Kaipara District Council

DETAILED SITE INVESTIGATION

WASTEWATER TREATMENT PLANT, 2/40 THELMA ROAD SOUTH, MANGAWHAI

22 FEBRUARY 2021

CONFIDENTIAL

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DETAILED SITE INVESTIGATION

WASTEWATER TREATMENT PLANT, 2/40 THELMA ROAD SOUTH, MANGAWHAI

KAIPARA DISTRICT COUNCIL

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REV	DATE	DETAILS
RevA	23/02/2021	Final Report

	NAME	DATE	SIGNATURE
Prepared by:	Daniel Ware	23/02/2021	
Reviewed by:	Colin Jowett	23/02/2021	
Approved by:	Colin Jowett	23/02/2021	

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EXECUTIVE SUMMARY

WSP New Zealand (WSP) has undertaken a DSI of the piece of land at the Mangawhai Wastewater Treatment Plant (WWTP), 2/40 Thelma Road South, Mangawhai that is the location of a proposed balance tank. The objective of this DSI was to ascertain whether it is more likely than not that the piece of land of the proposed construction area has been adversely impacted by the WWTP activity.

The Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) (MfE, 2011a). includes wastewater treatment sites as a HAIL activity under category G.6. 'Waste recycling or waste or wastewater treatment.'

Our desktop review of historical aerial imagery and available 'as-built' plans show that the WWTP was constructed in 2010 with the site containing undisturbed bush prior to the construction. The geology across the site contains sand and beach deposits with groundwater level being unknown.

During a site walkover and interview with site personal, no obviously contaminating activities or potential issues were observed within the piece of land proposed for development. While on site, shallow surface soil samples were collected on-site; two from within the piece of land and two from the hillside adjacent to the piece of land where safe access was possible. All soil samples were reported by the analytical laboratory as containing concentrations of heavy metal/metalloids below the adopted human health and background soil guideline values.

As a result of this DSI, WSP concludes that the piece of land of the proposed development has not been the location of a HAIL activity, although the wider site is the location of a HAIL activity. Further, the results of the site inspection, site interview and collection and analysis of soil samples show that the soil within the piece of land has not been adversely impacted by historical or current site uses.

Consequently, under the NESCS regulation 5(9), the regulations 'do not apply to a piece of land described in subclause (7) or (8) about which a detailed site investigation exists that demonstrates that any contaminants in or on the piece of land are at, or below, background concentrations.'

Based on soil analysis, WSP also concludes that soil removed from within the piece of land will likely meet the criteria for cleanfill and may be reused on site or disposed off-site as cleanfill.

1 INTRODUCTION

1.1 BACKGROUND

Kaipara District Council (KDC) plan to construct a new balance tank at the Wastewater Treatment Plant (WWTP), 2/40 Thelma Road, South Mangawhai ('the site'). The tank will be constructed within an area of the eastern section of the site and the adjacent hillside outside the current site fence line on the 'piece of land' indicated in Figure 1, Appendix A. The Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) (MfE, 2011a) includes wastewater treatment sites as a HAIL activity under category G.6. 'Waste recycling or waste or wastewater treatment.'

With reference to The Users' Guide: National Environmental Standard for assessing and Managing Contaminants in Soil to Protect Human Health (MfE, 2012), the National Environmental Standard for assessing and Managing Contaminants in Soil to Protect Human Health (NESCS, 2011), applies to a piece of land where it is more likely than not that a HAIL Activity has been, or is being, undertaken where that will be intersected by the proposed activity (the construction of the new balance tank). The area required to be investigated is that area covered by the proposed activity not the entire area of the WWTP where the HAIL activity may have occurred.

Consequently, WSP New Zealand (WSP) have undertaken a Detailed Site Investigation (DSI) only for the piece of land where the proposed balance tank will be constructed at the WWTP.

1.2 OBJECTIVES

The objective of this DSI is to ascertain whether it is more likely than not that the piece of land of the proposed construction activity has been adversely impacted by the WWTP activity.

