APPENDIX A BP33 GEOCHEMICAL CHARACTERISATION REPORT

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EcOz Environmental Consultants

Core Lithium BP33 Project

Geochemical characterisation of waste rock and ore

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Environmental
Geochemistry
International

ENVIRONMENTAL GEOCHEMISTRY
INTERNATIONAL PTY LTD

ABN 48 600 298 271

81A COLLEGE STREET
BALMAIN, NSW 2041 AUSTRALIA

T +61 2 9810 8100
E EGI@GEOCHEMISTRY.COM.AU
W WWW.GEOCHEMISTRY.COM.AU

TO:	EcOz Environmental Consultants
ATTENTION:	Suzanne Barber
FROM:	EGi
DATE:	26/03/2020
Job No.:	J000390
REFERENCE:	1312/1346
SUBJECT:	Core Lithium BP33Project - Geochemical characterisation of waste rock and ore

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Executive Summary

Environmental Geochemistry International Pty Ltd (EGi) have been commissioned by EcOz Environmental Consultants to undertake data analysis, interpretation and reporting on physical and geochemical analysis results for drill core samples collected from the Core Lithium BP33 project. The BP33 proposal involves excavation of a box cut portal to a depth of 60 m and construction of a 400 m long decline from the base of the box cut to access the spodumene deposit located beneath the historically worked open pit. The total volume of material mined over the four-year life of mine will be 2,095 kt (comprising 99 kt ore and 1,996 kt of waste rock). Waste rock from BP33 will be stored in onsite waste rock dumps (WRD), including a box cut WRD and underground WRD. At the end of the mine life waste rock will be used to backfill the box cut and underground workings. Ore mined at BP33 will be transported to the Grants processing facility approximately 7 km to the north-west. Tailings will be deposited in the Tailings Storage Facility constructed as part of the Grants Project.

Sampling and analysis of waste rock was undertaken during the exploration drilling program. Fifty-four samples were selected by EcOz from holes drilled in July 2018 (FRC166 – FRC171) and submitted for a limited suite of analyses comprising Total S, paste pH and EC (1:5) and exchangeable cations. A further 48 samples were selected from holes drilled during September 2019 (NRC129 and FRC212 – FRC214). Four of these were surface (soil) samples submitted for paste pH and EC (1:5), KCl extractable S, bulk density, moisture, colour/texture/Emerson Class No, PSD, exchangeable cations, total metals, N & P and TOC analysis. The remaining 44 samples were submitted for a more comprehensive suite of analyses comprising Total S, acid neutralising capacity (ANC), net acid generation (NAG), paste pH and EC (1:2), exchangeable cations, soluble metals, leachable metals, and naturally occurring radioactive materials (NORM) measuring radiation dose.

The results for the four soil samples suggest that soil at the site is an infertile, gravelly sandy loam. The Emerson test indicates that the soil should be non-dispersive, but given the low organic matter level and sandy texture, the soil likely has poor structure and limited water-holding capacity, and therefore could be susceptible to erosion under wet conditions. It is expected successful rehabilitation will require increasing the physical and chemical fertility of the soil to some extent, consistent with the proposed final end use.

Excluding the four soil samples, the materials tested included 9 ore samples and 89 waste rock samples. Waste rock samples included highly weathered, transitional and fresh rock. All 9 ore samples, together with 35 of the 89 waste rock samples, underwent the full suite of testing, with the remaining waste rock samples submitted for limited testing.

Based on the results of tests conducted on the samples described above, the following conclusions can be made:

- The rock type and oxidation profiles for samples used for geochemical analysis indicate that these samples reasonably represent the lithology and oxidation profile of waste rock and ore from all drill holes and therefore the waste rock and ore in the BP33 deposit overall.
- The samples used for this initial geochemical study would appear to adequately cover variations in rock types and alterations that will be encountered during the mining operation.
- Oxidised waste rock samples are largely devoid of sulphur and are classified as non-acid forming (NAF). Water extracts have very low salinity. This indicates that oxidised waste rock, which will form the majority of rock excavated during development of the box cut and the majority of waste rock generated during the project as a whole, will present a very low risk of acid rock drainage (ARD) or saline drainage (SD). However, drainage from oxidised rock stored in the Box cut WRD may contain low concentrations of aluminium and zinc.
- Transitional waste rock, which will comprise a small portion of the rock removed during development of the box cut and the mine decline, is generally low in sulphur content and can, in the main, be classified as NAF. Transitional samples also gave water extracts with low salinity. These results show that transitional rock will present a low risk of ARD or SD.
- Fresh waste rock will comprise the major portion of rock removed during development of the underground mine and therefore of waste rock stored in the underground WRD. However, the volume of fresh waste rock mined will be relatively small (<10% of the total volume). Fresh waste rock is generally low in sulphur content, but with some areas of higher sulphur. Higher sulphur content appears to be associated with fresh phyllite. Most fresh waste rock can be classified as NAF, but there is evidence that fresh phyllite may include PAF material. This material appears to have limited readily

available ANC. Fresh waste rock samples also produced water extracts with low salinity, although salinity was higher than for other rock types. Fresh rock may also contain water leachable arsenic and zinc. These results show that fresh waste rock may present some risk of ARD and/or arsenic and zinc in drainage from the UG WRD, but further testing is required to confirm these findings and to quantify the likely volume of PAF material in fresh waste rock.

- Testing of ore samples showed that this material is devoid of sulphur and can be classified as NAF, indicating very low risk of ARD from tailings produced from processing of the ore. Water extracts from the ore also had relatively low salinity, but higher than any of the waste rock samples tested, indicating low risk of SD from tailings.
- The potential radiation dose from all of the samples tested was well below guidelines for occupational radiation exposure, indicating that these materials are unlikely to pose a risk from radiation exposure.

Based on these test results, there remains some uncertainty around the acid generating properties of fresh waste rock samples with higher sulphur content (>0.2% S). The current set of samples from holes drilled in 2018 and 2019 includes 8 samples with a total S >0.2%. However, only one of these samples was sourced from the 2019 drill hole samples which were used for ABA and NAG testing. Thus, the current geochemical test results are under-represented in samples with higher sulphur content, preventing better definition of the amount of PAF material present in fresh phyllite and development of potential segregation criteria, should this type of material require specific management to prevent ARD. Results also indicate that drainage from oxidised rock stored in the Box cut WRD may contain low concentrations of aluminium and zinc and some of the fresh rock stored on the UG WRD may contain water leachable arsenic and zinc. These waste storages will be temporary, with waste rock returned underground or into the box cut. However, the results to date provide no information on the kinetics of aluminium, arsenic and zinc leaching and whether this could be an issue during short-term surface storage.

Consequently, it is recommended that the following tests be undertaken to clarify these issues:

- Complete ANC and NAG testing on selected samples from drill holes FRC166 – FRC171, focusing on, but not exclusively, samples with sulphur content >0.2 %S. Ideally all fresh and transitional waste rock from the 2018 drill holes should be included in the test program.
- Kinetic testing (leach columns) of oxidised and fresh rock samples to confirm initial results of aluminium, arsenic and zinc leachability and to define the kinetics of this process. Kinetic leach column (KLC) testing should be conducted under oxic conditions to simulate conditions during storage in WRD and in the unsaturated zones within the backfilled UG mine and boxcut. Following a period of leaching under oxic conditions, KLC tests should be conducted under saturated conditions to simulate the leaching properties of backfilled waste which will be placed below the water table upon rebound.

Current test results suggest that the risk of ARD from surface storage of waste rock from the underground mine will be low, due to the likely low volume of PAF material present in fresh waste rock. However, currently there is insufficient evidence to say conclusively that there will be no PAF material removed from the underground mine which may require management to mitigate ARD. Depending on outcomes from the recommended follow-up tests, it may be necessary to undertake more detailed static testing to refine ARD classification of some waste rock, in addition to kinetic testing to provide better definition of the ARD properties of any PAF material identified. These more detailed tests, if required, would inform ARD management plans should the need arise.

1. Introduction

Environmental Geochemistry International Pty Ltd (EGi) have been commissioned by EcOz Environmental Consultants to undertake data analysis, interpretation and reporting on physical and geochemical analysis results for drill core samples collected from the Core Lithium BP33 project. Core are seeking to progress approvals for underground mining at their BP33 deposit. The first step in the approvals process is to submit a Notice of Intent (NOI) to the NT Environmental Protection Authority (NT EPA). EcOz have been engaged by Core Lithium to assist with environmental approvals for proposed spodumene (lithium) mining activities and this work is intended to inform environmental approvals for the current NOI.

The BP33 deposit is a part of Core's Finniss Lithium Project, located in the Northern Territory on the Cox Peninsula, approximately 23 km southwest of Darwin or 90 km by road (Figure 1). The BP33 proposal involves excavation of a box cut portal to a depth of 60 m and construction of a 400 m long decline from the base of the box cut to access the spodumene deposit located beneath the historically worked open pit. The total volume of material mined over the four-year life of mine will be 2,095 kt (comprising 99 kt ore and 1,996 kt of waste rock). Waste rock from BP33 will be stored in onsite waste rock dumps (Figure 2) and at the end of the mine life will be used to backfill the box cut and the underground mine. Ore mined at BP33 will be transported to the Grants processing facility approximately 7 km to the north-west. Tailings will be deposited in the Tailings Storage Facility constructed as part of the Grants Project.

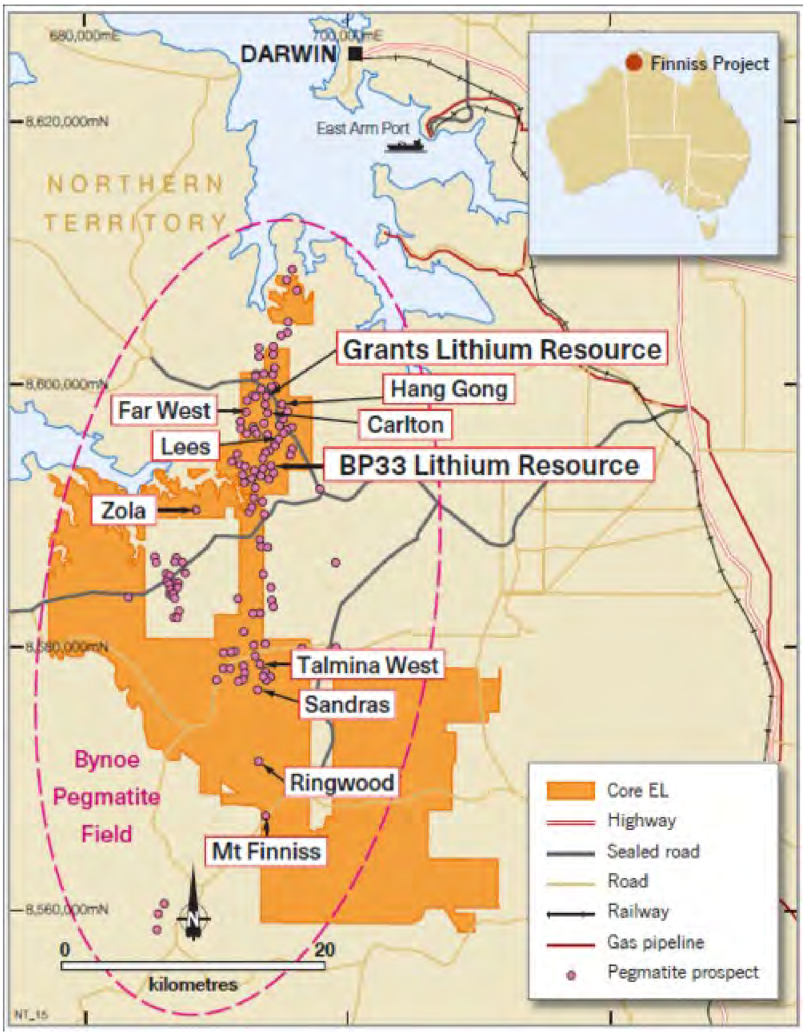
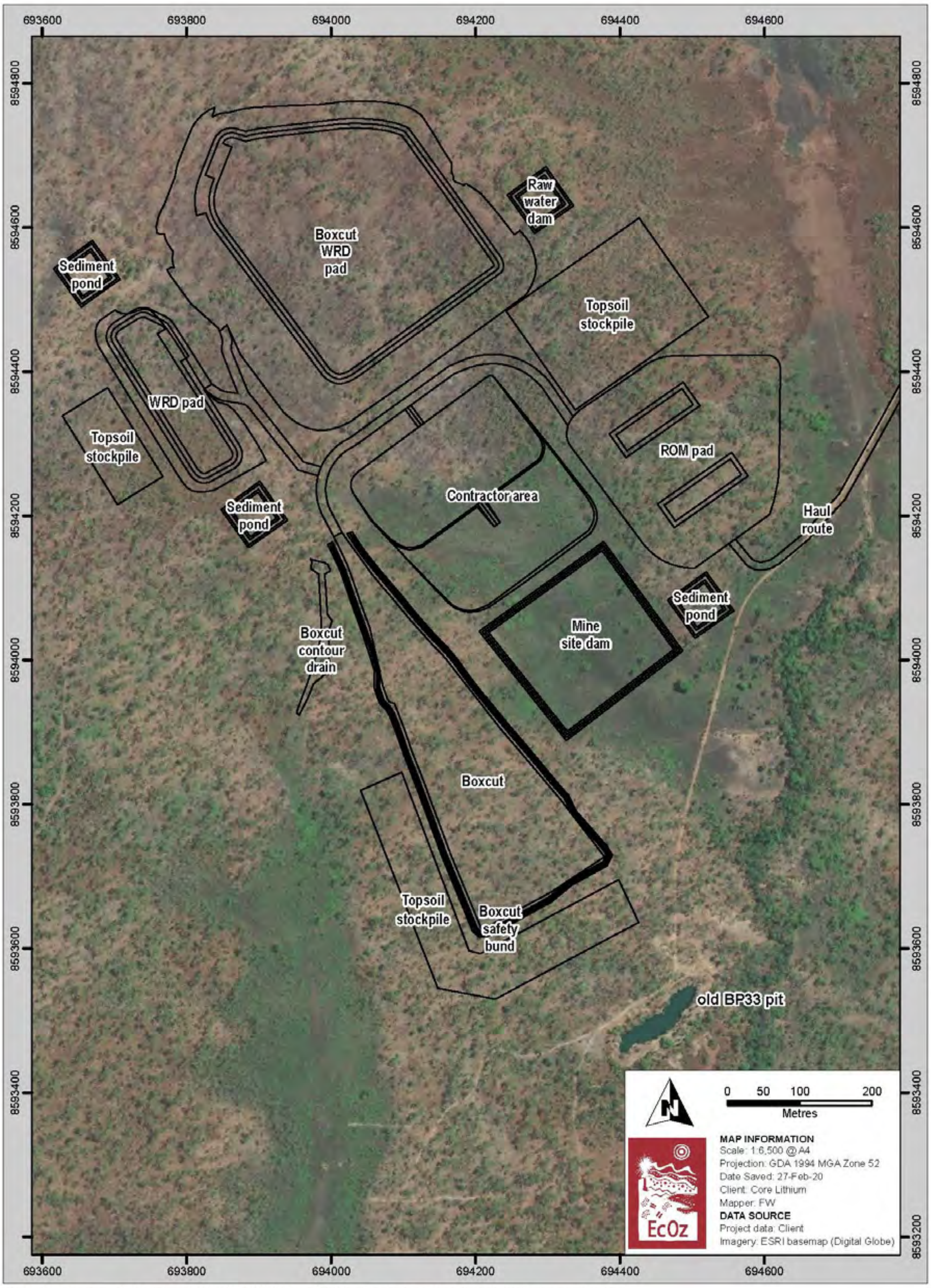


