Minarah College

Dam Dewatering Assessment
Minarah College,
268 & 278 Catherine Fields Road,
Catherine Fields, NSW

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P2108320JR03V01
April 2022

Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to complete a dam dewatering assessment for a proposed development, in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Minarah College (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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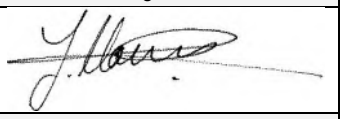
Mark Laidlaw	Ben McGiffin	Terry Harvey	

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All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 SCOPE OF WORK 6
1.1 Overview and Scope 6
2 LOCATION AND SETTING 7
2.1 Summary 7
2.2 Site Walkover and Observations 8
3 DAM DEWATERING ASSESSMENT 9
3.1 Dam Water Volume Estimate 9
3.2 Contaminants of Primary Concern 9
3.3 Sampling Methods 9
3.4 Site Acceptance Criteria 10
3.5 Investigation Results 10
4 DAM DEWATERING METHOD 11
4.1 Dam Water Removal Mechanism 11
4.2 Sequence Summary and Timeline 12
4.3 Monitoring and Contingency Planning 13
5 DISCUSSION AND CONCLUSION 14
6 LIMITATIONS 15
7 REFERENCES 16
8 ATTACHMENT A – SITE PLAN 17
9 ATTACHMENT B – LABORATORY CERTIFICATE 19

General Abbreviations

AASS	Actual acid sulfate soil
ABC	Ambient background concentrations
ACM	Asbestos containing material
AEC	Area of environmental concern
AF	Asbestos fines
AMP	Asbestos Management Plan
ANZECC	Australia and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Governments
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure (2013)
ASS	Acid sulfate soil
ASSMAC	Acid Sulfate Soils Management Advisory Committee
AST	Above ground storage tank
BGL	Below ground level
BH	Borehole
BTEXN	Benzene, toluene, ethylbenzene, xylene, naphthalene
CEMP	Construction Environmental Management Plan
COC	Chain of custody
COPC	Contaminants of potential concern
DA	Development application
DBT	Dibutyltin
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DNAPL	Dense non aqueous phase liquid
DP	Deposited Plan
DPI	NSW Department of Primary Industry
DPIW	NSW Department of Primary Industry – Water
DQI	Data quality indicators
DQO	Data quality objectives
DSI	Detailed Site Investigation
EAC	Ecological assessment criteria
EIL	Ecological investigation level
EMP	Environmental Management Plan
EPA	NSW Environmental Protection Authority
EQL	Estimated quantitation limit (interchangeable with PQL and LOR)
ESA	Environmental Site Assessment
ESL	Ecological screening level
FA	Fibrous asbestos
GIL	Groundwater investigation level
HIL	Health investigation level
HM	Heavy metals
HSL	Health screening level
IA	Investigation area
ISQG	Interim Sediment Quality Guideline
ITP	Inspection Testing Plan
LGA	Local government area
LNAPL	Light non aqueous phase liquid
LOR	Limit of reporting (interchangeable with EQL and PQL)
MA	Martens & Associates Pty Ltd
mAHD	Metres, Australian Height Datum
mbgl	Metres below ground level

MBT	Monobutyltin
MNA	Monitored natural attenuation
MPE	Multi phase extraction
NAPL	Non aqueous phase liquid
NATA	National Association of Testing Authorities
ND	No data
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
OCP	Organochloride pesticides
OEH	NSW Office of Environment and Heritage
OPP	Organophosphorus pesticides
PACM	Potential asbestos containing material
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soil
PCB	Polychlorinated biphenyl
PCEMP	Post Construction Environmental Management Plan
PESA	Preliminary Environmental Site Assessment
PFAS	Per- and polyfluoroalkyl substances
PID	Photoionisation detector
ppb	Parts per billion
ppm	Parts per million
PQL	Practical quantitative limit (interchangeable with EQL and LOR)
PSI	Preliminary Site Investigation
QA/QC	Quality assurance / quality control
RAC	Remediation acceptance criteria
RAP	Remedial Action Plan
HHRA	Human Health Risk Assessment
RPD	Relative percentage difference
SAC	Site assessment criteria
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environmental Planning Policy
SIL	Soil investigation level
SOP	Standard operating procedure
SWL	Standing water level
SWMS	Safe Work Method Statement
TB	Trip blank
TBT	Tributyl tin
TCLP	Toxicity characteristics leaching procedure
TEQ	Toxic equivalency factor
TP	Test pit
TPH	Total petroleum hydrocarbons
TRH	Total recoverable hydrocarbons
TS	Trip spike
UCL	Upper confidence limit
UPSS	Underground petroleum storage system
UST	Underground storage tank
VHC	Volatile halogenated compounds
VOC	Volatile organic compounds
WHS	Work health and safety
WHSP	Work Health and Safety Plan