1.3 SCOPE OF WORKS

To achieve the objective the scope of works comprised:

- A desktop study review of:
  - Kaipara District Council (KDC) files.
  - Historical aerial imagery of the site.
  - The Northland Regional Council (NRC) Selected Land Use Register (SLUR).
  - Documents or files in relation to site construction and operations held by the current site owner.
- A site walkover inspection of the piece of land and interview with site personnel.
- In-situ field screening for volatile compounds using a photoionisation detector (PID).
- Collection of soil samples from two locations.
- Analysis of soil samples for metals/metalloids.

- Comparison of analytical results against standards of the NESCS and expected background concentrations with reference to the Auckland Regional Background concentrations of inorganic elements in soils – Non-volcanic range (AC, 2001).
- Preparation of this report.

This investigation was completed with reference to the NESCS and the Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) No.1 Reporting on Contaminated sites in New Zealand (MfE, 2011b) and No.5 Site Investigation and Analysis of Soils (MfE, 2011c).

2 SITE SETTING

2.1 SITE IDENTIFICATION

The site is accessed off Thelma Road South, Mangawhai and contains several buildings and tanks of the WWTP operations, located on an engineered level site surrounded by bush. The site identification details are provided in Table 2-1. The piece of land under investigation is the location of an odour bark filter and associated infrastructure, and adjacent scrub hillside to the east beyond the current fence line. The site and piece of land is shown on Figure 1, Appendix A.

Table 2-1 - Site Details

Site Address	2/40 Thelma Road South, Mangawhai
Legal Identification	Lot 2 DP 450057
Property Area	4,863 m^2
Site Use	Wastewater Treatment Plant

2.2 TOPOGRAPHY

From the Land Information New Zealand (LINZ) Topography map, the site appears to be 20 m above mean sea level (AMSL). The site of the WWTP is predominantly flat and rises to the east and south-east approximately 10 m in elevation over the scrub hillside outside the current fence line.

2.3 GEOLOGY AND HYDROGEOLOGY

2.3.1 GEOLOGY

The Institute of Geological and Nuclear Sciences 1:250,000 geological map for Auckland (Edbrooke, 2009) describes the geology underlying the site as weakly cemented sand in fixed parabolic dunes.

WSP's review of the New Zealand Geological Database[1] (NZGD) found two cone penetrometer tests (CPT) conducted at the WWTP in February 2008 by Tonkin & Taylor Limited (T&T). No information relevant to this DSI was obtained from these tests.

2.3.2 HYDROGEOLOGY

The site is located on land approximately 400 m east of the Mangawhai Estuary and 950 m west of the Mangawhai harbour. The previous T&T (2008) CPT logs indicate groundwater located at 0.2 and 6.2 m below ground level (bgl) respectively.

[1] https://www.nzgd.org.nz/ARCGISMapViewer/mapviewer.aspx - Feb 2021

3 DESKTOP STUDY

3.1 REVIEW OF COUNCIL FILES

WSP requested a LIM report from the KDC; however, during a phone conversation with a representative of the KDC[2], WSP was advised that the LIM report file included numerous documents related to a multitude of larger sites in the area and, as such, obtaining the LIM was unlikely to provide information that could be specifically tied to this site and piece of land.

3.2 HISTORICAL AERIAL REVIEW

A WSP Environmental Scientist (ES) undertook a review of historical aerial photographs of the site and surrounding land. The images reviewed include a total of seven photographs sourced from Retrolens (Retrolens, 2021) and Google Earth (Google, 2021) between 1963 and 2019. Copies of the aerial images are included in Appendix C and a summary of the observations is provided in Table 3-1 below.

Table 3-1: Summary of historical aerial review observations

YEAR	OBSERVATIONS
1963 -1966 (Retrolens)	The site is under bush, Mangawhai heads township is 0.7 km to the east.
1977 (Retrolens)	Land 150 m to the west is under pasture, there are forest roads directly south of the site connecting to Molesworth Drive 0.5 km to the south.
1983 -2006 (Retrolens and Google Earth)	No significant changes can be observed from the previous photograph.
2015 (Google Earth)	The wastewater treatment plant has been constructed on the site
2019 (Google Earth)	No significant changes can be observed from the previous photograph

3.3 SELECTED LAND USE REGISTER REVIEW

The WWTP is not listed on the NRC SLUR[3] accessed by WSP online on 10 February 2021. The closest property which appears on the SLUR is approximately 950 m south-east and is listed as a landfill site which appears to currently been in use as a recreational park/reserve.