Figure 1: BP33 Resource within the larger Bynoe Pegmatite Field and Core's Finniss Lithium Project



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Report maps\Figure 3-3. Map of mine site footprint and preliminary layout.mxd

Figure 2: Map of mine site footprint and preliminary layout

Ore from the BP33 Lithium Deposit occurs in a rare element pegmatite that is a member of the Bynoe Pegmatite Field. Fresh pegmatite at BP33 is composed of coarse spodumene, quartz, albite, microcline and muscovite (in decreasing order of abundance). Spodumene, a lithium-bearing pyroxene ($LiAl(SiO_3)_2$), is the predominant lithium-bearing phase. The pegmatites are predominantly hosted within the early Proterozoic metasedimentary lithologies of the Burrell Creek Formation (BCF) and are usually conformable to the regional schistosity. The principal rock type of the BCF is phyllite, a low-grade metamorphic equivalent of an immature sandy siltstone. In fresh form, the phyllite is grey, finely bedded or cleaved, and is composed of quartz, feldspar, lithic fragments, micas and clay.

Fresh pegmatite hosting the ore is overlain by around 40 m of weathered rock and approximately 20 m of transitional rock. The box cut is required to provide geotechnically stable conditions for development of the UG portal and decline of the proposed UG mine. To achieve this, the portal needs to be developed in transitional and fresh rock requiring excavation of waste material down to at least 10 m below the oxidised zone. At BP33 the required depth of excavation is between 60 m and 70 m. This means that most of the waste rock excavated during this project will be sourced from the box cut, with a minor amount (<10%) sourced from the underground mine development. As the majority of the rock removed during construction of the box cut will be within the oxidised rock zone, a large proportion of rock stored in the Box cut WRD will be oxide material. In contrast, most waste stored in the UG WRD will comprise fresh rock. All waste rock will be used to refill the box cut and UG mine at completion of the mining operation. Some of the waste rock used for backfilling will also include some transitional and fresh rock which will have potentially undergone some atmospheric oxidation during surface storage.

As part of the mine planning and approvals process, physical and geochemical characterisation of the waste material and tailings is required to inform assessment of risks associated with acid, metalliferous (ARD), saline (SD) or neutral mine drainage (NMD); mine closure and rehabilitation. This report describes results from analysis of geochemical data provided by EcOz to EGi, and assessment of these results to determine the likelihood of acid and metalliferous, neutral mine or saline drainage as a consequence of the proposed BP33 mine project.

2. Samples

Sampling and analysis of waste rock was undertaken during the exploration drilling program. Fifty-four samples were selected by EcOz from holes drilled in July 2018 (FRC166 – FRC171) (Figure 3) and submitted for a limited suite of analyses comprising Total S, paste pH and EC (1:5) and exchangeable cations. A further 48 samples were selected from holes drilled during September 2019 (NRC129 and FRC212 – FRC214) (Figure 3). Four of these were surface (soil) samples submitted for paste pH and EC (1:5), KCl extractable S, bulk density, moisture, colour/texture/Emerson Class No, PSD, exchangeable cations, total metals, N & P and TOC analysis. The remaining 44 samples were submitted for a more comprehensive suite of analyses comprising Total S, acid neutralising capacity (ANC), net acid generation (NAG), paste pH and EC (1:2), exchangeable cations, soluble metals, leachable metals, and naturally occurring radioactive materials (NORM) measuring radiation dose.

Soil samples were collected from the topsoil prior to drilling. Waste rock samples were collected at each point where the material from the drill hole changed. Each lithology, and each alteration and each oxidation type within each lithology was sampled separately (compositing of samples was not undertaken) as encountered down hole. Samples were also collected from the ore zone, as well as the waste, to provide for geochemical characterisation of tailings. Field duplicates were collected at a frequency of 1 per 20 primary samples. The duplicates were taken from the same metre as the primary samples. Sufficient material to produce both the primary and duplicate sample was placed in a stainless steel bowl and thoroughly mixed to ensure a homogenous sample. The mixed sample was then split and distributed evenly amongst the required bags and jars for the primary and duplicate samples.

In addition to analysis results, EGi were also supplied with geology logs from the drilling program. Based on these logs, the spread of sample lithologies and degree of oxidation were determined. Materials with weathering codes CW, EW and HW were defined as oxide, MW and SW as transition, and FR as fresh. The results of this analysis are shown in Figure 4. Samples from drill holes FRC166 – FRC171 (2018), NRC129 and FRC212 – 214 (2019) are dominated by phyllite and pegmatite, with minor sandstone, quartz and quartz veining. Phyllite samples represented the full oxidation profile, while pegmatite samples were primarily fresh, including ore samples. The same analysis was conducted using only samples from drill holes NRC129 and FRC212 – 214, and from the sub-set of samples from these drill holes which were selected for geochemical analysis. These results are also shown in Figure 4. This analysis shows that the samples from the 2019 drill holes (Fig. 4 middle) showed similar rock type and oxidation profiles to that for the combined drill hole set (Fig. 4 top), albeit with a slightly higher representation of ore samples. Similarly, the rock type and oxidation profiles for samples used for geochemical analysis (Fig. 4 bottom) indicate that these samples reasonably represent the lithology and oxidation profile of waste rock and ore from all drill holes and therefore the waste rock and ore in the BP33 deposit overall.

Leading practice actions to minimise ARD risk through life of mine cycle suggest that during the resource definition phase of a project, geochemical testing, focusing on static testing (net acid producing potential (NAPP)/NAG), should include at least 5 – 10 samples for each key identified lithology/alteration type[1]. Given the relative homogeneity of the Burrell Creek Formation[2] and the limited number of major lithologies identified during the drilling program at BP33, the 44 samples used for this initial geochemical study would appear to adequately cover variations in rock types and alterations that will be encountered during the mining operation. As the project develops, further sampling and testing may be required to complement and verify the results of this study.

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[1] Preventing Acid and Metalliferous Drainage, Leading Practice Sustainable Development Program for the Mining Industry, Commonwealth of Australia, 2016

[2] Grants Lithium Environmental Impact Statement, Appendix E Materials Characterisation Report, EcOz Environmental Consultants, October 2018

