
# Ecological Survey: Doug's Opua Boatyard

For Doug Schmuck

Ecological report

April 2018

## REPORT INFORMATION AND QUALITY CONTROL

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| **Prepared for:** | Mr Doug Schmuck<br>Doug's Opua Boatyard |

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| **Author:** | Stephen Brown<br>Principal Marine Ecologist |  |
| **Reviewer:** | Mark Poynter<br>Principal Marine Ecologist/Manager |  |
| **Approved for Release:** | Michael Lindgreen<br>Director |  |

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|---|---|
| **Document Name** | AA3213_D Schmuck_Ecol Information_v2.0 |

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| **Version History:** | V0.2 | 22 March 2018 |
| | V1.0 | 03 April 2018 |
| | V2.0 | 05 April 2018 |
| | V2.1 (final) | 06 April 2018 |

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# 1 INTRODUCTION

Doug's Opua Boatyard Ltd (DOB) has been successfully operating in compliance with existing consent conditions for many years. DOB is seeking early renewal for consents for existing structures and new consents for associated activities including demolition and reconstruction of the jetty, two mudcrete grids, refurbishment of the slipway, and the use of two jetty facility berths as a marina, a new 40m length of seawall, and disturbance of the foreshore during demolition and construction activities and beach rehabilitation. New capital and maintenance dredging is proposed to form five all-tide berths and an approach channel to the jetty and slipway. DOB has also stated an intention to undertake measures to improve environmental quality around the facility such as conducting regular beach clean-up activities and construction of a retaining wall adjacent to the facility in an area where recent slips have compromised the public Paihia-Opua coastal walkway.

4Sight Consulting Ltd. (4Sight) has been engaged to provide information to assist in clarifying the density and size distribution of the shellfish population on the beach adjacent to the facility, and to determine contaminant levels in sediments. The purpose of this information is to assist DOB in their endeavours to encourage improved environmental quality around the facility, and to address matters raised in a submission made by the Northland District Health Board, to the notified consent application. Those matters related to potential public consumption of shellfish harvested near the boatyard, and the potential for resuspension and redistribution during the dredging and construction activities of contaminants associated with the sediment.

It is noted that 4Sight was not involved with the preparation of the consent application documents or the supporting assessment of environmental effects. 4Sight's brief with DOB was established following close of the public submission period to the notified application.

# 2 SURVEY OBJECTIVES

## 2.1 General description of the environment

A general description of the boatyard location and immediate vicinity provides context for the surveys.

## 2.2 Shellfish population

A survey was conducted to characterise the populations of edible shellfish on the beach area adjacent to the boatyard operation in terms of population density and size frequency, and to establish whether there was a harvestable shellfish bed at the site.

## 2.3 Sediment quality

The purpose of the sediment quality survey was to establish the levels of contaminants within sediments in three broad zones. These are:

a) the immediate vicinity of the slipway facility being the zone most likely to have accumulated contaminants from boatyard activities;

b) within the area to be disturbed by the proposed dredging;

c) providing 'background' or 'control' sites at positions adjacent to the area intended to be dredged, and at points distant from the boatyard operation.

Substances targeted for analysis were Zinc and Copper because those metals (particularly Copper) are the biocides that are currently most commonly associated with vessels and antifouling paint, and that are most likely to accumulate in sediments at boatyards and slipways (e.g. Ytreberg et al. 2016, Gadd and Cameron 2012).

# 3 METHODS

The survey was conducted on 14 March 2018 by a 4Sight scientist with assistance from Mr Doug Schmuck. All intertidal samples were collected between 1100 and 1400hrs (within 1 hour and 30 minutes of low water). Subtidal samples were collected between 1420 and 1600hrs.

## 3.1 Shellfish population survey

Ten shellfish samples were collected from the intertidal zone on the beach where the boatyard is located. The general zone where shellfish were known to be present was identified by the boatyard owner Mr Doug Schmuck and confirmed by 4Sight prior to conducting the sampling.