[2] Personal communication between Daniel Ware (WSP) and Pamela Henare (KDC) on 11 Feb 2021

[3] https://www.nrc.govt.nz/environment/waste-and-pollution/hazardous-activities-and-industries-list - Feb 2021

3.4 OTHER DOCUMENTS AND FILES

WSP reviewed 'as-built' plans of the site from Earth Tech Engineering (EarthTech, Engineering, 2010) which outline the structural drawings for the WWTP buildings on site.

The structure on the piece of land is a bark filter. While the general outline of the filter is indicated on the plans and is commensurate with its current location, no structural information for the filter was in plans. No other structures were identified within or beneath the piece of land from these plans. We would note that the plans indicate the site structures are built above ground with a slab-on-ground construction appearing dominant. The plans indicate limited beneath ground structures likely to cause in-ground contamination.

4 SITE WALKOVER

4.1 SITE INSPECTION

A WSP ES attended site on 3 February 2021 for the purpose of a site walkover and inspection of the piece of land.

While on site no contaminating or potentially contaminating activities or items were observed in the proposed balance tank area. Adjacent to the bark filter within the piece of land lies a rusted manhole which is believed to be a part of the gas transport from the main waste water tank through to the bark odour filter. The corrosion on the manhole is likely attributed to the transported gases.

4.2 SITE PERSONNEL INTERVIEW

At the time of the site inspection WSP staff interviewed David Allan a Broad-Spectrum Ltd employee and technician at the WWTP. The interview consisted of questions with regard to general site operations and potentially contaminating activities or incidents at site.

David indicated that the only chemicals stored on site was liquid chlorine approximately on the same elevation and 30 m north-east of the piece of land which was stored on the other side of the site from the proposed balance tank location. No fuels or other chemicals were kept on site and at no stage had there been any fuel tanks located on the site. No spills, events or fires were noted during the interview.

David stated to his knowledge, there were no other buildings or activities located on the site prior to its construction as a WWTP in 2010.

5 SAMPLING AND ANALYSIS

5.1 METHODOLOGY

5.1.1 SAMPLE LOCATIONS

The original scope included the collection of samples from two locations within the piece of land with one located between the bark tank and the eastern fence and the other located east of the WWTP within the reinstated scrub hillside. However, the reinstated hillside was overgrown with gorse and Manuka trees preventing access to the selected sampling location. Consequently, a secondary sample location to the north of the original sample location was identified where access was possible. WSP considered this an acceptable variation because the reinstated hillside bank is understood to have been developed at the same time as the initial construction and ground conditions expected to be generally homogenous across the slope. Final sample locations are shown on Figure 1, Appendix A.

5.1.2 FIELD SCREENING

Soil sample locations were screened on-site for volatile organic compounds (VOCs) using a PID. A 10-15 g sub-sample of soil at each location was placed in a plastic resealable bag and allowed to develop for 5 – 10 minutes prior to headspace analysis.

5.1.3 SOIL SAMPLE COLLECTION

WSP collected surficial soil samples on 3 February 2021; two from adjacent to the bark tank (Tank) and two within the hillside location (Bush).

Samples were collected using a hand augur with samples obtained from the augur head using fresh clean gloves. Sampling equipment was washed and decontaminated using a phosphate-free detergent between each sample location. WSP placed samples into glass jars provided by an International Accreditation New Zealand Accredited Laboratory (IANZ) before being stored in a cold box for transport to the laboratory.

Samples were sent in a cold box under chain of custody (CoC) to Eurofins Scientific Limited (Eurofins) who are accredited by IANZ for the analysis undertaken.