1 Scope of Work

1.1 Overview and Scope

This report, prepared by Martens and Associates (MA), documents a dam dewatering assessment undertaken at 268 & 278 Catherine Fields Road, Catherine Fields, NSW (the site). The assessment was commissioned by Minarah College (the Client) to support a Development Application (DA) to the Camden Council (Council) for a proposed residential subdivision at the site.

Scope of work included:

- Site walkover inspection by an experienced MA engineer, including collection of water and dam sediment samples.
- A walkover inspection of the dam and nearby site areas to ascertain appropriate locations for dam water discharge.
- Collection of a single water sample for laboratory analysis for heavy metals, OC / OP pesticides, TRH, BTEXN and PAH.
- Collection of two sediment samples for laboratory testing. Analysis of samples for heavy metals, OC / OP pesticides, TRH, BTEXN and PAH.
- Dam dewatering and contamination assessment report documenting:
    I. Walkover inspection and site description.
    II. Findings of site investigations and laboratory analysis in accordance with ANZG (2018) and ASC NEPM (1999, amended 2013).
    III. Work method procedure documenting proposed dewatering methods, sediment and erosion control, monitoring, dewatering program and any contingencies.
    IV. Provision of site plan with proposed discharge locations and sediment and erosion control measures.

We note that details of the site supervisor, who will undertake the dewatering, shall be provided by the Client once a contractor has been commissioned for the works.

2 Location and Setting

2.1 Summary

Site information is summarised in Table 1.

Table 1: Site background information.

Item	Description/Detail
Site address	268 & 278 Catherine Fields Road, Catherine Fields, NSW.
Legal Identifier	Lots 11 and 12; DP 833983.
Approximate site area	4.5 ha (QGIS)
Existing site development	The northern lot is occupied by a dwelling in the western portion of the lot and two sheds in the central portion of the lot. The southern lot is occupied by a dwelling and three sheds near the western portion of the lot. One farm dam and one silted in / vegetated farm dam were present near the central portion of the site. The remainder of the site consists of overgrown grass covered land.
Aspect	Site typically has a west facing aspect.
Typical slopes/elevation	The site slopes to the west with typical grades < 5%. Site elevation ranges between approximately 87 mAHD near the eastern boundary and 75 mAHD near the western boundary.
Neighbouring environments	The site was surrounded by rural residential land use to the north, low density residential to the west and south and vegetated bushland to the east. The site is bordered by Catherine Fields Road to the west.
Local Government Area (LGA)	Camden Council
Drainage	Drainage in the east portion of the site is via overland flow to the Council stormwater network on Catherine Hill Road located along the western boundary of the site.
Geology and soil landscapes	The *Penrith 1:100,000 Geological Sheet 9030* describes site geology as Bringelly Shale Formation within the Wianamatta Group, containing shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff. The NSW Environment and Heritage eSPADE website identifies the site as having soils of the Blacktown landscape, having mottled texture contrast soils, red and brown podzolic soils on crests and yellow podzolic soils on lower slopes and in drainage lines.

2.2 Site Walkover and Observations

Site observations of the lot at 268 Catherine Fields Road from the walkover conducted on 19 November 2019 were:

- The site was bordered by Catherine Fields Road to the west.
- The lot was occupied by a dwelling and three sheds near the western portion of the site.
- The eastern portion of the site was consisted of overgrown grass cover.
- A site dam was located in the central portion of the site. The dam appears to have been constructed by excavating an elongated basin. No embankments were observed.
- A second dam with an elongated shape had been filled with silt and was heavily vegetated.

3 Dam Dewatering Assessment

3.1 Dam Water Volume Estimate

Surface area of the dam was estimated to be 240 m^2 (QGIS). Dam depth was estimated at 0.75 m based on visual assessments and a likely gradual deepening towards the dam centre. The volume of water within the dam was estimated using the formula:

Volume = [Dam surface area (m^2) x maximum depth (m) x dam slope conversion factor (0.33)]

The formula estimated the dam volume to be 59.4 kL.