Each intertidal sample unit consisted of a 28 x 28 cm quadrat (area of 0.078 $m^2$) dug to a depth of ~15 cm. The contents were passed through a 2 mm aperture sieve. All individuals of the target species retained on the sieve were identified, counted, and measured across their widest axis to the nearest millimetre.

## 3.2 Sediment quality

Surficial sediments (to a depth of 3 cm) were collected at 6 sites shown in Figure 1:

1) The intertidal zone of the slipway (SL);
2) A control or 'background' site (CI) in the intertidal zone on the beach approximately 40 m from the boatyard slipway;
3) A control or 'background' site in the intertidal zone at Opua beach (CE) approximately 230 m from the boatyard;
4) A subtidal site in the southern portion of the proposed dredged area (D1);
5) A subtidal site in the northern portion of the proposed dredge area (D2); and
6) A subtidal control or 'background' site approximately 40 m southwest of the proposed dredged area (CS).

Each sample comprised a composite of three subsamples to ensure samples were representative of the contaminant level at each site. Subtidal samples were collected using a modified anchor box dredge. Samples were kept chilled overnight and couriered to Hills Laboratories for analysis the following day.

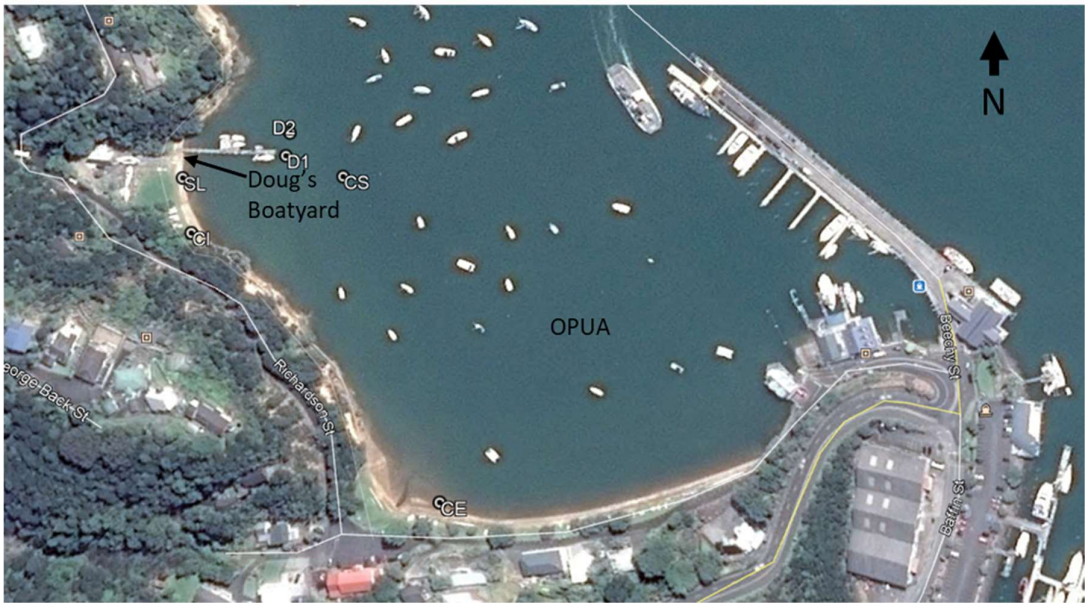


Figure 1: Sediment Sampling Locations

# 4 RESULTS

## 4.1 General site description

The boatyard is in a sheltered embayment close to the main commercial area of the Port of Opua, approximately 200 m from the Opua main wharf and 300 m from the Opua car ferry landing.

The slipway and jetty are located at the northern end of the beach adjacent to Richardson St, within the wider embayment at Opua (Figures 1, 2 and 3). At either end of the beach there is a rocky point extending into the subtidal zone. There is a small retaining wall at the top of the beach, the base of which is approximately at the high tide mark.

