideline values have been shaded yellow this denotes that the normalised LoR for that analyte is above the guideline value for that analyte and it is therefore not possible to assess whether the analyte is above or below the guideline value.
5. Where guideline values have been shaded green this denotes that the analyte measured is below the guideline value for that analyte in all samples tested.
6. Guideline values for 4,4 DDD and 4,4 DDE adopted as a conservative screen for total DDD and DDE.

6 Implications

In sample VC01-0.1 the measured mercury level was not able to be compared to guideline values. This is because the laboratory detection level for that sample (<0.2 mg/kg) was slightly above the guideline values (0.15 mg/kg). However, based on the measured levels of mercury in all other 8 samples (<0.1 mg/kg) it is considered unlikely that mercury is present at concentrations above the guideline values in Sample VC01-0.1.

The laboratory detection level for lindane and chlordane is slightly higher than the Guidelines for Dredging for those analytes. The laboratory cannot test any lower than to ultra-trace levels for OCP in soils. Therefore, the concentrations of lindane and chlordane contained in the samples were not able to be compared against the Guidelines for Dredging, but could be compared to the ANZG 2018 DGV. The measured levels of lindane and chlordane in all samples were below the ANZG 2018 DGV. On this basis, lindane and chlordane are not considered to be present at concentrations that present a risk to the environment

Laboratory testing has confirmed that heavy metals, mercury, tributyl tin, OCP and PAH in the sediment are present at low concentrations, below guidelines for the protection of the environment in all 9 samples tested. Consequently, if the construction works do mobilise and expose contaminants contained within the sediment, then under ANZG 2018 and the Guidelines for Dredging:

1 There is unlikely to be any unacceptable effects on water quality and marine organisms.

2 No specific mitigation is required, in so far as sediment contamination matters are concerned.

7 Applicability

The nature and continuity of the sediment away from the sample locations is inferred but it must be appreciated that actual conditions may vary from the assumed model.

This report has been prepared for the exclusive use of our client Whanganui District Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client may submit this report as part of an application for resource consent and that Horizons Regional Council as the consenting authority may use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

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Reuben Hansen
Principal Environmental Consultant

Authorised for Tonkin & Taylor Ltd by:

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Grant Pearce
Project Director

Technical review by Shane Moore – Principal Environmental Scientist

21-Dec-21
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Appendix A: WDC figure

Area	Depth CD	Area
Wharf 1	-4.5m	4635m²
Wharf 2	-4.5m	5314m²
Hardstand	-2.5m	1591m²
Wharf 3	-2.5m	3811m²
Boat Ramp	-2.5m	1337m²

Legend

- Priority Dredged Area
- Complimentary Dredging Area
- Proposed Recreational Dredged Area

WHANGANUI DISTRICT COUNCIL
Te Kaunihera a Rohe o Whanganui

TE PŪWAHA

Client:
Whanganui District Council

Location:
Whanganui Port

Project:
Te Puwaha – Port Project

Title:
Dredging Option v6

Drawing:
WM_WDC_Estimated_Sediment_Removal

Revision:
22

Scale:
1:6,000 @ A3

Date:
17 December 2021

Revisions:

ID		
12.	29/05/20	2020 Aerial
13.	15/07/20	Hardstand Layout
14.	15/07/20	Dredging Option v1 2020
15.	13/10/20	Floating pavilion
16.	13/10/20	Services
17.	26/06/21	Services Updated
18.	09/07/21	Dredging Updated
19.	10/08/21	Discharge Areas
20.	23/09/21	Change 2 & 4
21.	12/10/21	Estimated Sediment Removal
22.	13/12/21	Remove Disposal Locations

Notes:
1. All dimensions are in metres, unless otherwise stated

1:6,000 @ A3

0 60 120 240 Meters

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Appendix B: Hill Laboratory transcripts

Hill Laboratories
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Hamilton 3240 New Zealand

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W www.hill-laboratories.com

Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2758114 SPv4
Contact:	Hayley Jones C/- Tonkin & Taylor PO Box 317 Tauranga 3140	**Date Received:**	05-Nov-2021
		Date Reported:	09-Dec-2021 **(Amended)**
		Quote No:	113730
		Order No:	Whanganui Dredging
		Client Reference:	Whanganui Dredging
		Submitted By:	Hayley Jones