3.2 Contaminants of Primary Concern

Contaminants of potential concern (COPC) for dam silts and dam waters included TRH, BTEXN, PAH, heavy metals, OCP and OPP.

3.3 Sampling Methods

3.3.1 General

Sediment and water samples were placed in laboratory supplied jars, and placed into an esky with ice following collection and dispatched under chain of custody, to a NATA accredited laboratory the day of sampling.

3.3.2 Sediment & Fill Samples

Sediment samples were collected using a hand spade whilst wading in the dam. Sampling locations are provided in Attachment A.

3.3.3 Surface Water

Grab surface water samples were collected from the dam at approximately 0.1 to 0.2 m below the surface.

3.4 Site Acceptance Criteria

The site acceptance criteria (SAC) adopted for this dam dewatering assessment have been derived from the following sources:

- ASC NEPM (1999, amended 2013) for residential properties with accessible soil.
- ANZG (2018) default guideline values (DGV) for 95% species protection in freshwater.

3.5 Investigation Results

3.5.1 Sediment & Fill

Fill and dam sediment samples analysed by the laboratory were below their limits of reporting (LOR) and were less than the NEPM (1999, amended 2013) Health Investigation Levels (HIL-A) and Health Screening Levels (HSL-A) for all contaminants. The sediment material is acceptable to stay on site.

The laboratory certificate is provided in Attachment B.

3.5.2 Dam Water

Dam water sample contaminant levels were below their LOR and less than the ANZG 90% limit.

The laboratory certificate is provided in Attachment B.

4 Dam Dewatering Method

4.1 Dam Water Removal Mechanism

4.1.1 Overview

It is recommended that dewatering be undertaken via surface irrigation over the grassed area, to allow for absorption and evaporation of dam waters at the site. A nominal irrigation area of 5,000 m^2 is shown on the plan in Attachment A.

All personnel associated with the dam dewatering works are to be familiar with this report, particularly Section 4.

4.1.2 Establishment of Irrigation Areas

It is proposed that a single irrigation area (5,000 m^2) to the east of the dam (as outlined in Attachment A) be used for dam water disposal. In order to appropriately irrigate the soil without creating run off or site pooling of water, it is to be irrigated at specified rates (Section 4.1.4).

Dam irrigation application area, irrigation rates, and controls are to be continuously monitored and maintained by site personnel for site erosion. This is further explained in Section 4.3.

4.1.3 Dewatering Methods

It is recommended that dewatering be undertaken via surface irrigation over the grassed area of the site.

4.1.4 Irrigation Rates

The site is expected to be underlain by clay loams (based on soil mapping and geology). A preliminary design irrigation rate of 5mm / day is set subject to system performance review, rate to be reduced or increased to maximise disposal while avoiding runoff.

Using 5 mm / day the proposed irrigation of 59.4 kL over 5,000 m^2 will take approximately three days.

4.1.5 Sediment and Erosion and Surface Flow Controls

Details for erosion and surface flow controls for use during dewatering are to include:

- The irrigation area is to be maintained to ensure irrigation does not result in runoff sufficient to cause erosion. If sediment is mobilised, the irrigation application rate is to be reduced.
- Vegetation coverage is to be maintained over the irrigation area while irrigation occurs.

4.1.6 Dam Sediment Removal

Following dam dewatering, dam sediment shall be removed by excavator down to underlying residual soils and stockpiled on site for reuse, subject to geotechnical advice.

Earth diversion bunds and erosion sediment control (ESC) are to be placed around the stockpiles in accordance with Landcom (2004).

4.2 Sequence Summary and Timeline

1. Install irrigation infrastructure to allow irrigation of the area shown in Attachment A.
2. Dewater dam via irrigation (as per Section 4.1.3).
3. During the dewatering phase, dam walls are to be gradually lowered via excavation as dam water levels decreases. Dewatering is not to cause a dry weather discharge from the dam.
4. Sediment fence to be placed at dam outlet and immediately downslope of outlet to prevent sediment from exiting the dam.
5. Once surface water is removed, excavate dam sediments until underlying clay soils are exposed.
6. Undertake earthworks as required in accordance with approved engineering earthworks plans.