The substratum in the upper 1-2 m of shore is comprised mostly of gravel or sand with a high proportion of whole dead shell (mostly *Paphies australis* and also some *Crassostrea gigas* shell). The substratum in the mid intertidal zone comprises sand, gravel and shell gravel. The gravel component of the sediment increases in the mid and lower intertidal and the low intertidal is comprised of coarser gravel and sand overlaying muddy sand.

Figure 2: View of Area of Survey Looking from South End of Beach: Beach, Existing Jetty and Slipway.

Figure 3: View of Area of Survey Looking from Boatshed Toward Opua Wharf and Car Ferry Landing.

## 4.2 Shellfish population survey

Two species of edible shellfish were identified in the survey: pipis (*Paphies australis*); and cockles (*Austrovenus stutchburyi*). There were a few pacific oysters (*Crassostrea gigas*) growing on rocks at either end of the beach and on the boatyard jetty structures, but no measurements were made of the oyster population in this survey. All pipis and cockles sampled appeared normal and healthy.

### 4.2.1 Pipis (*Paphies australis*)

The survey found pipis in all quadrats sampled on the mid and lower intertidal. The mean density of pipis was 288 per $m^2$. The population on the beach adjacent to the boatyard is considered to be a 'bed' of pipis according to the accepted definition (where shellfish density is greater than 10 per $m^2$ e.g. Pawley and Smith 2014). Length frequency data and summary statistics are shown in Figure 4 and Table 1.

There is no legal minimum size for the harvest of pipis but a generally accepted rule of thumb is that they are considered as harvestable at shell length greater than 50 mm (Pawley and Smith 2014). The mean density of harvestable pipis surveyed at the beach was 51 per $m^2$. The Ministry for Primary Industries has historically used a general guideline to define a harvestable shellfish population as 25 per $m^2$ for pipis 50 mm and over (Pawley and Smith 2014), so the population surveyed was a harvestable pipi bed, so defined. Assuming a nominal area of 250 $m^2$ of suitable beach habitat it can be estimated that the bed holds ~12,750 edible sized pipi. On this basis it is to be regarded as a small bed.