5.2 ASSESSMENT CRITERIA

The four samples collected were scheduled for analysis by Eurofins for heavy metal/metalloids. The relevant assessment criteria for sample analysis are detailed in table 5-1.

The NESCS includes human health soil guideline criteria for selected land uses. Where guideline values have not been supplied, and with reference to the MFE CLMG No.2 (MfE, 2011d) criteria have been adopted from the Australian National Environmental Protection Measure (NEPM)

The site is located in Northland and the NRC do not have listed expected naturally occurring background concentrations for inorganic contaminants. Consequently, we have adopted the Auckland Region non-volcanic background values as an indicator for naturally occurring background concentrations.

Table 5-1: Soil Guideline Assessment Criteria

SOURCE GUIDELINES	CONTAMINANTS	LANDUSE
MfE Users' Guide: NES for Assessing and Managing Contaminants in Soil to Protect Human Health (MfE, 2011f)	As, Cd, Cr, Cu, Hg, Pb	Commercial/industrial
National Environmental Protection Measure Schedule B1: Guideline on Investigation Levels for Soil and Groundwater, Table 1A (1) (NEPC, 2011)	Ni, Zn	Commercial/industrial
Auckland Regional Background concentrations of inorganic elements in soils – Non-volcanic range (AC, 2001)	As, Cd, Cr, Cu, Hg, Pb, Ni, Zn	ALL

6 ANALYTICAL RESULTS

6.1 SURFACE AND SUBSURFACE CONDITIONS

Ground conditions consisted of dry yellow/gold sand with a surface covering of bark approximately 0.1 – 0.2 m thick across the reinstated hillside. Refusal at the tank location occurred at approximately 0.35 m bgl.

6.2 FIELD SCREENING AND SOIL ANALYTICAL RESULTS

During field screening, PID results did not exceed 0 ppm. Summary comparative analytical tables or laboratory results are provided in Appendix C and copies of the laboratory certificates of analysis are in Appendix D.

All soil samples analysed were reported by Eurofins with concentrations of metals/metalloids below the adopted human health and background soil guideline values.

7 CONCLUSIONS

WSP has undertaken a DSI of the piece of land at the Mangawhai Wastewater Treatment Plant (WWTP), 2/40 Thelma Road South, Mangawhai that is the location of a proposed balance tank. The objective of this DSI was to ascertain whether it is more likely than not that the piece of land of the proposed construction area has been adversely impacted by the WWTP activity.

The DSI identified that the WWTP was constructed in 2010 and that the site was under bush prior to construction. The geology across the site consists of sand and beach deposits with groundwater level being unknown.

During a site walkover, and following an interview with an on-site staff member familiar with site history and operations, no obviously contaminating HAIL activities or contamination issues were observed associated with the piece of land proposed for development.

WSP screened surficial soil samples on-site for VOCs using a PID. No VOCs over a concentration of 0 ppm were identified. Four surficial soil samples were collected on-site; two from within the piece of land and two from the hillside adjacent to the piece of land where safe access was possible. Soil samples were collected to a depth not exceeding 0.3 m bgl and despatched in a cool box under CoC to Eurofins for analysis of metals/metalloids. Eurofins reported all concentrations of metals/metalloids below the NESCS soil contaminant standards for protection of human health for a commercial/industrial outdoor worker (unpaved). None of the samples were reported with concentrations of contaminants of concern exceeding the expected naturally occurring background ranges of the Auckland region for a non-volcanic soil.

As a result of this DSI, WSP concludes that the piece of land of the proposed development has not been the location of a HAIL activity, although the wider site is the location of a HAIL activity. Further, the results of the site inspection, site interview and collection and analysis of soil samples show that the soil within the piece of land has not been adversely impacted by historical or current site uses.

Consequently, under the NESCS regulation 5(9), the regulations 'do not apply to a piece of land described in subclause (7) or (8) about which a detailed site investigation exists that demonstrates that any contaminants in or on the piece of land are at, or below, background concentrations.'

Based on soil analysis, WSP also concludes that soil removed from within the piece of land will likely meet the criteria for cleanfill and may be reused on site or disposed off-site as cleanfill.