4.3 Monitoring and Contingency Planning

Periodic monitoring during dam dewatering is to be undertaken by the appointed contractor. Monitoring requirements during the dewatering phase include:

- Monitoring of irrigated areas for signs of runoff, erosion, sedimentation and vegetation loss.

Dewatering works are to cease and MA is to be contacted if:

- Observation of surface water or sediments exiting the site.
- Irrigation areas are pooling water.
- Sediment fences fail.
- Significant erosion or overland flow occurs during dewatering.
- Any submerged materials are identified in the dam that are likely to have or may cause contamination of water or sediments.

In the event of wet weather, all dewatering works are to cease until a period of 24 hours has passed where less than 5 mm of rain has been recorded. Should greater than 5 mm of rain be recorded, the site shall be assessed for suitability to recommence dewatering.

5 Discussion and Conclusion

The site dam volume was estimated to be 59.4 kL, and will take approximately three days to dewater, assuming rates provided in Section 4.1.4.

Dam sediment and dam water laboratory analysis (Envirolab report no. 283492) found all tested analytes to be below the adopted SAC, and dam silts are considered suitable for reuse at the site (subject to geotechnical advice).

6 Limitations

It is important to note that no assessment of dam water and sediment conditions can be considered to be a complete and exhaustive characterisation nor can it be guaranteed that any assessment shall identify and characterise all potential contamination, or all past potentially contaminating land uses. Should material be exposed during dam dewatering which appears to be contaminated, additional testing may be required to determine the implications for the site.

Martens & Associates Pty Ltd has undertaken this assessment for the purposes of assessing dam water and sediment quality, to provide a dam dewatering plan. No reliance on this report should be made for any other investigation or proposal. Martens & Associates Pty Ltd accepts no responsibility, and provides no guarantee regarding the characteristics of areas of the site not specifically studied in this investigation.

This dewatering assessment only provides advice regarding the dam dewatering and does not provide any advice regarding geotechnical or civil engineering of the project.

7 References

Australian and New Zealand Environment and Conservation Council (ANZG) (2018), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Geological Survey of NSW (1991), *Penrith 1: 100,000 Geological Series Sheet 9030.*

Landcom (2004), *Managing Urban Stormwater: Soils and Construction, Volume 1.*

NSW Environment and Heritage, Espade: NSW Soil and Land Information, *Blacktown residual soil landscape*.

NEPC (1999, amended) *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).*

8 Attachment A – Site Plan

Legend

- Cadastre
- Site Boundary
- Dam Water Sample
- Dam Sediment Sample
- Former Dam - Silted and Vegetated
- Dam
- Irrigation Area

DS01 DW01 DS02

N

0 10 20 30 40 50 m

1:1000 @ A3

Map Title / Figure:

Dam Dewatering Assessment Plan

Map 01	Map
268 and 278 Catherine Fields Road, Catherine Fields, NSW.	Site
Minarah College – Catherine Field	Project
Dam Dewatering Assessment	Sub-Project
Minarah College	Client
06/04/2022	Date

martens
Environment | Water | Geotechnics | Civil | Projects

Project No: P2108320 Map Set: MS03-R01 EPSG: 28356

9 Attachment B – Laboratory Certificate

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ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 283831

Client Details

Client	Martens & Associates Pty Ltd
Attention	Maheer Hasan
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P2108320COC01V01: 268 & 278 Catherine Fields**
Number of Samples	5 soil
Date samples received	25/11/2021
Date completed instructions received	25/11/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

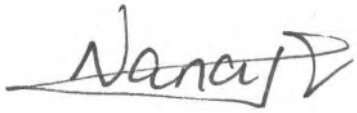
Date results requested by	02/12/2021
Date of Issue	02/12/2021

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Metals Supervisor
Manju Dewendrage, Prep Team Leader
Nick Sarlamis, Assistant Operation Manager

Authorised By



Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		283831-1	283831-2	283831-3	283831-4	283831-5
Your Reference	UNITS	8320/BH101/0.2-0.3	8320/BH106/0.7-0.8	8320/BH107/0.7-1.0	8320/BH110/1.2-1.4	8320/BH111/0.6-1.1
Date Sampled		22/11/2021	22/11/2021	22/11/2021	22/11/2021	22/11/2021
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Date analysed	-	30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
pH 1:5 soil:water	pH Units	6.6	6.7	6.6	5.2	5.5
Electrical Conductivity 1:5 soil:water	µS/cm	48	41	81	430	500
Chloride, Cl 1:5 soil:water	mg/kg	25	10	38	610	740
Sulphate, SO4 1:5 soil:water	mg/kg	10	10	33	190	180
Resistivity in soil*	ohm cm	210	240	120	23	20