Sample Type: Sediment

Sample Name:		BH1 4m 04-Nov-2021	BH6 Surface 04-Nov-2021	BH8 Surface 04-Nov-2021		
Lab Number:		2758114.1	2758114.2	2758114.3		
Individual Tests						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	-	-
Dry Matter	g/100g as rcvd	63	63	68	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.2	< 0.10	< 0.10	-	-
Total Organic Carbon*	g/100g dry wt	0.99	2.0	1.20	-	-
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 4	6	4	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.2	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	15	16	13	-	-
Total Recoverable Copper	mg/kg dry wt	9	12	8	-	-
Total Recoverable Lead	mg/kg dry wt	7.4	12.4	8.3	-	-
Total Recoverable Nickel	mg/kg dry wt	12	14	12	-	-
Total Recoverable Zinc	mg/kg dry wt	45	54	51	-	-
Organochlorine Pesticides UltraTrace in Soil						
Aldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
alpha-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
beta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
delta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
cis-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
trans-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
2,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
2,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
2,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Dieldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan I	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan II	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endrin aldehyde	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Heptachlor	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-

Sample Type: Sediment						
Sample Name:		BH1 4m 04-Nov-2021	BH6 Surface 04-Nov-2021	BH8 Surface 04-Nov-2021		
Lab Number:		2758114.1	2758114.2	2758114.3		
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Acenaphthene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Anthracene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Chrysene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Fluoranthene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Fluorene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.08	< 0.08	-	-
Perylene	mg/kg dry wt	0.047	0.050	0.037	-	-
Phenanthrene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Pyrene	mg/kg dry wt	< 0.016	< 0.016	< 0.015	-	-
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	-	-
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	-	-
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	-	-
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2758114-SPv3' issued on 07-Dec-2021 at 1:40 pm.
Reason for amendment: Mercury and Total PAH added.

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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sediment			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-3
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%.	-	1-3
Soil Prep Dry for Organics,Trace*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-3
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-3
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg dry wt	1-3
Organochlorine Pesticides UltraTrace in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.0002 mg/kg dry wt	1-3
Polycyclic Aromatic Hydrocarbons Screening in Solids*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	1-3

Sample Type: Sediment			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Tributyl Tin Trace in Soil samples by GCMS	Solvent extraction, derivitisation, GC-MS analysis. Tested on dried sample. In-house.	0.003 - 0.007 mg/kg dry wt	1-3
Dry Matter (Env)	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	1-3
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-3
Total Recoverable Mercury	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.10 mg/kg dry wt	1-3
Total Organic Carbon*	Acid pretreatment to remove carbonates present followed by Catalytic Combustion (900°C, O2), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1-3

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

Testing was completed between 09-Nov-2021 and 09-Dec-2021. 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.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2778197 SPv2
Contact:	Hayley Jones C/- Tonkin & Taylor PO Box 317 Tauranga 3140	**Date Received:**	25-Nov-2021
		Date Reported:	09-Dec-2021 **(Amended)**
		Quote No:	114972
		Order No:	Whanganui Dredging Stage 2
		Client Reference:	Whanganui Dredging Stage 2
		Submitted By:	Enzo Liddle

Sample Type: Sediment

Sample Name:		HA19 0.0 22-Nov-2021	HA21 0.0 23-Nov-2021	HA21 1.5 23-Nov-2021	HA11 0.1 23-Nov-2021	HA15 0.1 23-Nov-2021
Lab Number:		2778197.1	2778197.4	2778197.5	2778197.7	2778197.9
Individual Tests						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Dry Matter	g/100g as rcvd	66	70	67	74	71
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Organic Carbon*	g/100g dry wt	0.81	0.37	0.86	0.10	0.13
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	2	2	4	2	2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	11	14	8	8
Total Recoverable Copper	mg/kg dry wt	6	5	9	3	3
Total Recoverable Lead	mg/kg dry wt	6.2	4.9	8.3	3.3	3.4
Total Recoverable Nickel	mg/kg dry wt	11	10	13	7	7
Total Recoverable Zinc	mg/kg dry wt	38	33	46	25	26
Organochlorine Pesticides UltraTrace in Soil						
Aldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
alpha-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
beta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
delta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
cis-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
trans-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Dieldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan I	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan II	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan sulphate	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin aldehyde	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor epoxide	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Hexachlorobenzene	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004