8 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Kaipara District Council ('Client') in relation to the Detailed Site Investigation ('Purpose') and in accordance with the ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

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The data reported and Conclusions drawn by WSP in this Report are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

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9 REFERENCES

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Appendix A

Figure

Figure 1 - Site Layout and Sampling Plan

Mangawhai Waste Water Treatment Plant

Kaipara District Council

Project Number:	Author:	Client:
1-14129.12	Daniel Ware	Kaipara District Council
Date: 17/2/2021	Approved by: Colin Jowett	

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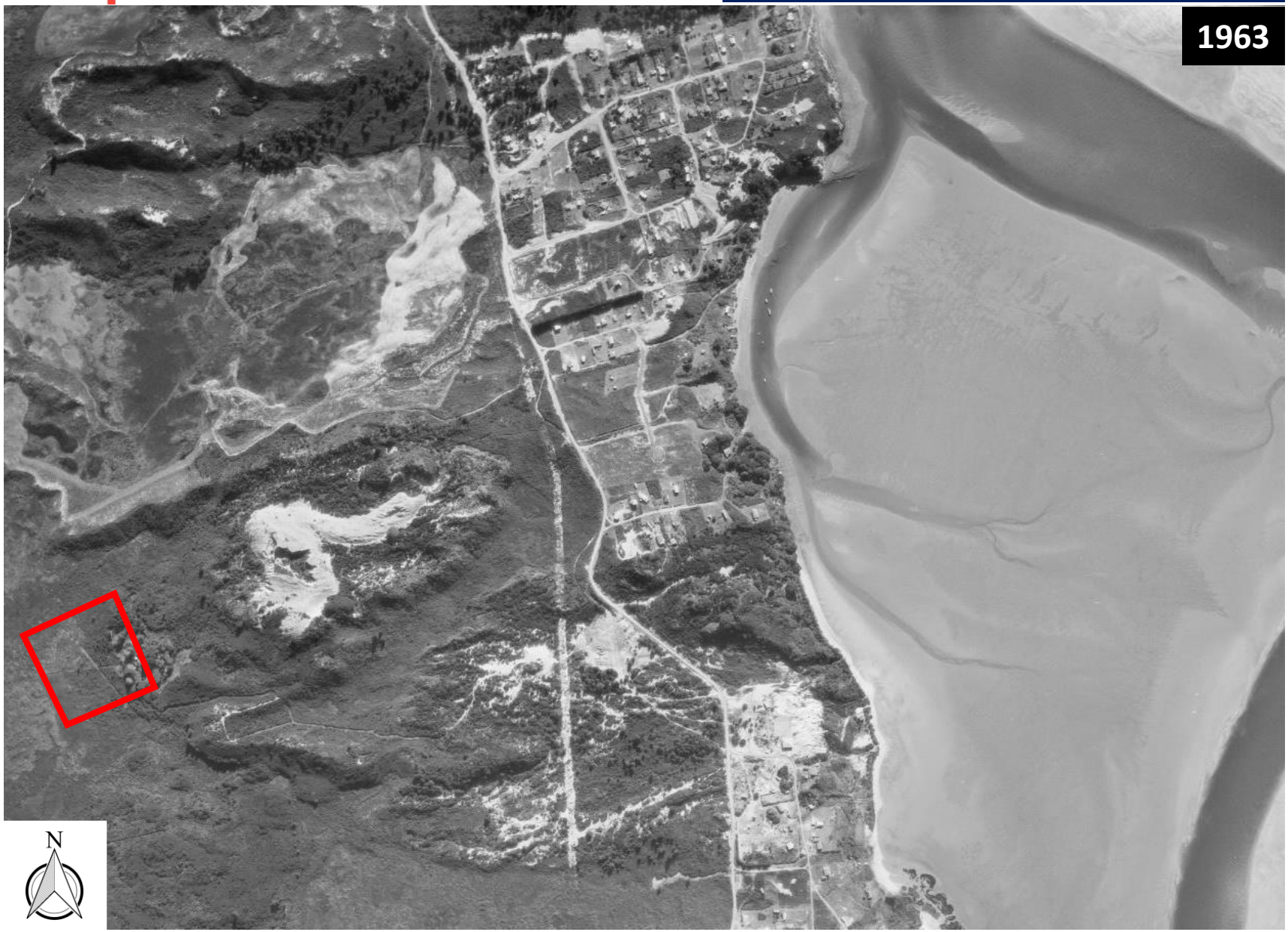
Source: Kaipara District Council Geomaps and Google Earth