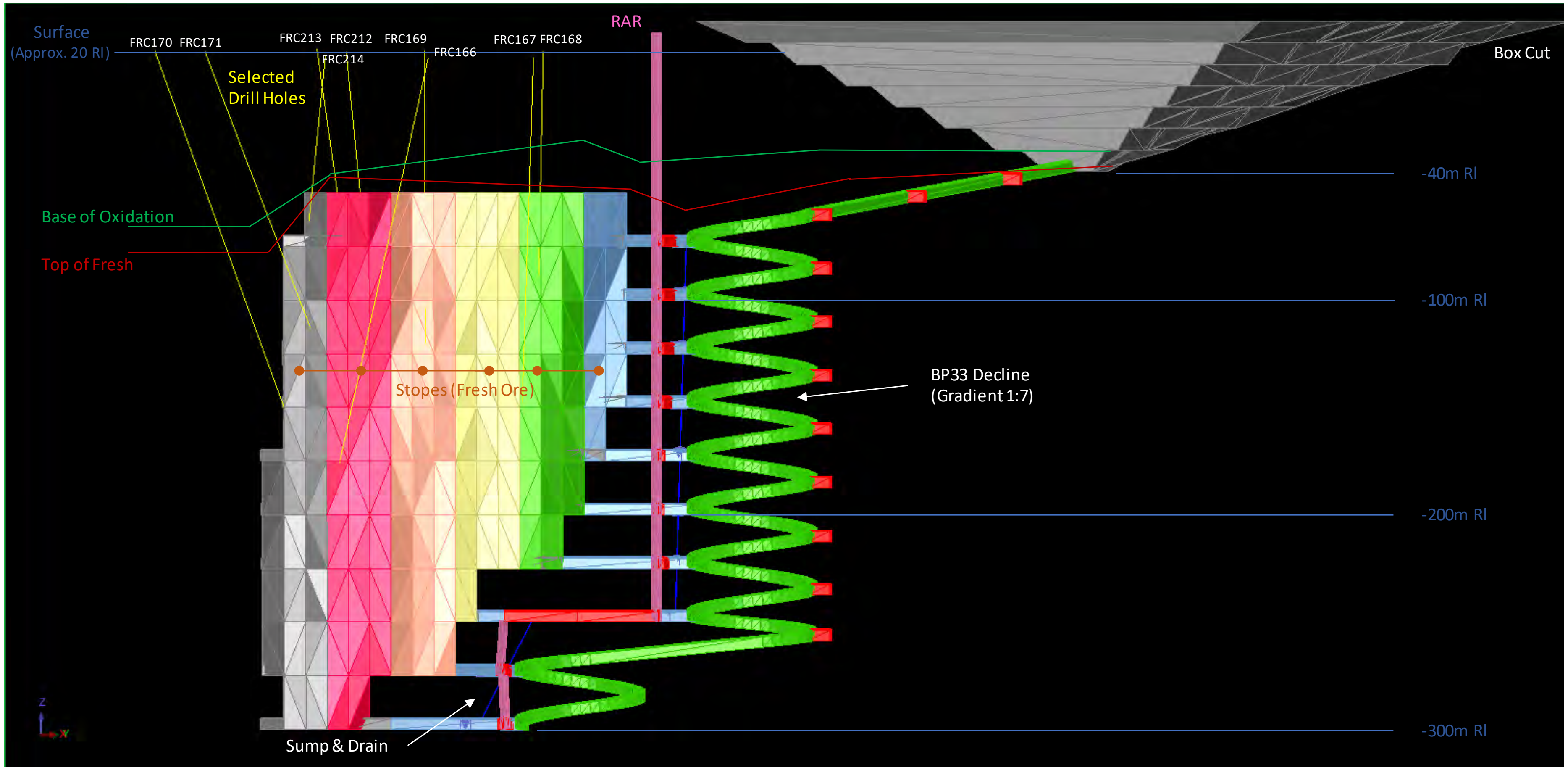
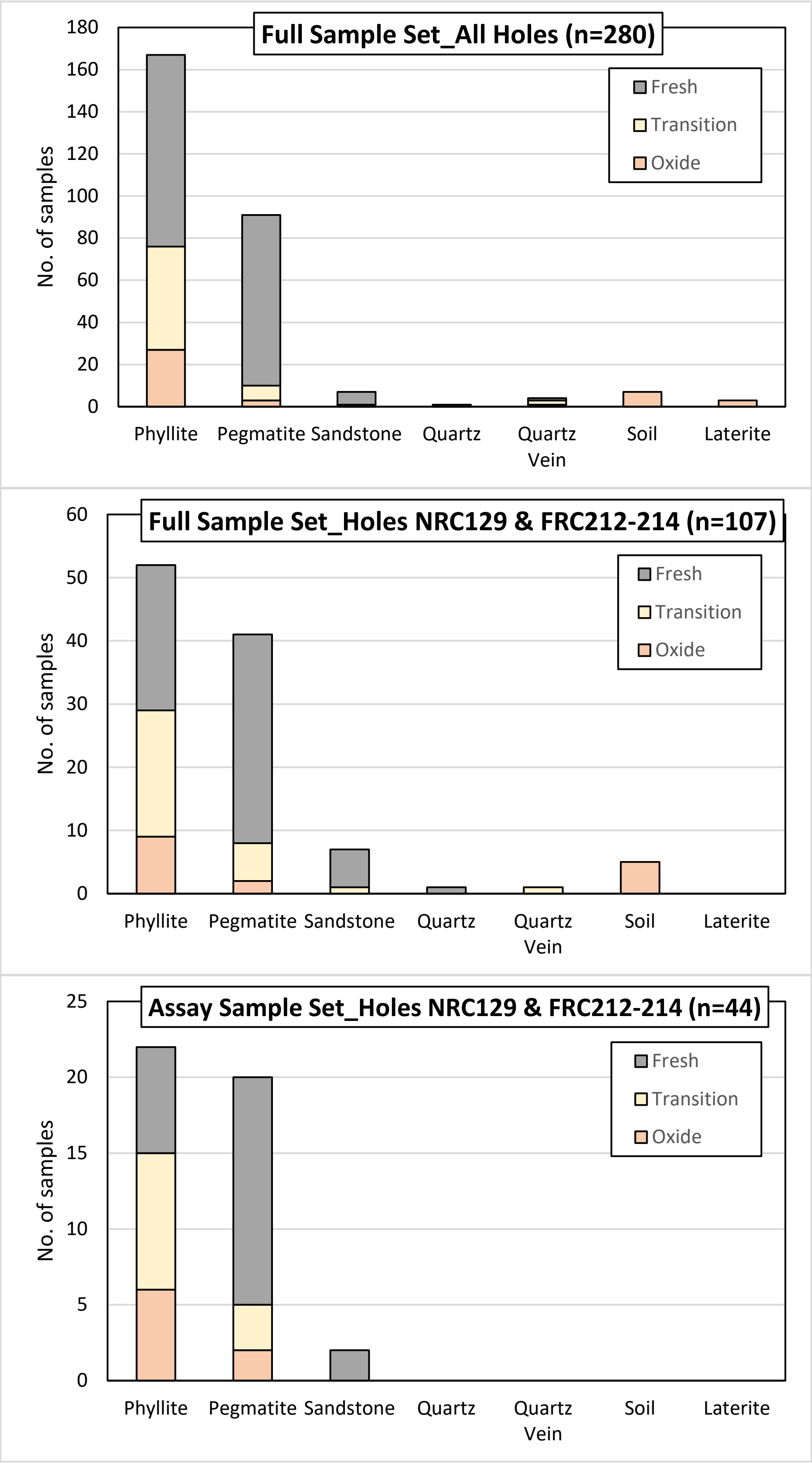


Figure 3: Location of drill holes used for resource definition and waste rock characterisation of the BP33 deposit and relation to proposed box cut and mine development


Full Sample Set_All Holes (n=280)

Full Sample Set_Holes NRC129 & FRC212-214 (n=107)

Assay Sample Set_Holes NRC129 & FRC212-214 (n=44)

Figure 4: Sample numbers by lithology and oxidation for the whole set of samples from drill holes from 2018/2019 (FRC166 – FRC 171, NRC129 and FRC212 – FRC214) for the BP33 project (top), all samples from the 2019 drill holes (NRC129 and FRC212 – FRC214) (middle) and samples from 2019 drill holes selected for geochemical testing (bottom).

3. Results

3.1 Analytical Data Quality

Five field duplicate samples were submitted as a part of the analytical quality control process. These field duplicate samples were analysed for the same full suite of analyses as the 44 samples used for geochemical characterisation. Relative standard deviations (RSD) for all analyses conducted on duplicate samples were on average less than 6%, indicating that the whole analytical process including sample collection, preparation and analysis was providing acceptable precision for the analytical results. QC data reported by the analytical laboratory demonstrated satisfactory accuracy and precision in the analytical results with all duplicate analyses, laboratory spikes (QC standards) and matrix spikes providing acceptable values for repeatability and recovery.

3.2 ARD, NMD and SD characterisation

ABA and NAG Testing

Acid forming characterisation data are provided in Appendix A. Analyses included paste pH and EC, and Total S for all samples (drill holes NRC129 and FRC212 – FRC214 and FRC166 – FRC171), and also included ANC and NAG test results for samples from drill holes NRC129 and FRC212 – FRC214.

Figure 5 shows an ARD classification plot for the 44 samples for which both acid base accounting (ABA) (Total S and ANC) and NAG testing results were available. The ARD classification plot, plots NAGpH against NAPP. NAPP represents the balance between acid potential (MPA) and neutralising potential (ANC), i.e. NAPP = MPA – ANC. Where NAPP values are negative i.e. excess neutralising capacity, and NAGpH is greater than 4.5, samples are classified as non-acid forming (NAF). Conversely when samples are NAPP positive (excess acidity) and NAGpH is below 4.5, samples are classified as potentially acid forming (PAF). Where there is a conflict between NAPP and NAG results, samples are classified as uncertain (UC). In this case, further testing is usually required to resolve the uncertain classification.

For the BP33 drill hole samples, 40 of the 44 samples clearly plotted in the NAF classification. The remaining 4 samples were all NAPP negative, but with NAGpH<4.5, although two of these samples gave a NAGpH only just below 4.5. Three of the samples plotting in the UC classification were fresh or slightly weathered phyllite, with one fresh pegmatite sample.

The slightly acidic NAG liquors for the 4 samples plotting in the UC category, suggests that the neutralising capacity measured by the ANC test method (pH typically 1.5 – 2) overestimated the amount of neutralising capacity available during the NAG test (pH 3.4 – 4.4). Although the carbonate content was not determined for these samples, these results indicate there are negligible or limited carbonate neutralising minerals in these rocks and that the majority of ANC is probably derived from silicate minerals. During NAG testing of the 4 UC samples, the pH has not dropped sufficiently to result in dissolution of these silicates at a rate fast enough to provide significant neutralising capacity. This has likely resulted in the UC classification.

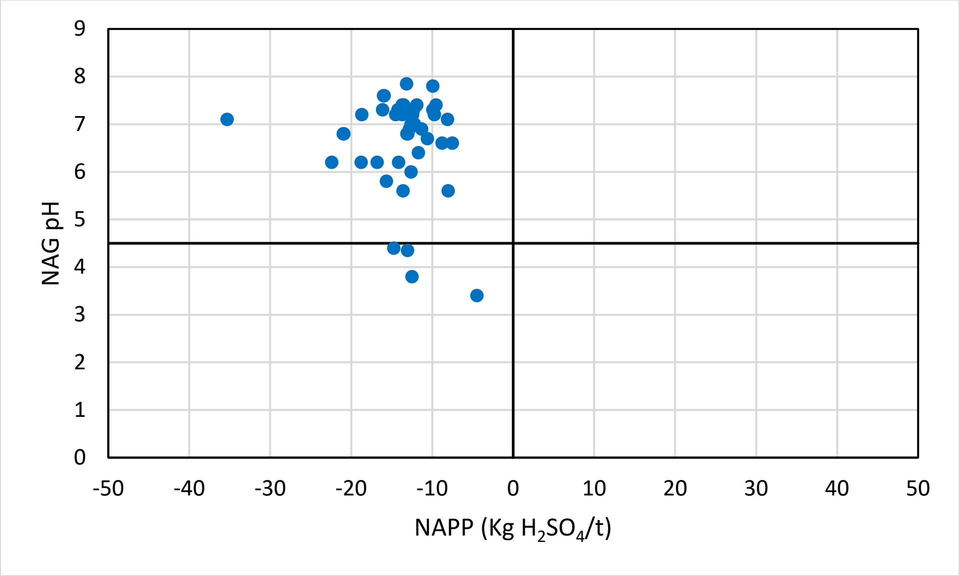


Figure 5: ARD classification plot for samples from drill holes NRC129 and FRC212 – FRC 214

Figure 6 shows NAGpH plotted against Total S for the ARD classification samples set. This plot shows that the majority of these materials contain very little sulphur and consequently NAGpH are circum-neutral. The plot also suggests that for samples with a Total S content above around 0.2% may have a NAGpH below 4.5, although this relationship is based on a very limited number of samples.

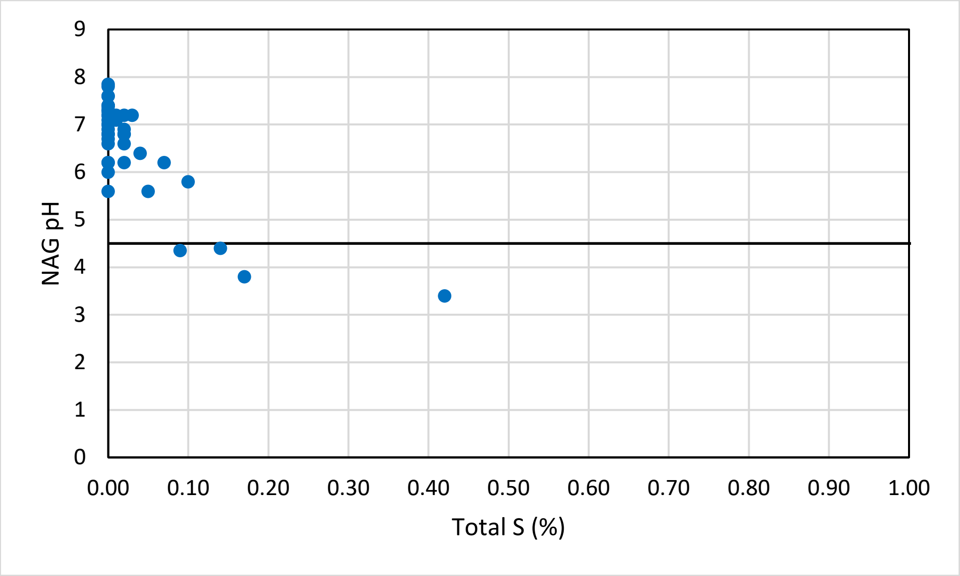


Figure 6: NAGpH vs Total S for samples from drill holes NRC129 and FRC212 – FRC 214

Figure 7 shows Total S results for 98 samples from drill holes NRC129 and FRC212 – FRC214 and FRC166 – FRC171. While only one sample from the 44 samples which underwent NAG testing had a Total S content above 0.2% (NAGpH 3.4), a somewhat higher percentage of samples from the samples which did not undergo NAG testing had a Total S content above 0.2%, although the number is still relatively small (8% of all samples). This suggests that while the majority of samples from these drill holes have very limited sulphur content and no potential for acidic drainage, there are a small but significant number of samples which have higher sulphur content and therefore could be potentially acid forming. The potential for limited neutralising capacity derived principally from silicate minerals in these samples, also indicates that even slightly elevated sulphur may result in acid generation. Further analysis is required to investigate the acid generating potential of these higher sulphur samples.