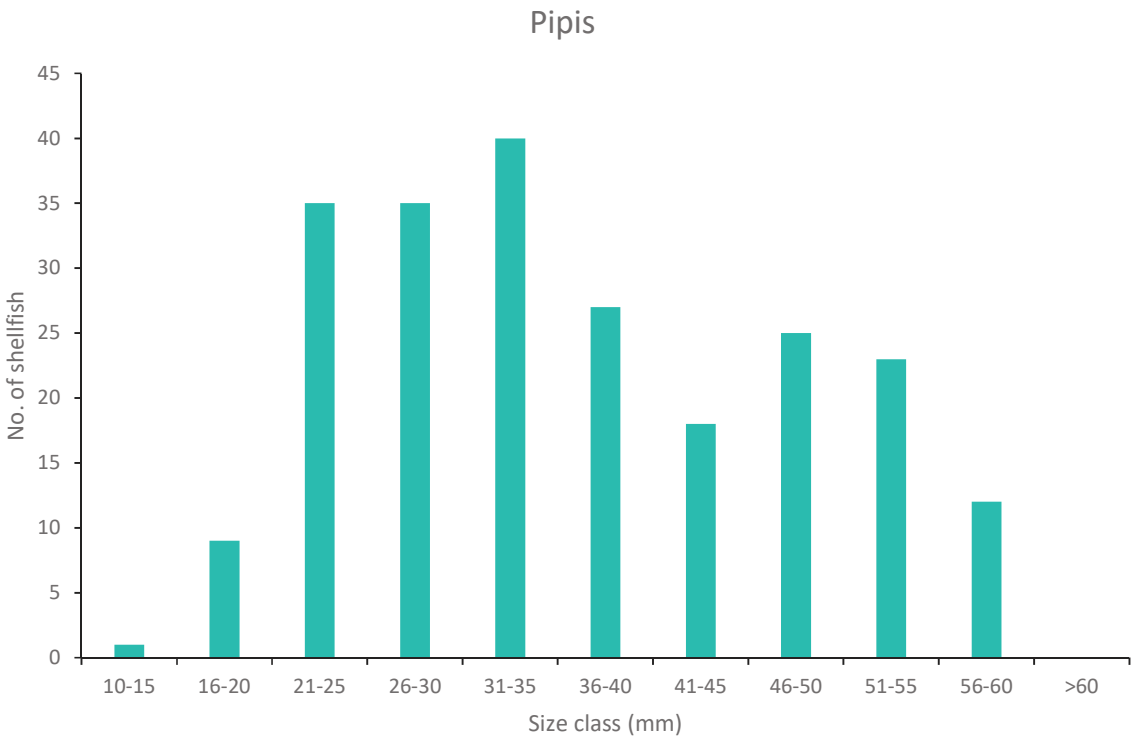


Figure 4: Size Frequency of all Pipis Surveyed

Table 1: Pipi Length Frequency Distribution Summary Statistics (mm)

| Mean | Median | Mode | Range |
|---|---|---|---|
| 36.36 | 33 | 32 | 15 - 60 |

#### 4.2.2 Cockles (*Austrovenus stutchburyi*)

Cockles were found in 7 of the 10 quadrats sampled, and they were most abundant in the lower intertidal zone. The mean density of cockles was 41 per $m^2$ so the cockle population would be considered as a cockle 'bed'. Length frequency data and summary statistics are shown in Figure 5 and Table 2.

There is no legal minimum size for the harvest of cockles but a generally accepted rule of thumb is that they are considered as harvestable at shell length greater than 30 mm (Pawley and Smith 2014). The mean density of harvestable cockles surveyed at the beach was 11 per $m^2$ which was below the accepted guideline used historically to define a harvestable shellfish population (Pawley and Smith 2014).