Appendix B

Historical Aerials



Approximate Site Location

Approximate Site Location

Approximate Site Location

Approximate Site Location

Approximate Site Location

Approximate Site Location

Approximate Site Location

Approximate Site Location

Appendix C

Analysis Summary Table

Table C1

1-14129.12 - Mangawhai WWTP Balance Tank

Analytical Soil Results - Heavy Metals

Location	Auckland Regional Background Concentrations [1]	Commercial / Industrial Outdoor Worker [2]	Mangawhai WWTP			
WSP Sample Name			Bush 0.1	Bush 0.25 - 0.3	Tank 0.1	Tank 0.3
Laboratory Sample Name			K21-Fe07279	K21-Fe07280	K21-Fe07282	K21-Fe07283
Sample Depth			0.1 m	0.25-0.3 m	0.1 m	0.3 m
Geological Unit			Sand	Sand	Sand	Sand
Sampling Date			3/02/2021	3/02/2021	3/02/2021	3/02/2021
Photo-Ionisation Detector (ppm)			0	0	0	0
Heavy Metals (mg/kg)						
Arsenic	**12**	70	4.2	4.4	4.5	4.6
Cadmium	**0.65**	1,300	< 0.4	< 0.4	< 0.4	< 0.4
Chromium (III+VI)	**55**	>10,000	7.8	7.8	7.3	8.1
Copper	**45**	>10,000	< 5	< 5	< 5	< 5
Lead	**65**	3,300	< 5	< 5	< 5	< 5
Mercury	**0.45**	4,200	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	**35**	4000 [3]	< 5	< 5	< 5	< 5
Zinc	**180**	400,000 [3]	12	9.5	14	13

Key:

Bold Exceeds Background Concentrations

Exceeds Human Health Criteria for Commerical/Industrial Outdoor Worker

Notes:

1 - Auckland Regional Background concentrations of inorganic elements in soils – Non-volcanic range

2 - MfE Users' Guide: NES for Assessing and Managing Contaminants in Soil to Protect Human Health

3 - National Environmental Protection Measure Schedule B1: Guideline on Investigation Levels for Soil and Groundwater, Table 1A(1)

Appendix D

Certificate of Analysis

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

WSP New Zealand Limited
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Attention: **Daniel Ware**

Report **771522-S**
Project name MANGAWHAI WWTP
Project ID 1-14129.12
Received Date Feb 04, 2021

Client Sample ID			MANGAWHAI WWTP1 BUSH 0.1M	MANGAWHAI WWTP1 BUSH 0.25-0.3	MANGAWHAI WWTP1 TANK 0.1M	MANGAWHAI WWTP1 TANK 0.3M
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K21-Fe07279**	**K21-Fe07280**	**K21-Fe07282**	**K21-Fe07283**
Date Sampled			**Not Provided**[I12]	**Not Provided**[I12]	**Not Provided**[I12]	**Not Provided**[I12]
Test/Reference	LOR	Unit				
Metals M8 (NZ MfE)						
Arsenic	2	mg/kg	4.2	4.4	4.5	4.6
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	7.8	7.8	7.3	8.1
Copper	5	mg/kg	< 5	< 5	< 5	< 5
Lead	5	mg/kg	< 5	< 5	< 5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	< 5
Zinc	5	mg/kg	12	9.5	14	13
% Moisture	1	%	5.1	8.6	1.9	5.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M8 (NZ MfE)	Auckland	Feb 04, 2021	6 Months
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Auckland	Feb 04, 2021	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

eurofins | Environment Testing

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Project Name: MANGAWHAI WWTP
Project ID: 1-14129.12