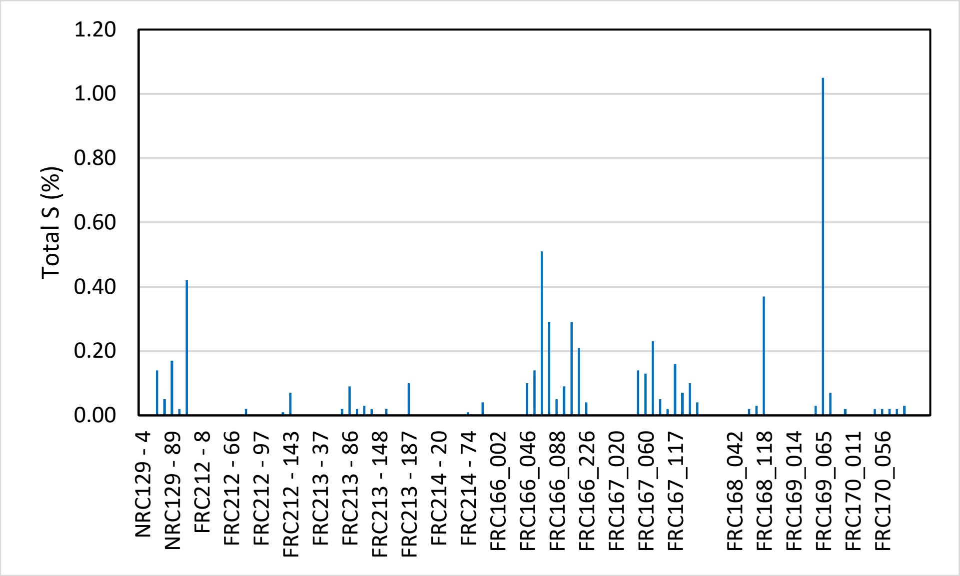


Figure 7: Total S for samples from drill holes NRC129 and FRC212 – FRC 214 and FRC166 – FRC171

A summary of acid base accounting (Total S and ANC) and NAG test results as a function of rock type (lithology and weathering) are provided in Table 1 and Table 2 below. Results show that oxidised phyllite is generally devoid of sulphur and therefore does not contain sulphides or metal sulphate salts that on (oxidative) dissolution will produce acidity. This is borne out by NAG test results for oxidised phyllite samples which confirm the lack of acid generation from these samples.

As the degree of oxidation decreases, the concentration of sulphur in the phyllite samples increase, as does the neutralising capacity. NAG test results suggest that the increasing sulphur content is more influential than increasing ANC on NAGpH, since NAGpH tends to decrease and NAG values increase as oxidation decreases. These results indicate that the vast majority of waste rock stored in the box cut WRD during operations will not produce acidity as most of this material will be oxidised rock. However, rock from the underground development stored in the UG WRD (Figure 2), is more likely to contain material with higher sulphur content and might therefore contain some PAF material.

Fresh pegmatite which hosts the ore (spodumene) is, like oxidised phyllite, generally barren with respect to sulphur (Table 1) and the NAG test results (Table 2) confirm the lack of acid generating potential. As ore samples appear to be exclusively NAF, tailings produced during processing of the ore is also likely to be non-acid forming.

Table 1: Total S and ANC by rock type and weathering

Rock Type	Totals S (%)		ANC (kg H_2SO_4/t)	
	Mean	Maximum	Mean	Maximum
Oxidised phyllite	<0.01	<0.01	10	14
Transitional phyllite	0.05	0.51	15	19
Fresh phyllite	0.14	1.05	18	23
Fresh pegmatite[1]	0.03	0.09	18	36
Ore	<0.01	0.02	13	19

1. Excludes ore samples

Table 2: NAGpH and NAG$_{4.5}$ and NAG$_7$ by rock type and weathering

Rock Type	NAGpH		NAG$_{4.5}$ (kg H_2SO_4/t)		NAG$_7$ (kg H_2SO_4/t)	
	Mean	Minimum	Mean	Maximum	Mean	Maximum
Oxidised phyllite	6.9	5.6	<0.1	<0.1	0.4	1.3
Transitional phyllite	6.8	4.4	<0.1	0.2	1.1	4.3
Fresh phyllite	5.7	3.4	1.0	2.8	5.5	8.2
Fresh pegmatite[1]	6.4	4.4	<0.1	0.3	0.7	2.4
Ore	7.1	6.0	<0.1	<0.1	0.7	3.8

1. Excludes ore samples

Paste pH & EC and Soluble and Leachable Metals

Figure 8 shows results for paste pH and EC (1:2) analysis of samples from the NRC129 and FRC212 – FRC214 drill holes. Figure 9 shows similar results (paste pH and EC (1:5)) for samples from the FRC166 – FRC171 drill holes. The only difference between the methods used for the two sample sets is the solid to water ratio (1:2 or 1:5) used to make the slurries in which pH and conductivity are measured. More dilution at the higher solid:water ratio in the 1:5 method may result in a decrease in measured conductivity but will not generally affect the measured pH to any great extent.

Results show that paste pH increases as sample depth increases with oxidised samples providing circum-neutral to slightly alkaline paste pH, increasing through transitional rock, with fresh rock paste pH generally mildly alkaline. Paste conductivities show a similar trend, with increasing conductivity as sample depth increases.

There was one sample which proved to be an exception to the above. This sample (NRC129-55), described as a transitional phyllite, gave a mildly acidic paste pH (4) and somewhat elevated EC (≈800 µS/cm). Although this sample is classified as UC (NAPP = -15 kg H2SO4/t and NAGpH = 4.4), the low Total S content of 0.14% suggests acid generation in the longer term unlikely. Nevertheless, the short-term appearance of mildly acidic conditions suggests the presence of acidic salts resulting from sulphide oxidation, and the paste pH of around 4 is consistent with buffering from dissolution of iron hydroxy sulphate salts such as schwertmannite or jarosite.

These results indicate that highly weathered rock is likely to be quite inert, producing no acidity (sulphur content negligible) and very low salinity in any drainage from storage in the Box cut WRD. Fresh waste rock (UG WRD) and ore (tailings) are likely to produce more saline drainage in the short term, but salinities do not appear to be high for any of the samples (with one exception) examined.

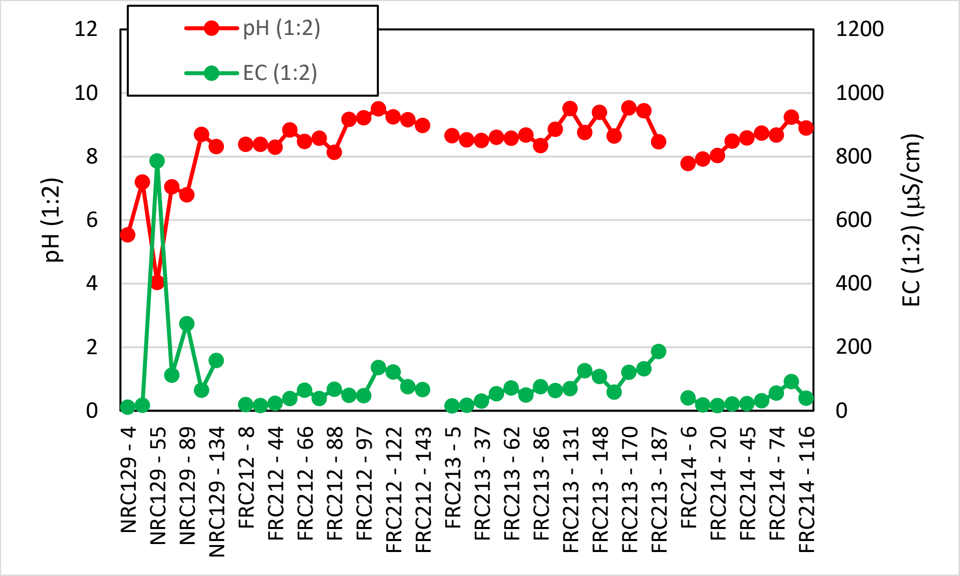


Figure 8: Paste pH and EC (1:2) for samples from drill holes NRC129 and FRC212 – FRC 214

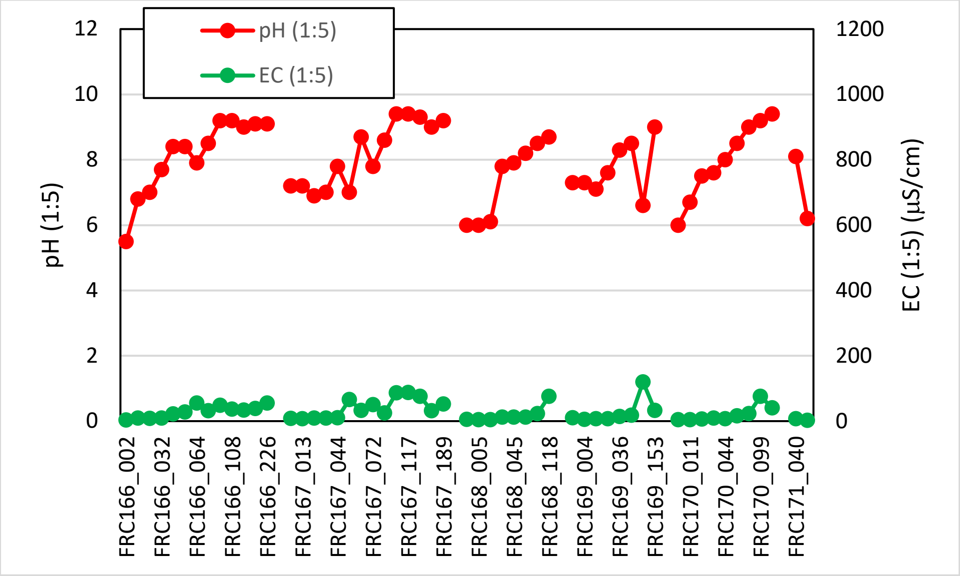


Figure 9: Paste pH and EC (1:5) for samples from drill holes FRC166 – FRC171

In addition to paste pH and EC measurements, the water-soluble metals and leachable metals content of selected samples from drill holes NRC129 and FRC212 – FRC214 were measured. Soluble metals were determined by mixing 10 g of solid with 50 mL of water for 1 h. The mixture was then allowed to settle and the supernatant filtered using a 0.45 μm cellulose acetate membrane. The water extract was then analysed by ICP to determine metal concentrations. Results were reported as mg/kg soluble metals. Leachable metals were determined using the toxicity characteristic leaching procedure (TCLP) method. 100 g of solid were extracted with 2 L of extraction solution #1 (sodium acetate buffer pH 4.9) for 20 h, before filtration and analysis by ICP. Results were reported as mg/L leachable metals.

In order to compare the results from soluble and leachable metals with paste pH and EC results, soluble metal results were back calculated to concentrations in mg/L in the 1:5 solid to water extract. Leachable metal concentrations were multiplied by a factor of 4 to account for the higher dilution at the 1:20 solid to liquid ratio used in the TCLP method. The adjusted results can then be correlated with paste pH and EC results, which were conducted at 1:2 solid to liquid ratio for the same samples.

Full results are provided in Appendix B (Soluble Metals) and Appendix C (Leachable Metals).

Water extracts showed that oxidised and transitional rock contain soluble iron and aluminium species, with fresh rock giving lower concentrations of these metals (Figure 10). Similarly, aluminium and iron concentrations in the water extracts of waste rock samples were generally higher than in ore samples (Table 3). These concentrations are higher than would generally be found in water extracts unless the water extract has low pH. However, solution speciation modelling suggests that the slightly alkaline pH of many of the extracts (pH ≈8.5) means that $Al(OH)_4^-$ is likely to be the dominant aluminium species, providing elevated concentrations. Without redox measurements, it is difficult to accurately model the speciation of iron in the extracts. However, results suggest that the higher than normal concentrations of iron in the water extract may result from colloidal iron that was not effectively filtered from the extract prior to analysis.

In contrast to the aluminium and iron results, lithium concentrations were higher in water extracts of fresh rock, especially for ore samples (Figure 10, Table 3). Heavy metal concentrations in water extracts were generally very low with the exception of the one sample (NRC129-55) with lower pH, which contained slightly elevated Co, Cu and Ni (Figure 11 and Figure 12). Water extracts of some fresh phyllite and siltstone samples also contained elevated concentrations of arsenic, suggesting that leachable arsenic will more likely be an issue in waste rock than in ore or tailings (Figure 13, Table 3). A few samples also displayed slightly elevated concentrations of zinc, with no distinction between waste rock and ore samples (Table 3).

Table 3: Average soluble metals concentrations from waste and ore samples

Element	Average Soluble Metals (mg/L)	
	Waste	Ore
Al	2.3	0.9
As	0.13	0.07
Fe	2.9	0.3
Li	0.1	2.1
Zn	0.1	0.1

The toxicity characteristic leaching procedure (TCLP) is an extraction method usually used to simulate leaching through a landfill. In this case, the TCLP test utilised an extraction solution buffered at pH 4.9. Paste pH results show that in most cases the pH of water in contact with these materials would be considerably higher than 4.9. Consequently, it is difficult to interpret the results of the TCLP tests in the context of the behaviour of waste rock and ore from the BP33 project. Nevertheless, the TCLP (leachable metals) results are generally in agreement with water extract results. The lower pH and longer extraction time of the TCLP procedure has resulted in higher concentrations of aluminium and much higher concentrations of extractable iron from fresh rock samples (Figure 10). Concentrations of manganese and zinc were also higher in the TCLP leachates (Figure 12). Results from TCLP tests also support the leachability of arsenic from some fresh rock samples (Figure 13).