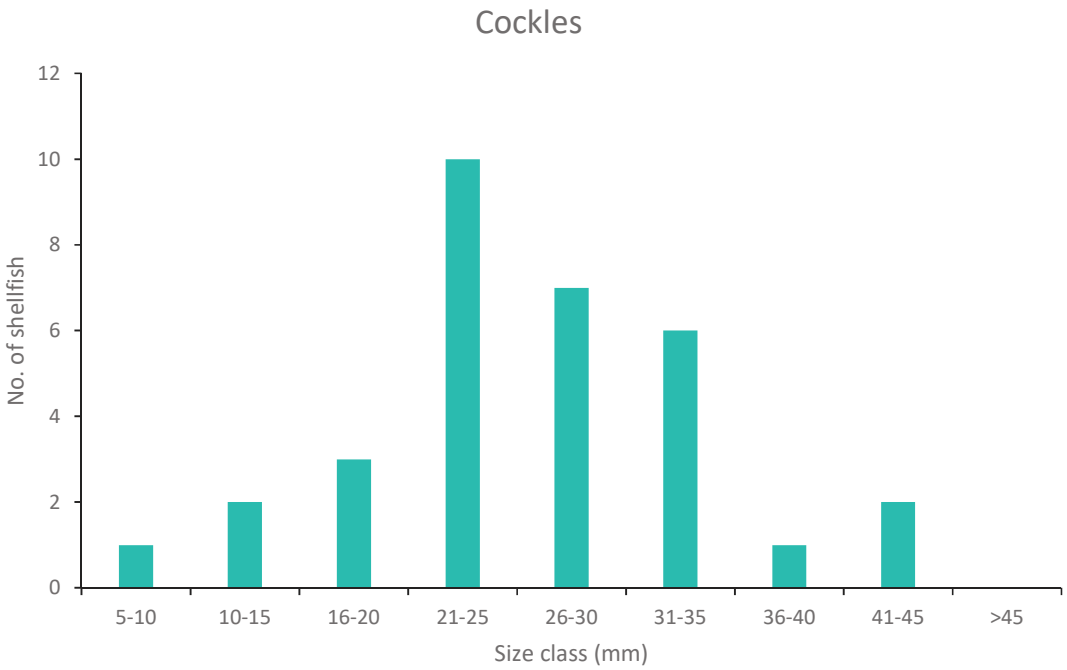


Figure 5: Size-Frequency of all Cockles Surveyed

Table 2: Cockle Length Frequency Summary Statistics (mm)

| Mean | Median | Mode | Range |
|---|---|---|---|
| 25.9 | 25 | 21 | 8 - 42 |

## 4.3 Sediment quality

Concentrations of Copper and Zinc in sediment samples are shown in Table 3. At the slipway site (SL), levels of copper significantly exceeded ANZECC Interim Sediment Quality Guidelines (ISQG) high trigger values that indicate levels at which there is a 50% risk of an effect on living organisms based on toxicological testing. This would be regarded as 'polluted' sediment. The zinc concentration at that site was below the ANZECC ISQG high trigger level, but exceeded the low trigger level at which there is a 10% chance of an effect on living organisms. A zinc value in this range would be regarded as 'moderately polluted' sediment. Copper and Zinc concentrations in sediments from all the other sites were below ANZECC trigger levels and would be regarded as 'unpolluted' on this basis.

Table 3: Copper and Zinc Concentrations in Sediment Samples.

| Heavy metals (mg/kg dry wt) | Sample Sites | | | | | | ANZECC ISQG LOW | ANZECC ISQG High |
|---|---|---|---|---|---|---|---|---|
| | SL | CI | CE | D1 | D2 | CS | | |
| Copper | 340 | 59 | 21 | 16.2 | 16.5 | 11.3 | 65 | 270 |
| Zinc | 270 | 133 | 90 | 113 | 106 | 95 | 200 | 410 |

*Yellow shading indicates level exceeding ANZECC ISQG low trigger values and cell shaded orange indicates level exceeding ANZECC ISQG high trigger values*

# 5 DISCUSSION

## 5.1 Edible shellfish population

The survey confirmed the presence of a small shellfish bed on the beach adjacent to the boatyard operation. The shellfish bed comprised two species of edible shellfish: pipis (*Paphies australis*) and cockles (*Austrovenus stutchburyi*). The Ministry for Primary Industries has historically used a general guideline to define a harvestable shellfish population as 25 per $m^2$ for pipis 50 mm and over and 25 per $m^2$ for cockles 30 mm and over. The shellfish survey indicates that the beach adjacent to the boatyard supports a small but harvestable population of pipis, but not of cockles. The size frequency distribution (=age distribution) of the pipis suggests a stable bed which is maintained notwithstanding the high level of local commercial and other activity.

On the day of the survey sampling, a person visited the beach and took shellfish, presumably for consumption. The person is apparently the only one who occasionally takes shellfish from the beach (pers. com. Mr Doug Schmuck). The population structure of the pipi bed on the beach is consistent with relatively light and infrequent harvesting pressure. If the bed was heavily exploited, there would be few larger sized pipis greater than 50 mm length.

## 5.2 NDHB Submission

In a submission made in response to the DOB consent application, the Northland District Health Board (NDHB) did not oppose the consent, but they did recommend inclusion of consent conditions. We address each of those recommendations below.

### 5.2.1 Capital and maintenance dredge process

The NDHB requested a condition ensuring that the proposed dredging of the Veronica Channel be conducted in such a way as to prevent as far as practicable the recirculation of toxic metal sediments, or persistent organic compounds, or other pollutants, or their degradation products.