Order No.: 1-14129_12
Report #: 771522
Phone: 0011 64 4 471 7160
Fax:

Received: Feb 4, 2021 10:15 AM
Due: Feb 11, 2021
Priority: 5 Day
Contact Name: Daniel Ware

Eurofins Analytical Services Manager : Swati Shahaney

Sample Detail						HOLD	Moisture Set	Metals M8 (NZ MfE)
Auckland Laboratory - IANZ# 1327						X	X	X
Christchurch Laboratory - IANZ# 1290								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	MANGAWHAI WWTP1 BUSH 0.1M	Not Provided		Soil	K21-Fe07279		X	X
2	MANGAWHAI WWTP1 BUSH 0.25-0.3	Not Provided		Soil	K21-Fe07280		X	X
3	MANGAWHAI WWTP1 BUSH 0.45-0.5	Not Provided		Soil	K21-Fe07281	X		
4	MANGAWHAI WWTP1 TANK 0.1M	Not Provided		Soil	K21-Fe07282		X	X
5	MANGAWHAI WWTP1 TANK 0.3M	Not Provided		Soil	K21-Fe07283		X	X

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Project Name: MANGAWHAI WWTP
Project ID: 1-14129.12

Order No.: 1-14129_12
Report #: 771522
Phone: 0011 64 4 471 7160
Fax:

Received: Feb 4, 2021 10:15 AM
Due: Feb 11, 2021
Priority: 5 Day
Contact Name: Daniel Ware

Eurofins Analytical Services Manager : Swati Shahaney

Sample Detail	HOLD	Moisture Set	Metals M8 (NZ MfE)
Auckland Laboratory - IANZ# 1327	X	X	X
Christchurch Laboratory - IANZ# 1290			
External Laboratory			
Test Counts	1	4	4

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram | **mg/L:** milligrams per litre | **ug/L:** micrograms per litre

ppm: Parts per million | **ppb:** Parts per billion | **%:** Percentage

org/100mL: Organisms per 100 millilitres | **NTU:** Nephelometric Turbidity Units | **MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Metals M8 (NZ MfE)							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Metals M8 (NZ MfE)							
Arsenic	%	102			80-120	Pass	
Cadmium	%	98			80-120	Pass	
Chromium	%	90			80-120	Pass	
Copper	%	90			80-120	Pass	
Lead	%	93			80-120	Pass	
Mercury	%	96			80-120	Pass	
Nickel	%	93			80-120	Pass	
Zinc	%	103			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Metals M8 (NZ MfE)				Result 1					
Arsenic	K21-Fe07602	NCP	%	91			75-125	Pass	
Cadmium	K21-Fe07602	NCP	%	88			75-125	Pass	
Chromium	K21-Fe07602	NCP	%	76			75-125	Pass	
Copper	K21-Fe07602	NCP	%	73			75-125	Fail	Q08
Lead	K21-Fe07602	NCP	%	83			75-125	Pass	
Mercury	K21-Fe07602	NCP	%	88			75-125	Pass	
Nickel	K21-Fe07602	NCP	%	78			75-125	Pass	
Zinc	K21-Fe07602	NCP	%	82			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Metals M8 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K21-Fe07283	CP	mg/kg	4.6	4.5	2.0	30%	Pass	
Cadmium	K21-Fe07283	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	K21-Fe07283	CP	mg/kg	8.1	8.0	1.0	30%	Pass	
Copper	K21-Fe07283	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Lead	K21-Fe07283	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Mercury	K21-Fe07283	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	K21-Fe07283	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Zinc	K21-Fe07283	CP	mg/kg	13	13	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	K21-Fe07283	CP	%	5.1	4.9	3.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	N/A
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
I12	Where sampling date has not been provided, Eurofins | Environment Testing is not able to determine whether analysis has been performed within recommended holding times.
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised by:

Swati Shahaney	Analytical Services Manager
Shasti Ramachandran	Senior Analyst-Metal (NZN)

Michael Ritchie
Head of Semi Volatiles (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.