Whilst the results of batch extraction tests provide an insight into seepage water quality, they are not kinetic based, and the results should be considered as qualitative rather than quantitative. Factors that affect the chemistries of batch test extracts include the solid to liquid ratio used (1:5 for water and 1:20 for TCLP) and the contact time between sample and extractant (typically 1 - 24 hours). Under field conditions within a waste rock emplacement, the solid to pore water ratio at any given time will be significantly lower than the ratios used in the batch tests, but leaching will be an ongoing progression through time. Also, under field conditions only a fraction of the rock surface will be in contacted with water as it flows through waste rock pile, while in the leach tests, the rock is finely ground increasing surface area and all of the sample is contacted by extractant. Under batch leach conditions, while dissolution reactions are occurring, precipitation reactions which are likely to take place in waste rock emplacements, will be non-existent or limited. Consequently, comparisons between metal/metalloid concentrations in batch extracts as indicative of WRD drainage and water quality trigger values should be undertaken with caution.

Notwithstanding the above restraints, concentrations of soluble metals were compared with ANZECC freshwater toxicant default guideline values (DGV)[3]. The results of this comparison indicate that only aluminium and arsenic concentrations in water extracts exceed the DGV for the majority of samples tested and for a significant number of samples in the case of zinc (Figure 14). It should be noted that these guideline values apply to surface water as the receptor for the toxicant. It may be that during the short storage period (up to 3 years) of these materials in the WRDs, little or no drainage will discharge from the waste rock piles, as water hold-up times in waste rock dumps can be up to decades in length. Consequently, there may be no impact on surface water bodies in the vicinity of the WRDs. However, even if there is little or no leachate draining from the WRD, weathering during the period of surface storage may result in production of soluble or partially soluble salts. Following backfilling and rebound of the water table in the underground workings, the products of these weathering reactions may dissolve and metal/metalloids mobilised under the anoxic conditions which will prevail in saturated rock. In this case the likely receptor is groundwater. Therefore, comparison with background groundwater concentrations of aluminium, arsenic and zinc would be more appropriate, but this information is currently unavailable.

In summary, leachate test results suggest that, in general, drainage from these materials will have circum-neutral to alkaline pH and low salinity. However, results also indicate that drainage from oxidised rock stored in the Box cut WRD may contain low concentrations of aluminium and zinc. In addition, some of the fresh rock stored on the UG WRD may contain water leachable arsenic species and possibly zinc, resulting in elevated arsenic and zinc in drainage from this waste storage facility. These preliminary results suggest that further testing should be undertaken to investigate aluminium, arsenic and zinc leaching from fresh and oxidised waste rock.

Additional testing should comprise kinetic leach column (KLC) testing, which provides conditions closer to those within a WRD, with both dissolution and precipitation reactions occurring. KLC tests should be conducted under oxic conditions to simulate conditions during storage in WRD. Following a period (≈6 months) of oxic weathering , testing should be continued under saturated conditions to simulate saturated zones within the backfilled UG mine and Box cut. Samples should include oxide and transitional waste rock to investigate leaching of aluminium and zinc, and transitional and fresh waste rock samples which gave elevated arsenic and zinc levels in water extracts. Results can then be compared with background groundwater metal concentrations, which are likely to be available by this time.

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[3] Australian & New Zealand Guidelines for Fresh & Marine Water Quality 2018: Toxicant default guideline values, https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search#tox-293

Oxide/transitional waste rock for KLC testing should be made by generating composite samples from the following:

- NRC129-20 to 68 plus
- FRC212-15 to 81 plus
- FRC213-5 to 67 plus
- FRC214-6 to 45

Transitional/fresh waste rock for KLC testing should be made by generating composite samples from the following:

- NRC129-34 plus
- FRC212- 66 to 88 plus
- FRC213-86 to 131 plus
- FRC214-50 to 74

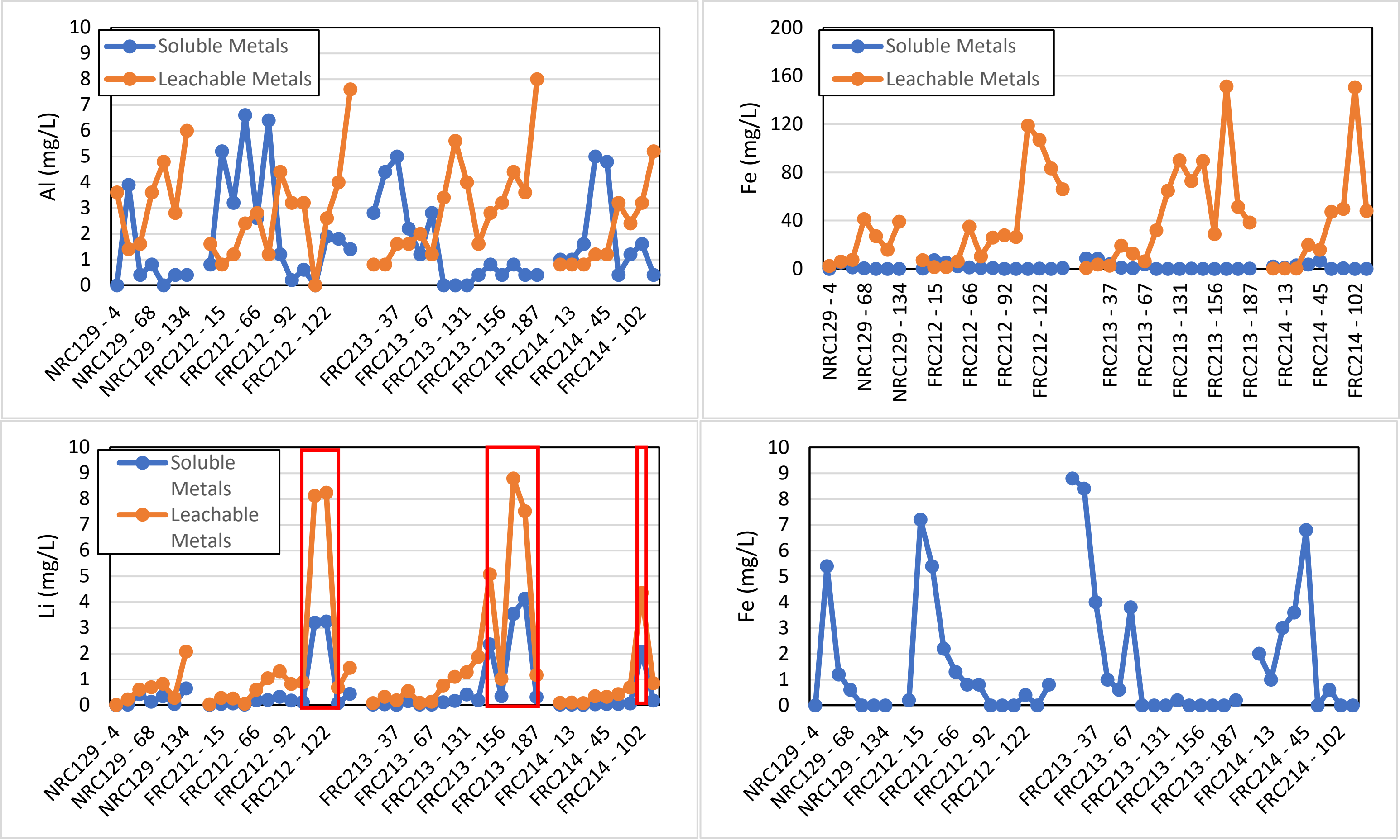

Figure 10: Soluble and leachable Al (top left), Fe (top right), soluble Fe (expanded axis, bottom right) and soluble and leachable Li (bottom left) for samples from drill holes NRC129 and FRC212 – FRC214. Red boxes highlight ore samples. Note, soluble metals are plotted as concentrations in the extract (mg/L) only, but are reported as amount extracted (mg/kg) and concentrations (mg/L) in Appendix B. Leachable metals are plotted as the original leachate concentrations (Appendix C) multiplied by a factor of 4 to allow comparison with soluble metals. See text for explanation.

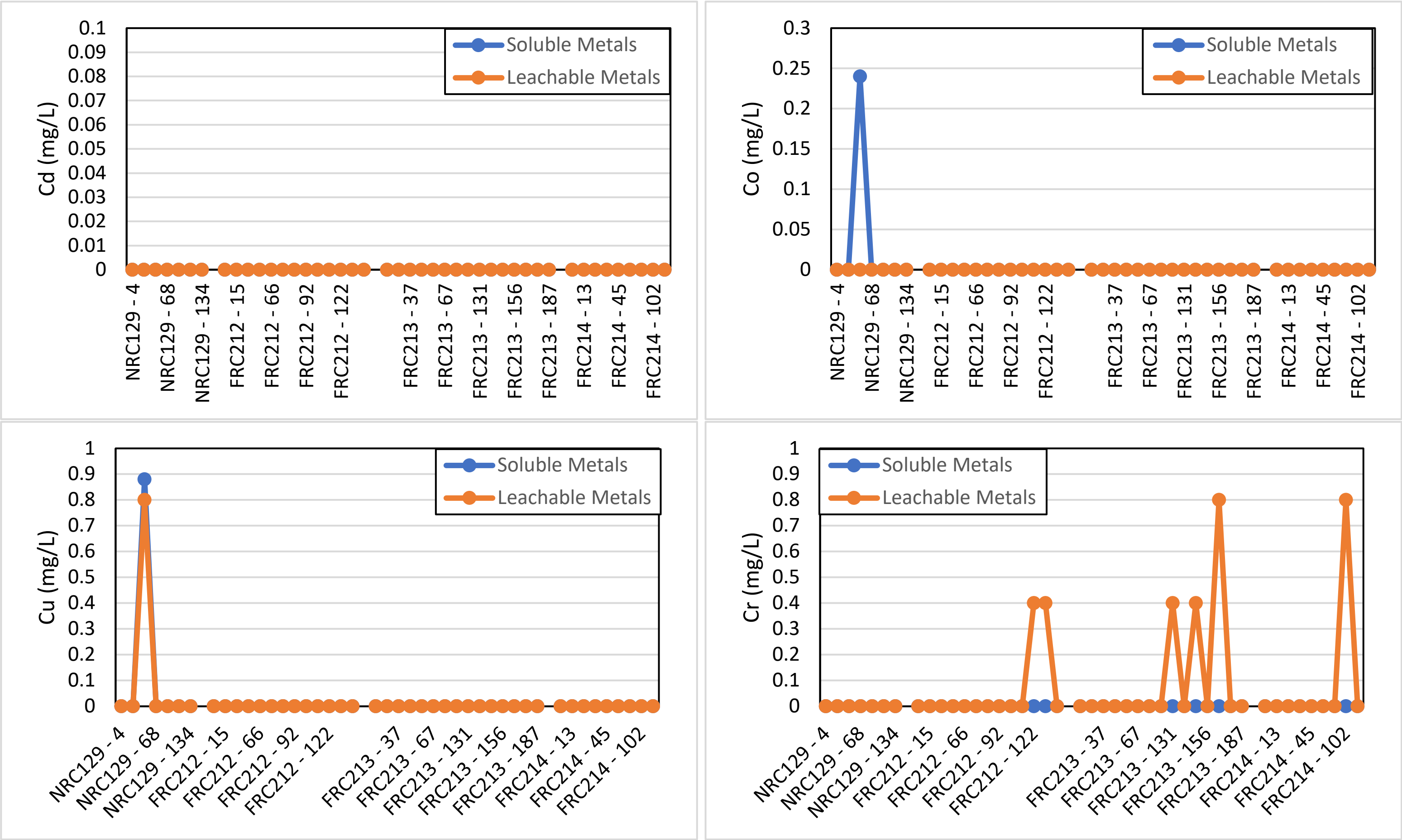

Figure 11: Soluble and leachable heavy metals for samples from drill holes NRC129 and FRC212 – FRC214. Note, soluble metals are plotted as concentrations in the extract (mg/L) only, but are reported as amount extracted (mg/kg) and concentrations (mg/L) in Appendix B. Leachable metals are plotted as the original leachate concentrations (Appendix C) multiplied by a factor of 4 to allow comparison with soluble metals. See text for explanation.