The proposed dredging volume and footprint is very small. Contaminants which may reside within the sediments are likely to have accumulated from multiple sources including runoff from road surfaces, moored boats, the Opua marina and catchment discharges. It is understood that since 2002, DOB has had an approved management system for handling washdown water and stormwater from the boatyard hardstand. In 2012 further improvements were undertaken so that waterborne material is diverted to the trade waste (sewer), and DOB is likely to be a small contributor to the overall potential contaminant load in the wider area. The sediment disturbance associated with the proposed dredging is likely to be minor in scale compared to the overall flux of sediment generated by catchment discharge, vessel activity, and wind and wave induced resuspension of shallow muddy sediments in the vicinity. It is not expected that the small scale dredging operation poses a significant risk in terms of mobilising contaminants.

### 5.2.2 Sediment sampling

The NDHB recommended that a sediment testing regime be carried out prior to, during and post dredging to monitor pollutants in sediments throughout the dredging process. To address this recommendation 4Sight designed a sampling protocol to test levels of Copper and Zinc in sediments, and conducted the baseline pre-dredging sampling as described in this report.

The findings of the analysis indicated that the sediments sampled at (within ~1 m distance from) the Boatyard's slipway exhibited significantly elevated levels of copper and elevated zinc relative to ANZECC Interim Sediment Quality Guidelines. This level of contamination appeared to be localised to the slipway footprint.

Prior to 1999, boat maintenance activities including hull cleaning were conducted at the slipway site within the intertidal zone. In 1999 improvements to the boatyard infrastructure and vessel haulout facilities enabled those operations to be shifted up above the foreshore and subsequently boat cleaning and associated activities were carried out landward of the intertidal zone. The high concentrations of Copper and Zinc at the slipway sampling site were expected, given its long history of use for boatyard activities. The sampling demonstrated that the very high levels of those contaminants did not extend to the other sampling sites located 40 to 50 m from the slipway within the intertidal zone on the adjacent beach, or subtidally within the proposed dredged area.

### 5.2.3 Recreational shellfish sampling

The NDHB recommended sampling of recreational shellfish be conducted once prior to commencement of the proposed works and once following reestablishment of the shellfish bed. A further recommendation NDHB made with regard to shellfish was that the maximum level of contaminants and natural toxicants concentrated in the recreational shellfish must comply with Schedule 19 of the Australia New Zealand Food Standards Code, and that if those standards are exceeded, warning signs must be erected to warn members of the public of the risk involved in the consumption of recreational shellfish.

In addressing those recommendations by the NDHB regarding recreational shellfish sampling we offer the following opinion.

Compliance with Schedule 19 of the Australia New Zealand Food Standards Code is not appropriate in the context of DOB's consent application because the code does not provide food standards for levels of Copper or for Zinc (NZ Gazette No. 50 2016). These are, as has been shown in the 4Sight sampling, the potential contaminants most commonly associated with vessels and antifouling paint, and that are most likely to accumulate in sediments at boatyards and slipways (e.g. Ytreberg et al. 2016, Gadd and Cameron 2012). Further, the term 'natural toxicants' refers to naturally occurring compounds found in plants and animals. Such naturally occurring compounds are not likely to be discharged to the environment from a boatyard.

In a guide for food safety when gathering shellfish, the Ministry for Primary Industry states that although dangerous levels of chemical contamination are very rare in New Zealand shellfish, the collection of shellfish from areas near wharves, industry, marinas and near sewage and storm water outlet pipes where sewage or chemicals such as anti-fouling paint or fuel may have been discharged is not advised (MPI 2013).

The boat yard can be characterised as such an industrial activity in keeping with other nearby activities and potential sources of contaminants including a much larger boatyard and slipway facility, commercial activities associated with the Opua wharf facilities, the Opua marina, the Opua Car Ferry operation, vessels on swing moorings, and various stormwater and stream outlets into the same basin. It is noted that the boat yard falls within an area zoned Marine 4 (Controlled Mooring) Management Area within the Operative Northland Regional Coastal Plan. Shellfish within the embayment that are potentially affected by multiple of such influences, may accumulate and carry a significant contaminant load at times. In this area then, shellfish quality is more appropriately a matter for the consideration of the Health Board rather than a site-specific responsibility of DOB.