Sample Type: Sediment						
Sample Name:		HA19 0.0 22-Nov-2021	HA21 0.0 23-Nov-2021	HA21 1.5 23-Nov-2021	HA11 0.1 23-Nov-2021	HA15 0.1 23-Nov-2021
Lab Number:		2778197.1	2778197.4	2778197.5	2778197.7	2778197.9
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Acenaphthene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Anthracene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.03	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[e]pyrene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.03	< 0.014	< 0.015	< 0.014	< 0.014
Chrysene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Fluoranthene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Fluorene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	< 0.08	< 0.07	< 0.07
Perylene	mg/kg dry wt	0.134	< 0.014	0.029	< 0.014	< 0.014
Phenanthrene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Pyrene	mg/kg dry wt	< 0.015	< 0.014	< 0.015	< 0.014	< 0.014
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003

Sample Name:		HA12 0.0 23-Nov-2021	HA16 0.0 23-Nov-2021	HA18 0.0 23-Nov-2021	VC03 0.1 23-Nov-2021	VC04 0.1 23-Nov-2021
Lab Number:		2778197.11	2778197.13	2778197.15	2778197.19	2778197.21
Individual Tests						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Dry Matter	g/100g as rcvd	72	72	68	67	62
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Organic Carbon*	g/100g dry wt	0.07	0.13	0.23	1.79	0.81
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	2	2	6	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	9	9	10	16	15
Total Recoverable Copper	mg/kg dry wt	3	3	4	11	9
Total Recoverable Lead	mg/kg dry wt	3.2	3.9	4.7	9.5	8.9
Total Recoverable Nickel	mg/kg dry wt	7	8	10	14	13
Total Recoverable Zinc	mg/kg dry wt	27	30	33	54	47
Organochlorine Pesticides UltraTrace in Soil						
Aldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
alpha-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
beta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
delta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
cis-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
trans-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004

Sample Type: Sediment						
Sample Name:		HA12 0.0 23-Nov-2021	HA16 0.0 23-Nov-2021	HA18 0.0 23-Nov-2021	VC03 0.1 23-Nov-2021	VC04 0.1 23-Nov-2021
Lab Number:		2778197.11	2778197.13	2778197.15	2778197.19	2778197.21
Organochlorine Pesticides UltraTrace in Soil						
4,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDT	mg/kg dry wt	0.0004	< 0.0004	< 0.0004	0.0004	< 0.0004
Dieldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan I	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan II	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan sulphate	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin aldehyde	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor epoxide	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Hexachlorobenzene	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Acenaphthene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Chrysene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Fluoranthene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Fluorene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	< 0.08	< 0.08	< 0.08
Perylene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	0.025	< 0.016
Phenanthrene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Pyrene	mg/kg dry wt	< 0.014	< 0.014	< 0.015	< 0.015	< 0.016
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003

Sample Name:		VC05 0.1 23-Nov-2021	VC07 0.1 23-Nov-2021	VC22 0.1 23-Nov-2021	Composite of HA19 1.5 and HA12 0.8	Composite of HA19 2.9 and HA21 2.9
Lab Number:		2778197.23	2778197.25	2778197.27	2778197.29	2778197.30
Individual Tests						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Dry Matter	g/100g as rcvd	63	69	61	77	76
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Organic Carbon*	g/100g dry wt	1.28	0.67	1.39	0.87	0.82

Sample Type: Sediment						
Sample Name:		VC05 0.1 23-Nov-2021	VC07 0.1 23-Nov-2021	VC22 0.1 23-Nov-2021	Composite of HA19 1.5 and HA12 0.8	Composite of HA19 2.9 and HA21 2.9
Lab Number:		2778197.23	2778197.25	2778197.27	2778197.29	2778197.30
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	5	3	5	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	17	13	16	12	12
Total Recoverable Copper	mg/kg dry wt	10	8	10	5	7
Total Recoverable Lead	mg/kg dry wt	9.5	13.0	10.3	5.3	6.2
Total Recoverable Nickel	mg/kg dry wt	14	10	15	10	10
Total Recoverable Zinc	mg/kg dry wt	54	58	54	35	38
Organochlorine Pesticides UltraTrace in Soil						
Aldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
alpha-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
beta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
delta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
cis-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
trans-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDD	mg/kg dry wt	0.0005	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
2,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
4,4'-DDT	mg/kg dry wt	0.0005	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Dieldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan I	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan II	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endosulfan sulphate	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Endrin aldehyde	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Heptachlor epoxide	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Hexachlorobenzene	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Acenaphthene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Anthracene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.016	0.016	< 0.016	< 0.013	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.016	0.021	< 0.03	< 0.02	< 0.019
Benzo[e]pyrene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.016	< 0.015	< 0.03	< 0.02	< 0.019
Chrysene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Fluoranthene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	0.013
Fluorene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013
Naphthalene	mg/kg dry wt	< 0.08	< 0.08	< 0.08	< 0.07	< 0.07
Perylene	mg/kg dry wt	0.050	0.016	0.036	0.037	0.086
Phenanthrene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	< 0.013