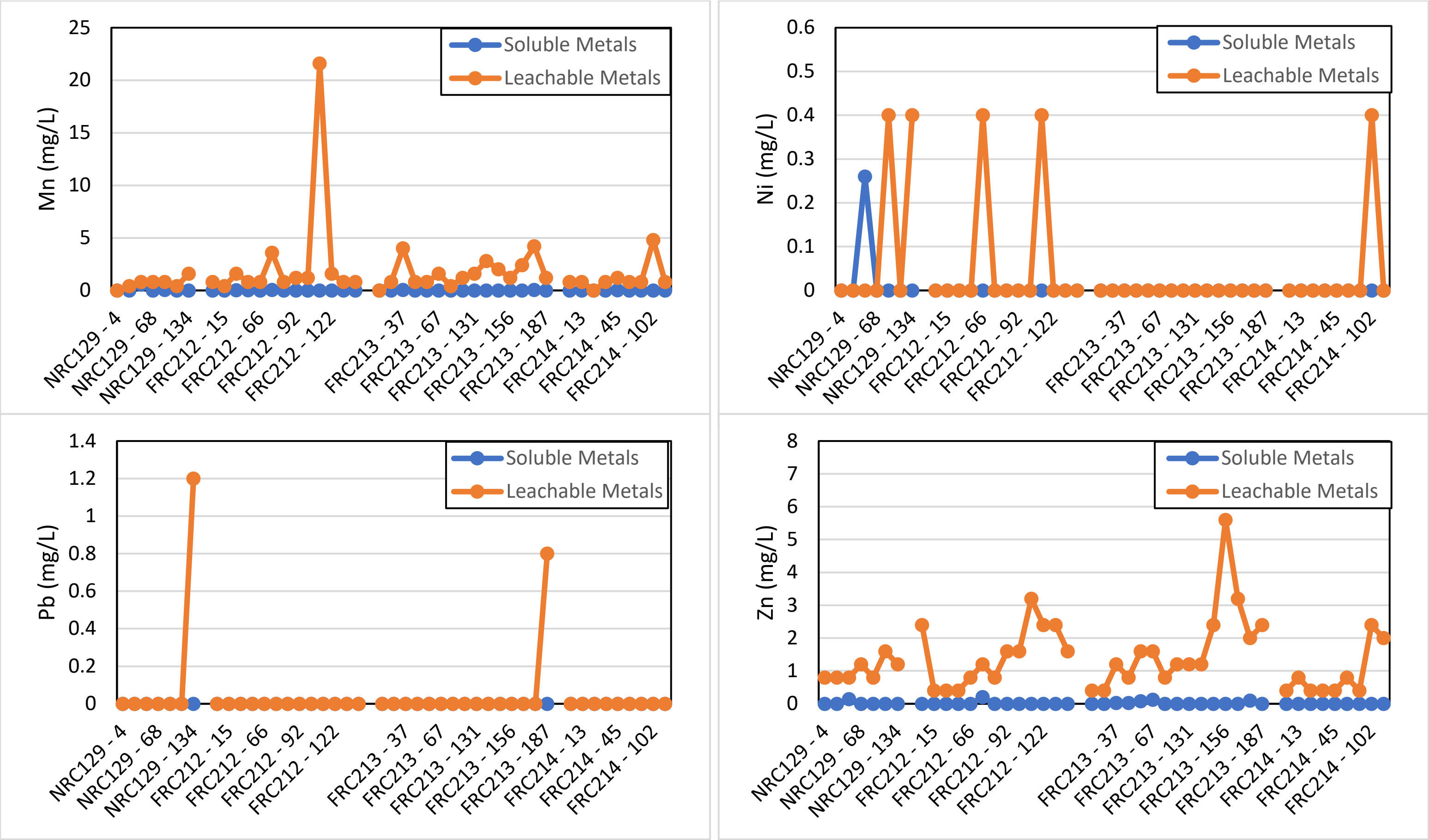

Figure 12: Soluble and leachable heavy metals for samples from drill holes NRC129 and FRC212 – FRC214. Note, soluble metals are plotted as concentrations in the extract (mg/L) only, but are reported as amount extracted (mg/kg) and concentrations (mg/L) in Appendix B. Leachable metals are plotted as the original leachate concentrations (Appendix C) multiplied by a factor of 4 to allow comparison with soluble metals. See text for explanation.

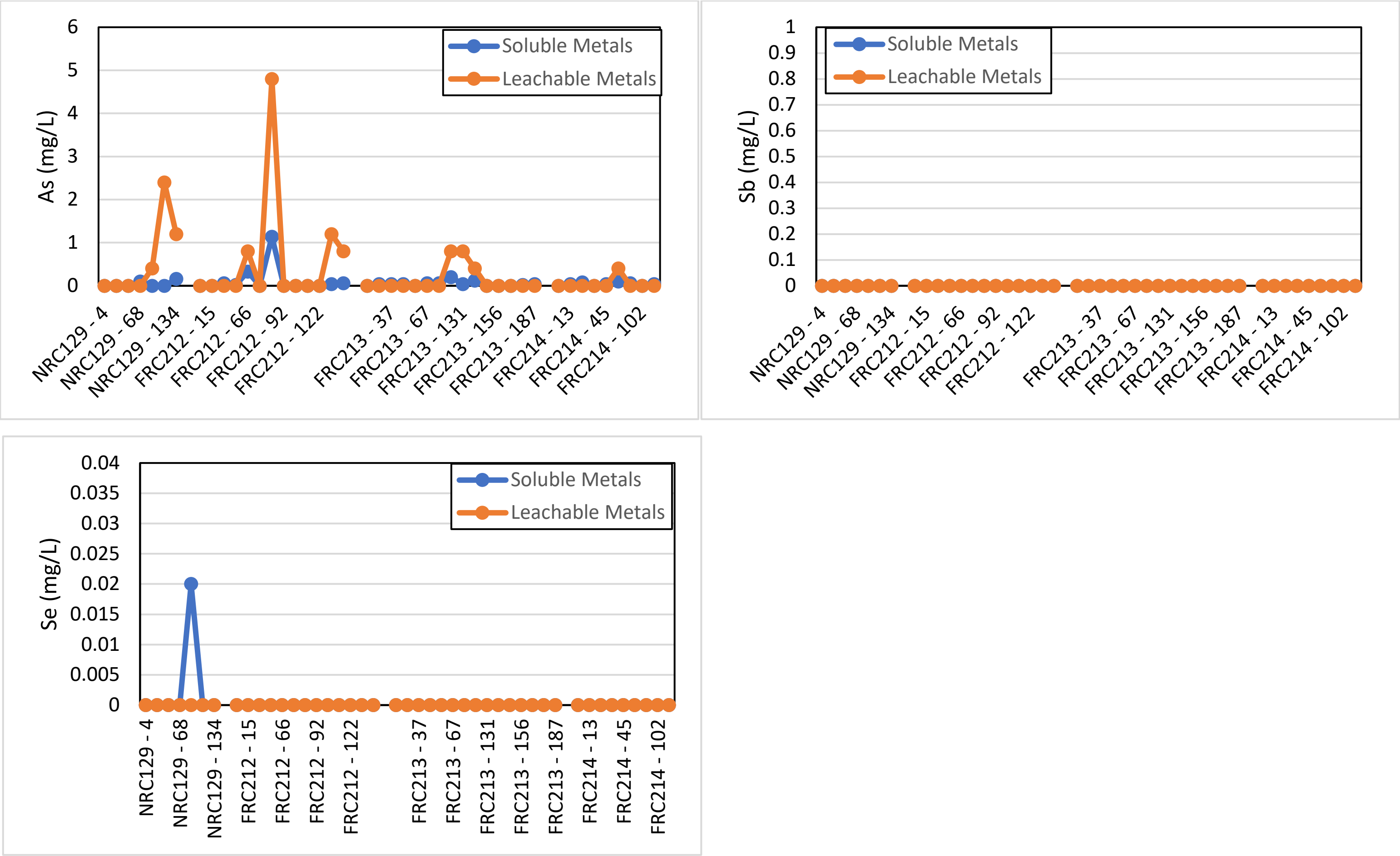

Figure 13: Soluble and leachable metalloids for samples from drill holes NRC129 and FRC212 – FRC214. Note, soluble metalloids are plotted as concentrations in the extract (mg/L) only, but are reported as amount extracted (mg/kg) and concentrations (mg/L) in Appendix B. Leachable metalloids are plotted as the original leachate concentrations (Appendix C) multiplied by a factor of 4 to allow comparison with soluble metalloids. See text for explanation.

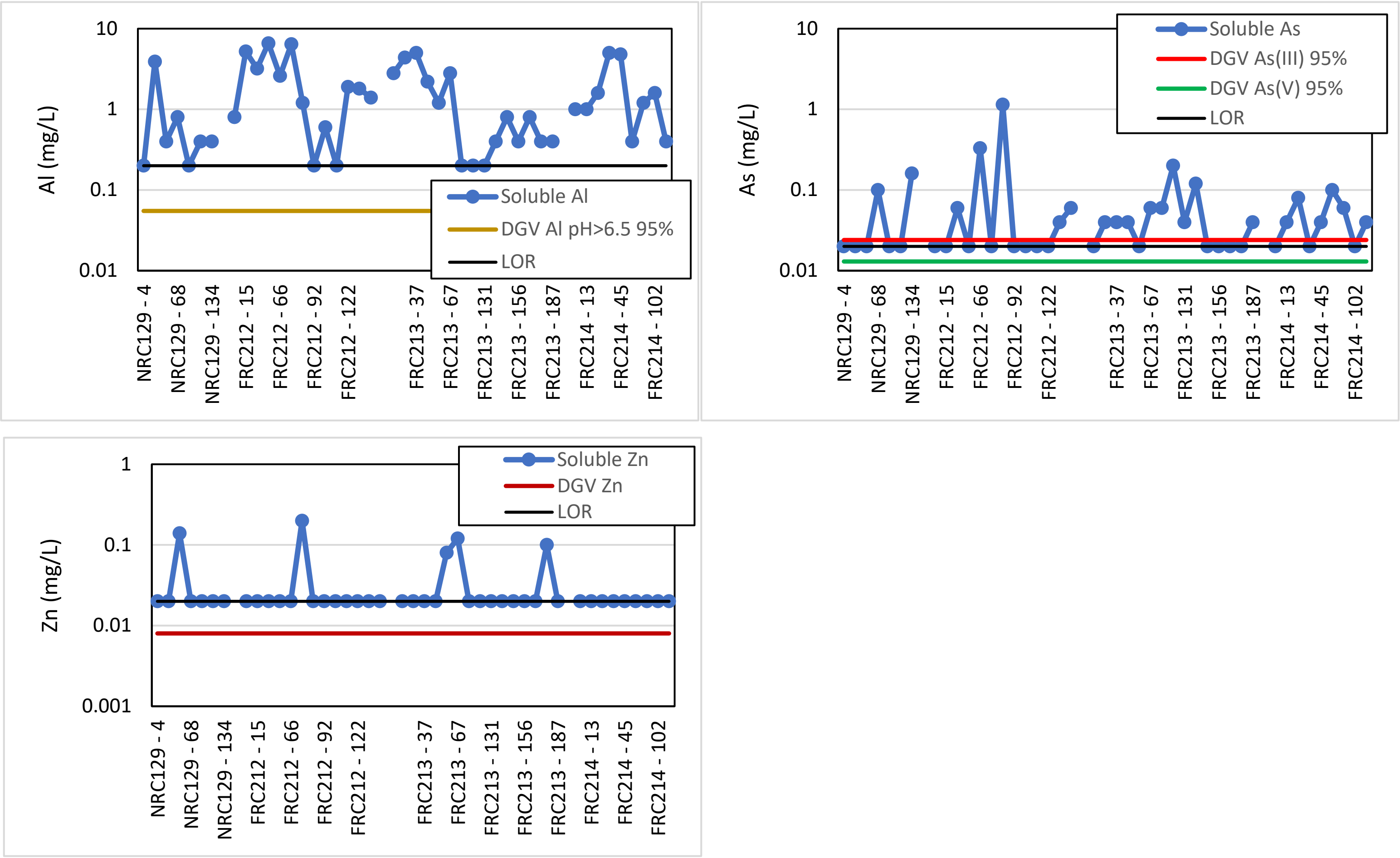

Figure 14: Soluble Al, As and Zn for samples from drill holes NRC129 and FRC212 – FRC214 and corresponding ANZECC freshwater default guideline values and method reporting limits (LOR). Note, soluble metalloids are plotted as concentrations in the extract (mg/L) only, but are reported as amount extracted (mg/kg) and concentrations (mg/L) in Appendix B. See text for explanation.