# 6 REFERENCES


ANZECC & ARMCANZ. 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Page Book.

Gadd, J., and M. Cameron. 2012. Antifouling biocides in marinas: Measurement of copper concentrations and comparison to model predictions for eight Auckland sites. Prepared by NIWA for Auckland Council. Auckland Council technical report TR2012/033.

Gazette, N. E. W. Z. 2016. Schedule 19 – Maximum Levels of Contaminants and Natural Toxicants – Food Standards ( Proposal P1025 – Code Revision ) Variation — Australia New Zealand Food Standards Code – Amendment No . 154. Pages 1–5.

Pawley, M. D., and A. N. H. Smith. 2014. The distribution and abundance of pipis and cockles in the Northland , Auckland and Bay of Plenty regions , 2013. Ministry for Primary Industries Fisheries Assessment Report 2014/29.

Ytreberg, E., M. A. Bighiu, L. Lundgren, and B. Eklund. 2016. XRF measurements of tin, copper and zinc in antifouling paints coated on leisure boats. Environmental Pollution 213:594–599.

Williamson, R. B; Wilcock, R. J; Van Dam, L. F; and Schriner, R 1993. The Impact of Copper-Based Antifouling Paint Residues on the Marine Environment around Auckland. ARC Environment Division. Technical Publication No33, November 1993

**Appendix A:**

**Results of sediment sample analysis**

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

# Certificate of Analysis



| | | | | |
|---|---|---|---|---|
| **Client:** | 4SIGHT Consulting Limited | **Lab No:** | 1945062 | SPv1 |
| **Contact:** | Stephen Brown | **Date Received:** | 16-Mar-2018 | |
| | C/- 4SIGHT Consulting Limited | **Date Reported:** | 27-Mar-2018 | |
| | PO Box 402053 | **Quote No:** | 91130 | |
| | Tutukaka 0153 | **Order No:** | AA3213 | |
| | | **Client Reference:** | Marine Sediment | |
| | | **Submitted By:** | Stephen Brown | |

**Sample Type: Sediment**

| | Sample Name: | SL | CI | CE | D1 | D2 |
|---|---|---|---|---|---|---|
| | **Lab Number:** | 1945062.1 | 1945062.2 | 1945062.3 | 1945062.4 | 1945062.5 |
| Total Recoverable Copper | mg/kg dry wt | 340 | 59 | 21 | 16.2 | 16.5 |
| Total Recoverable Zinc | mg/kg dry wt | 270 | 133 | 90 | 113 | 106 |

| | Sample Name: | CS | | | | |
|---|---|---|---|---|---|---|
| | **Lab Number:** | 1945062.6 | | | | |
| Total Recoverable Copper | mg/kg dry wt | 11.3 | - | - | - | - |
| Total Recoverable Zinc | mg/kg dry wt | 95 | - | - | - | - |

## 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 clean 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.

**Sample Type: Sediment**

| Test | Method Description | Default Detection Limit | Sample No |
|---|---|---|---|
| Environmental Solids Sample Preparation | Air dried at 35°C and sieved, <2mm fraction.<br>Used for sample preparation.<br>May contain a residual moisture content of 2-5%. | - | 1-6 |
| Total Recoverable digestion | Nitric / hydrochloric acid digestion. US EPA 200.2. | - | 1-6 |
| Total Recoverable Copper | Dried sample, sieved as specified (if required).<br>Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2. | 0.2 mg/kg dry wt | 1-6 |
| Total Recoverable Zinc | Dried sample, sieved as specified (if required).<br>Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2. | 0.4 mg/kg dry wt | 1-6 |

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.



Ara Heron BSc (Tech)
Client Services Manager - Environmental