Sample Type: Sediment						
Sample Name:		VC05 0.1 23-Nov-2021	VC07 0.1 23-Nov-2021	VC22 0.1 23-Nov-2021	Composite of HA19 1.5 and HA12 0.8	Composite of HA19 2.9 and HA21 2.9
Lab Number:		2778197.23	2778197.25	2778197.27	2778197.29	2778197.30
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
Pyrene	mg/kg dry wt	< 0.016	< 0.015	< 0.016	< 0.013	0.013
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003

Sample Name:		Composite of HA11 0.9, HA15 0.7, HA16 1.0 and HA18 1.0	Composite of VC03 1.0, VC04 1.0 and VC22 0.7	Composite of VC05 1.0 and VC07 1.0		
Lab Number:		2778197.31	2778197.32	2778197.33		
Individual Tests						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	-	-
Dry Matter	g/100g as rcvd	82	70	66	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Organic Carbon*	g/100g dry wt	0.34	1.63	1.39	-	-
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	3	13	6	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	11	29	18	-	-
Total Recoverable Copper	mg/kg dry wt	5	16	12	-	-
Total Recoverable Lead	mg/kg dry wt	5.3	11.0	12.4	-	-
Total Recoverable Nickel	mg/kg dry wt	9	19	15	-	-
Total Recoverable Zinc	mg/kg dry wt	33	71	61	-	-
Organochlorine Pesticides UltraTrace in Soil						
Aldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
alpha-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
beta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
delta-BHC	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
cis-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
trans-Chlordane	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
2,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDD	mg/kg dry wt	< 0.0004	< 0.0004	0.0004	-	-
2,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDE	mg/kg dry wt	< 0.0004	< 0.0004	0.0005	-	-
2,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
4,4'-DDT	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Dieldrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan I	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan II	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endrin	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Endrin aldehyde	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Heptachlor	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.0004	< 0.0004	< 0.0004	-	-
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Acenaphthene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Anthracene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-

Sample Type: Sediment						
Sample Name:		Composite of HA11 0.9, HA15 0.7, HA16 1.0 and HA18 1.0	Composite of VC03 1.0, VC04 1.0 and VC22 0.7	Composite of VC05 1.0 and VC07 1.0		
Lab Number:		2778197.31	2778197.32	2778197.33		
Polycyclic Aromatic Hydrocarbons Screening in Solids*						
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.019	< 0.03	< 0.03	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.019	< 0.03	< 0.03	-	-
Chrysene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Fluoranthene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Fluorene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Naphthalene	mg/kg dry wt	< 0.07	< 0.08	< 0.08	-	-
Perylene	mg/kg dry wt	< 0.013	0.033	0.048	-	-
Phenanthrene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Pyrene	mg/kg dry wt	< 0.013	< 0.015	< 0.015	-	-
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	-	-
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	-	-
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	-	-
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2778197-SPv1' issued on 06-Dec-2021 at 5:38 pm.
Reason for amendment: Mercury and Total PAH added.

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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sediment			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
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%.	-	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Soil Prep Dry for Organics,Trace*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Heavy metals screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33

Sample Type: Sediment			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Organochlorine Pesticides UltraTrace in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.0002 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Polycyclic Aromatic Hydrocarbons Screening in Solids*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Tributyl Tin Trace in Soil samples by GCMS	Solvent extraction, derivitisation, GC-MS analysis. Tested on dried sample. In-house.	0.003 - 0.007 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Dry Matter (Env)	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, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Total Recoverable Mercury	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.10 mg/kg dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33
Total Organic Carbon*	Acid pretreatment to remove carbonates present followed by Catalytic Combustion (900°C, O2), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1, 4-5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 29-33

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

Testing was completed between 01-Dec-2021 and 09-Dec-2021. 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.

Kim Harrison MSc
Client Services Manager - Environmental