3.3 Naturally Occurring Radioactive Material (NORM)

Naturally occurring radioactive material (NORM) was assessed on samples from the NRC129 and FRC212 – FRC214 drill holes used in the waste characterisation. All testing was undertaken using RadEye B20 – ER contamination meter (SN 32215 Calibrated 15/04/2019) by registered NT Radiation Advisor Accreditation Number 10/00054A. This meter characterises alpha, beta and gamma radiation. The results are recorded in μSv/h and are provided in Appendix D.

The average radiation dose in Australia over a one year period is around 1.5 mSv[4]. Assuming exposure to the materials tested here for an average of 45 h per week (average working hours for Australian mine workers), this would provide an additional dose of 0.3 mSv. The recommended dose limit for occupational exposure in Australia is 20 mSv/year (averaged over a period of 5 years)[5]. The results from radiation dose measurements for the drill core samples from the BP33 deposit measured here, indicate that these materials are unlikely to contribute significantly to workers radiation exposure and that further testing is unwarranted.

3.4 Soil Characterisation

Soil characterisation results for four soil samples taken at the surface of drill holes NRC129-0, FRC212-0, FRC213-0 and FRC214-0 are given in Appendix E.

The four samples were logged as completely weathered, and they were variously described as sandy loam, sandy clay loam or clay loam. However, the clay fractions were relatively low (i.e. between 7 to 11% of the minus 2 mm sized material) and the particle size distributions indicate that typical surface soil at the site is a sandy loam that in some locations also has a significant gravel content. Soil stability was assessed using the Emerson test, which measures the tendency of the clay fraction of a soil to go into colloidal suspension (i.e. disperse). All four soils were classed at 7, which means the soil samples were non-dispersive.

In addition to particle size analysis, the soil characterisation program included measurements of a number of parameters pertaining to soil fertility. They included pH and electrical conductivity (EC), cation exchange capacity (CEC) and exchangeable cations, analysis of trace metals, determination of soil nitrogen, potassium and phosphorus, and measurements of carbon and soil organic matter. The main findings with respect to soil fertility, based on guidelines by Agriculture Victoria[6], are as follows:

Slightly Acidic Soil pH

Values ranged from 5.3 to 5.8, which indicate the soil is slightly acidic, but within the range that is generally acceptable for plant growth.

Non-Saline

The ECs ranged from 14 to 33 μS/cm, which is at the low end of the typical range for soil. The EC values are indicative of low contents of soluble salts and hence the soils can be considered non-saline. Also, as exchangeable sodium values were negligible the soils can be considered non-sodic.

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[4] Radiation Information sheet, Naturally occurring radioactive material (NORM), Environmental Protection Authority South Australia, Issued December 2017

[5] Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) Radiation Protection Series Publication No. 9, ARPANSA 2005

[6] Agriculture Victoria, Victoria State Government (2020). Accessed 20 February 2020.
< http://agriculture.vic.gov.au/agriculture/farm-management/business-management/ems-in-victorian-agriculture/environmental-monitoring-tools/soil-fertility >

Low CEC and Exchangeable Cations

The soils CECs were less than 1, which signifies they have minimal capacity for cation exchange. The low CECs are consistent with the soils being sandy and containing little organic matter (i.e. clay and organic matter are the two main contributors of CEC in typical fertile soil; a loam typically has an CEC around 5 meq/100 gm and a clay up to 20 meq/100g). Calcium and magnesium were the dominant exchange cations. There was no evidence of exchangeable sodium or aluminium, which are not plant nutrients, and can be detrimental to growth if present in excess. Exchangeable sodium and exchangeable aluminium were both less than the 0.1 meq/100g limit of analytical detection.

Low Fertility

Extractable phosphorus was determined by the Colwell test. The extractable phosphorus contents of the four soil samples were less than the 5 mg/kg detection limit. As a guide, an available P content of around 20 mg/kg is generally considered adequate for good plant growth.

Extractable potassium was also determined by the Colwell test. The extractable potassium contents varied. One sample (FRC213-0) contained 341 mg/kg, which is relatively high for a sandy loam. However, the other three samples contained less than 140 mg/kg extractable potassium, which rates as low to marginal for plant growth.

Nitrogen is also essential for plant growth but nitrogen testing is generally of limited value when assessing soil fertility as the levels of soil nitrate and ammonium (which plants adsorbed) fluctuate widely with soil and weather conditions over short periods of time. Total N contents for the soils ranged from 410 to 790 mg/kg but most was likely present as organic matter. Nitrate which can be utilise by plants was low (<1 mg/kg).

Low Trace Elements

One sample had a marginally elevated arsenic content of 15 mg/kg, but otherwise the concentrations of trace metals (Cd, Cr, Cu, Ni, Pb, Zn, Li, Sn and Hg) were at, or in most cases much less than, the respective median concentrations typically reported for soils from non-mineralised areas.

Low Organic Matter

The total carbon contents ranged from 0.6 to 1.1 %C, which converts to between 1 to 2 % organic matter. An organic matter content exceeding 2% is generally desirable for plant growth and to maintain good soil physical structure.

Summary

Overall, the results for the four samples suggest that soil at the site is an infertile, gravelly sandy loam. The Emerson test indicates that the soil should be non-dispersive, but given the low organic matter level and sandy texture the soil likely has poor structure and limited water-holding capacity, and therefore could be susceptible to erosion under wet conditions. It is expected successful rehabilitation will require increasing the physical and chemical fertility of the soil to some extent, consistent with the proposed final end use.

APPENDIX A - ABA & NAG Test Results

Sample details								Net Acid Generation			Acid Base Accouting					
Sample Date	**Sample ID**	**Depth**	**Lithology**	**Weathering**	**Sample Type**	**pH (1:2)^1 or (1:5)^2**	**EC (1:2)$_1$ or (1:5)^2**	**NAGpH**	**NAG (pH 4.5)**	**NAG (pH 7.0)**	**NAPP**	**MPA**	**Total S (LECO)**	**ANC**	**Fizz Rating**	**ANC/MPA**
						pH Unit	**µS/cm**	**pH Unit**	**kg H2SO4/t**	**kg H2SO4/t**	**kg H2SO4/t**	**kg H2SO4/t**	**%**	**kg H2SO4/t**	**Fizz Unit**	
						0.1	**1**	**0.1**	**0.1**	**0.1**	**0.5**	**0.3**	**0.01**	**0.5**		
10/09/2019	NRC129 - 4	4	Py	EW	Waste	5.5	12	5.6	<0.1	1.3	-8	<0.3	<0.01	8	1	>27
10/09/2019	NRC129 - 20	20	Py	MW	Waste	7.2	18	7.3	<0.1	<0.1	-12	<0.3	<0.01	12	1	>41
10/09/2019	NRC129 - 55	55	Py	SW	Waste	4.0	786	4.4	0.2	2.5	-15	4.3	0.14	19	1	4.4
10/09/2019	NRC129 - 68	68	Sst	Fr	Waste	7.1	112	5.6	<0.1	3	-14	1.5	0.05	15	1	10
10/09/2019	NRC129 - 89	89	Py	Fr	Waste	6.8	274	3.8	1.7	6.7	-12	5.2	0.17	18	1	3.4
10/09/2019	NRC129 - 98	98	Pg	Fr	Waste	8.7	65	6.9	<0.1	0.4	-13	0.6	0.02	13	1	22
10/09/2019	NRC129 - 134	134	Py	Fr	Waste	8.3	159	3.4	5.5	8.2	-4	13	0.42	17	1	1.3
10/09/2019	FRC212 - 8	8	Pg	HW	Waste	8.4	19	6.6	<0.1	0.7	-8	<0.3	<0.01	8	1	>25
10/09/2019	FRC212 - 15	15	Py	MW	Waste	8.4	17	7.4	<0.1	<0.1	-12	<0.3	<0.01	12	1	>40
10/09/2019	FRC212 - 44	44	Py	MW	Waste	8.3	24	7.3	<0.1	<0.1	-16	<0.3	<0.01	16	1	>54
10/09/2019	FRC212 - 53	53	Pg	MW	Waste	8.8	39	7.0	<0.1	<0.1	-13	<0.3	<0.01	13	1	>42
11/09/2019	FRC212 - 66	66	Py	SW	Waste	8.5	65	6.2	<0.1	4.3	-14	<0.3	<0.01	14	1	>47
11/09/2019	FRC212 - 81	81	Pg	Fr	Waste	8.6	39	6.8	<0.1	1	-13	<0.3	<0.01	13	1	>44
11/09/2019	FRC212 - 88	88	Py	Fr	Waste	8.1	68	6.2	<0.1	2.4	-22	0.6	0.02	23	1	38
11/09/2019	FRC212 - 92	92	Pg	Fr	Waste	9.2	49	7.2	<0.1	<0.1	-12	<0.3	<0.01	12	1	>41
11/09/2019	FRC212 - 97	97	Pg	Fr	Ore	9.2	48	6.0	<0.1	3.8	-13	<0.3	<0.01	13	1	>42
11/09/2019	FRC212 - 109	109	Pg	Fr	Ore	9.5	136	7.6	<0.1	<0.1	-16	<0.3	<0.01	16	1	>53
11/09/2019	FRC212 - 122	122	Pg	Fr	Ore	9.3	122	7.0	<0.1	0.9	-12	<0.3	<0.01	12	1	>41
11/09/2019	FRC212 - 131	131	Pg	Fr	Waste	9.2	76	7.1	<0.1	<0.1	-35	0.3	0.01	36	1	116
11/09/2019	FRC212 - 143	143	Py	Fr	Waste	9.0	68	6.2	<0.1	1.1	-19	2.1	0.07	21	1	10
11/09/2019	FRC213 - 5	5	Py	HW	Waste	8.7	15	6.7	<0.1	0.9	-11	<0.3	<0.01	11	1	>35
11/09/2019	FRC213 - 26	26	Py	MW	Waste	8.5	18	7.4	<0.1	<0.1	-14	<0.3	<0.01	14	1	>45
11/09/2019	FRC213 - 37	37	Pg	HW	Waste	8.5	31	7.6	<0.1	<0.1	-16	<0.3	<0.01	16	1	>53
11/09/2019	FRC213 - 58	58	Py	SW	Waste	8.6	54	6.2	<0.1	3	-17	<0.3	<0.01	17	1	>56
11/09/2019	FRC213 - 62	62	Pg	SW	Waste	8.6	72	6.8	<0.1	0.9	-13	<0.3	<0.01	13	1	>43
11/09/2019	FRC213 - 67	67	Pg	SW	Waste	8.7	50	6.8	<0.1	0.9	-21	0.6	0.02	22	1	35
11/09/2019	FRC213 - 86	86	Pg	Fr	Waste	8.3	76	4.4	0.25	2.4	-13	2.8	0.09	16	1	5.7
11/09/2019	FRC213 - 107	107	Sst	Fr	Waste	8.9	64	6.8	<0.1	0.6	-21	0.6	0.02	22	1	35
11/09/2019	FRC213 - 131	131	Py	Fr	Waste	9.5	70	7.2	<0.1	<0.1	-14	0.9	0.03	15	1	17
14/09/2019	FRC213 - 142	142	Pg	Fr	Ore	8.8	126	7.2	<0.1	<0.1	-19	0.6	0.02	19	1	32
14/09/2019	FRC213 - 148	148	Pg	Fr	Ore	9.4	109	7.8	<0.1	<0.1	-10	<0.3	<0.01	10	1	>33
14/09/2019	FRC213 - 156	156	Pg	Fr	Ore	8.7	59	6.6	<0.1	0.8	-9	0.6	0.02	9	1	15
14/09/2019	FRC213 - 170	170	Pg	Fr	Ore	9.5	121	7.3	<0.1	<0.1	-10	<0.3	<0.01	10	1	>33
14/09/2019	FRC213 - 178	178	Pg	Fr	Ore	9.4	132	7.9	<0.1	<0.1	-13	<0.3	<0.01	13	1	>44
14/09/2019	FRC213 - 187	187	Py	Fr	Waste	8.5	186	5.8	<0.1	0.9	-16	3.1	0.10	19	1	6.1