Acid Extractable Cations in Soil						
Our Reference		283831-1	283831-2	283831-3	283831-4	283831-5
Your Reference	UNITS	8320/BH101/0.2-0.3	8320/BH106/0.7-0.8	8320/BH107/0.7-1.0	8320/BH110/1.2-1.4	8320/BH111/0.6-1.1
Date Sampled		22/11/2021	22/11/2021	22/11/2021	22/11/2021	22/11/2021
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	29/11/2021	29/11/2021	29/11/2021	29/11/2021	29/11/2021
Date analysed	-	30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Magnesium	mg/kg	1,100	1,000	1,400	1,100	1,100

Moisture						
Our Reference		283831-1	283831-2	283831-3	283831-4	283831-5
Your Reference	UNITS	8320/BH101/0.2-0.3	8320/BH106/0.7-0.8	8320/BH107/0.7-1.0	8320/BH110/1.2-1.4	8320/BH111/0.6-1.1
Date Sampled		22/11/2021	22/11/2021	22/11/2021	22/11/2021	22/11/2021
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	26/11/2021	26/11/2021	26/11/2021	26/11/2021	26/11/2021
Date analysed	-	29/11/2021	29/11/2021	29/11/2021	29/11/2021	29/11/2021
Moisture	%	20	19	22	14	19

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity (non NATA). Resistivity (calculated) may not correlate with results otherwise obtained using Resistivity-Current method, depending on the nature of the soil being analysed.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	283831-2
Date prepared	-			30/11/2021	1	30/11/2021	30/11/2021		30/11/2021	30/11/2021
Date analysed	-			30/11/2021	1	30/11/2021	30/11/2021		30/11/2021	30/11/2021
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.6	6.6	0	99	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	48	54	12	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	25	36	36	113	118
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	10	10	0	115	126
Resistivity in soil*	ohm cm	1	Inorg-002	<1	1	210	180	15	[NT]	[NT]

QUALITY CONTROL: Acid Extractable Cations in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	283831-2
Date prepared	-			29/11/2021	1	29/11/2021	29/11/2021		29/11/2021	29/11/2021
Date analysed	-			30/11/2021	1	30/11/2021	30/11/2021		30/11/2021	30/11/2021
Magnesium	mg/kg	10	Metals-020	<10	1	1100	1200	9	97	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Cations in soil - # Percent recovery is not applicable due to the high concentration of the element in the sample. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY FORM

martens consulting engineers since 1989
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Laboratory Testing										
Project	GEOTECHNICAL INVESTIGATION: 268 & 278 CATHERINE FIELDS ROAD, CATHERINE FIELD, NSW 2557									
Martens Contact Officer	Maheer Hasan			**Contact Email**	mhasan@martens.com.au					
Sampling and Shipping	**Sample Date**	22/11/2021	**Dispatch Date**	25/11/2021	**Due Date**			Standard		
	Our Reference	P2108320COC01V01		**Shipping Method (x)**	**Hand**		**Post**		**Courier**	X
	On Ice (X)		**No Ice (X)**	**X**	**Other (X)**					
Laboratory										
Name	Envirolab Services Pty Ltd									
Sample Delivery Address	12 Ashley St, Chatswood NSW 2067									
Delivery Contact	**Name**	Simon Song		**Phone**	02 99106200	**Fax**		**Email**	Samplereceipt@envirolabservices.com.au	
Please Send Report BY (X)	**Post**		**Fax**		**Email**	**X**	**Reporting Email Address**		mhasan@martens.com.au skarasu@martens.com.au	

Item	Sample ID	Ph	EC	soluble SO4	Cloride	Resisitivity (ohm.cm)	Mg		Notes
1	8320/BH101/0.2-0.3	X	X	X	X	X	X		
2	8320/BH106/0.7-0.8	X	X	X	X	X	X		
3	8320/BH107/0.7-1.0	X	X	X	X	X	X		
4	8320/BH110/1.2-1.4	X	X	X	X	X	X		
5	8320/BH111/0.6-1.1	X	X	X	X	X	X		

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 283831
Date Received: 25-11-2021
Time Received: 1230
Received By: DJT
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None