Sample details								Net Acid Generation			Acid Base Accouting					
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	pH (1:2)^1 or (1:5)^2	EC (1:2)$_1$ or (1:5)^2	NAGpH	NAG (pH 4.5)	NAG (pH 7.0)	NAPP	MPA	Total S (LECO)	ANC	Fizz Rating	ANC/MPA
						pH Unit	µS/cm	pH Unit	kg H2SO4/t	kg H2SO4/t	kg H2SO4/t	kg H2SO4/t	%	kg H2SO4/t	Fizz Unit	
						0.1	1	0.1	0.1	0.1	0.5	0.3	0.01	0.5		
14/09/2019	FRC214 - 6	6	Py	CW	Waste	7.8	41	7.4	<0.1	<0.1	-10	<0.3	<0.01	10	1	>32
14/09/2019	FRC214 - 13	13	Py/Qv	HW	Waste	7.9	19	7.1	<0.1	<0.1	-8	<0.3	<0.01	8	1	>27
14/09/2019	FRC214 - 20	20	Py	CW	Waste	8.0	17	7.2	<0.1	<0.1	-10	<0.3	<0.01	10	1	>32
14/09/2019	FRC214 - 34	34	Py	HW	Waste	8.5	22	7.4	<0.1	<0.1	-14	<0.3	<0.01	14	1	>46
14/09/2019	FRC214 - 45	45	Py	MW	Waste	8.6	23	7.3	<0.1	<0.1	-14	<0.3	<0.01	14	1	>47
14/09/2019	FRC214 - 50	50	Py	SW	Waste	8.7	32	7.3	<0.1	<0.1	-14	<0.3	<0.01	14	1	>46
14/09/2019	FRC214 - 74	74	Py	Fr	Waste	8.7	56	7.2	<0.1	<0.1	-14	0.3	0.01	14	1	46
14/09/2019	FRC214 - 102	102	Pg	Fr	Ore	9.2	92	6.9	<0.1	0.5	-11	<0.3	<0.01	11	1	>38
14/09/2019	FRC214 - 116	116	Pg	Fr	Waste	8.9	40	6.4	<0.1	0.4	-12	1.2	0.04	13	1	11
6/07/2018	FRC166_002	2	Laterite	CW	Waste	5.5	3	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
6/07/2018	FRC166_008	8	Py	CW	Waste	6.8	9	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
6/07/2018	FRC166_018	18	Py	HW	Waste	7.0	8	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
6/07/2018	FRC166_032	32	Py	HW	Waste	7.7	9	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
6/07/2018	FRC166_046	46	Py	MW	Waste	8.4	22	N/D	N/D	N/D	N/D	3.1	0.1	N/D	N/D	N/D
6/07/2018	FRC166_052	52	Py	SW	Waste	8.4	28	N/D	N/D	N/D	N/D	4.3	0.14	N/D	N/D	N/D
6/07/2018	FRC166_064	64	Py	SW	Waste	7.9	55	N/D	N/D	N/D	N/D	16	0.51	N/D	N/D	N/D
6/07/2018	FRC166_075	75	Py	FR	Waste	8.5	32	N/D	N/D	N/D	N/D	8.9	0.29	N/D	N/D	N/D
6/07/2018	FRC166_088	88	Py	FR	Waste	9.2	48	N/D	N/D	N/D	N/D	1.5	0.05	N/D	N/D	N/D
6/07/2018	FRC166_108	108	Py	FR	Waste	9.2	37	N/D	N/D	N/D	N/D	2.8	0.09	N/D	N/D	N/D
6/07/2018	FRC166_144	144	Py	FR	Waste	9.00	34	N/D	N/D	N/D	N/D	8.9	0.29	N/D	N/D	N/D
6/07/2018	FRC166_152	152	Py	FR	Waste	9.1	39	N/D	N/D	N/D	N/D	6.4	0.21	N/D	N/D	N/D
7/07/2018	FRC166_226	226	Py	FR	Waste	9.1	55	N/D	N/D	N/D	N/D	1.2	0.04	N/D	N/D	N/D
8/07/2018	FRC167_004	4	Py	CW	Waste	7.2	8	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
8/07/2018	FRC167_013	13	Py	HW	Waste	7.2	7	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
8/07/2018	FRC167_020	20	Py	HW	Waste	6.9	9	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
8/07/2018	FRC167_031	31	Py	HW	Waste	7.0	9	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
8/07/2018	FRC167_044	44	Py	MW	Waste	7.8	10	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
8/07/2018	FRC167_049	49	Py	MW	Waste	7.00	66	N/D	N/D	N/D	N/D	4.3	0.14	N/D	N/D	N/D
8/07/2018	FRC167_060	60	Py	SW	Waste	8.7	33	N/D	N/D	N/D	N/D	4.0	0.13	N/D	N/D	N/D
8/07/2018	FRC167_072	72	Py/SST	FR	Waste	7.8	50	N/D	N/D	N/D	N/D	7.0	0.23	N/D	N/D	N/D
8/07/2018	FRC167_076	76	Py/QV	FR	Waste	8.6	25	N/D	N/D	N/D	N/D	1.5	0.05	N/D	N/D	N/D
8/07/2018	FRC167_098	98	Py/QV	FR	Waste	9.4	87	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
8/07/2018	FRC167_117	117	Py/SST	FR	Waste	9.4	88	N/D	N/D	N/D	N/D	4.9	0.16	N/D	N/D	N/D
9/07/2018	FRC167_126	126	PEG/PY	FR	Waste	9.3	76	N/D	N/D	N/D	N/D	2.1	0.07	N/D	N/D	N/D
9/07/2018	FRC167_140	140	Py/SST	FR	Waste	9.00	32	N/D	N/D	N/D	N/D	3.1	0.1	N/D	N/D	N/D
9/07/2018	FRC167_189	189	Py/SST	FR	Waste	9.2	52	N/D	N/D	N/D	N/D	1.2	0.04	N/D	N/D	N/D
10/07/2018	FRC168_001	1	laterite	CW	Waste	6.0	5	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
10/07/2018	FRC168_005	5	PY	CW	Waste	6.0	4	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
10/07/2018	FRC168_017	17	PY	HW	Waste	6.1	4	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
10/07/2018	FRC168_042	42	PY	MW	Waste	7.8	12	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
10/07/2018	FRC168_045	45	PY	MW	Waste	7.9	12	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D

Sample details								Net Acid Generation			Acid Base Accouting					
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	pH (1:2)^1 or (1:5)^2	EC (1:2)$_1$ or (1:5)^2	NAGpH	NAG (pH 4.5)	NAG (pH 7.0)	NAPP	MPA	Total S (LECO)	ANC	Fizz Rating	ANC/MPA
						pH Unit	µS/cm	pH Unit	kg H2SO4/t	kg H2SO4/t	kg H2SO4/t	kg H2SO4/t	%	kg H2SO4/t	Fizz Unit	
						0.1	1	0.1	0.1	0.1	0.5	0.3	0.01	0.5		
11/07/2018	FRC168_052	52	PY	SW	Waste	8.2	12	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
11/07/2018	FRC168_060	60	PY	MW	Waste	8.5	23	N/D	N/D	N/D	N/D	0.9	0.03	N/D	N/D	N/D
11/07/2018	FRC168_118	118	PY	FR	Waste	8.7	76	N/D	N/D	N/D	N/D	11	0.37	N/D	N/D	N/D
12/07/2018	FRC169_002	2	Laterite	CW	Waste	7.3	10	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
12/07/2018	FRC169_004	4	PY	CW	Waste	7.3	5	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
12/07/2018	FRC169_014	14	PY	HW	Waste	7.1	7	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
12/07/2018	FRC169_026	26	PY	HW	Waste	7.6	7	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
12/07/2018	FRC169_036	36	PY/SST	MW	Waste	8.3	14	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
12/07/2018	FRC169_057	57	PY/SST	SW	Waste	8.5	18	N/D	N/D	N/D	N/D	0.9	0.03	N/D	N/D	N/D
12/07/2018	FRC169_065	65	PY	FR	Waste	6.6	120	N/D	N/D	N/D	N/D	32	1.05	N/D	N/D	N/D
14/07/2018	FRC169_153	153	PY	FR	Waste	9.0	33	N/D	N/D	N/D	N/D	2.1	0.07	N/D	N/D	N/D
15/07/2018	FRC170_004	4	SOIL	CW	Waste	6.0	4	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
15/07/2018	FRC170_011	11	PY	CW	Waste	6.7	4	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
15/07/2018	FRC170_023	23	PY	HW	Waste	7.5	6	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
15/07/2018	FRC170_035	35	PY	HW	Waste	7.6	9	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
15/07/2018	FRC170_044	44	PY	MW	Waste	8.0	7	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
15/07/2018	FRC170_056	56	PY	SW	Waste	8.5	16	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
15/07/2018	FRC170_064	64	PY	FR	Waste	9.0	23	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
15/07/2018	FRC170_099	99	PY	FR	Waste	9.2	76	N/D	N/D	N/D	N/D	0.6	0.02	N/D	N/D	N/D
16/07/2018	FRC170_142	142	PY	FR	Waste	9.4	41	N/D	N/D	N/D	N/D	0.9	0.03	N/D	N/D	N/D
					Waste											
18/07/2018	FRC171_040	40	PY	MW	Waste	8.1	7	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D
14/07/2018	FRC171_065	65	PY/QV	SW	Waste	6.2	2	N/D	N/D	N/D	N/D	<0.3	<0.01	N/D	N/D	N/D

1. pH and EC (1:2) conducted samples from drill holes NRC129 and FRC212-214
2. pH and EC (1:5) conducted samples from drill holes FRC166-171

APPENDIX B – Water Soluble Metals

Sample details						Soluble Metals by ICPAES																							
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	Aluminium		Antimony		Arsenic		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Nickel		Selenium	
						mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L
						1		0.1		0.1		0.1		0.1		0.1		0.1		1		0.1		0.1		0.1		0.1	
10/09/2019	NRC129 - 4	4	Py	EW	Waste	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	NRC129 - 20	20	Py	MW	Waste	20	3.9	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	27	5.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	NRC129 - 55	55	Py	SW	Waste	2	0.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	1.2	0.2	4.4	0.9	6	1.2	<0.1	<0.02	2.8	0.6	1.3	0.3	<0.1	<0.02
10/09/2019	NRC129 - 68	68	Sst	Fr	Waste	4	0.8	<0.1	<0.02	0.5	0.10	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	3	0.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	NRC129 - 89	89	Py	Fr	Waste	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	0.3	0.06	<0.1	<0.02	0.1	0.02
10/09/2019	NRC129 - 98	98	Pg	Fr	Waste	2	0.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	NRC129 - 134	134	Py	Fr	Waste	2	0.4	<0.1	<0.02	0.8	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	FRC212 - 8	8	Pg	HW	Waste	4	0.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	1	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	FRC212 - 15	15	Py	MW	Waste	26	5.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	36	7.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	FRC212 - 44	44	Py	MW	Waste	16	3.2	<0.1	<0.02	0.3	0.1	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	27	5.4	<0.1	<0.02	0.1	0.02	<0.1	<0.02	<0.1	<0.02
10/09/2019	FRC212 - 53	53	Pg	MW	Waste	33	6.6	<0.1	<0.02	0.1	0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	11	2.2	<0.1	<0.02	0.1	0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 66	66	Py	SW	Waste	13.0	2.6	<0.1	<0.02	1.7	0.3	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	6.5	1.3	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 81	81	Pg	Fr	Waste	32	6.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	4	0.8	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 88	88	Py	Fr	Waste	6	1.2	<0.1	<0.02	5.7	1.1	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	4	0.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 92	92	Pg	Fr	Waste	1	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 97	97	Pg	Fr	Ore	3	0.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 109	109	Pg	Fr	Ore	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 122	122	Pg	Fr	Ore	10	1.9	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	2	0.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 131	131	Pg	Fr	Waste	9	1.8	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC212 - 143	143	Py	Fr	Waste	7	1.4	<0.1	<0.02	0.3	0.06	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	4	0.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 5	5	Py	HW	Waste	14	2.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	44	8.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 26	26	Py	MW	Waste	22	4.4	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	42	8.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 37	37	Pg	HW	Waste	25	5.0	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	20	4.0	<0.1	<0.02	0.3	0.06	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 58	58	Py	SW	Waste	11	2.2	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	5	1.0	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 62	62	Pg	SW	Waste	6	1.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	3	0.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 67	67	Pg	SW	Waste	14	2.8	<0.1	<0.02	0.3	0.1	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	19	3.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 86	86	Pg	Fr	Waste	<1	<0.2	<0.1	<0.02	0.3	0.06	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 107	107	Sst	Fr	Waste	<1	<0.2	<0.1	<0.02	1	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
11/09/2019	FRC213 - 131	131	Py	Fr	Waste	<1	<0.2	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 142	142	Pg	Fr	Ore	2	0.4	<0.1	<0.02	0.6	0.1	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	1	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 148	148	Pg	Fr	Ore	4	0.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 156	156	Pg	Fr	Ore	2	0.4	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 170	170	Pg	Fr	Ore	4	0.8	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 178	178	Pg	Fr	Ore	2	0.4	<0.1	<0.02	0.1	0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	0.3	0.05	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC213 - 187	187	Py	Fr	Waste	2	0.4	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	1	0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 6	6	Py	CW	Waste	5	1.0	<0.1	<0.02	0.2	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	10	2.0	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 13	13	Py/Qv	HW	Waste	5	1.0	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	5	1.0	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 20	20	Py	CW	Waste	8	1.6	<0.1	<0.02	0.4	0.08	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	15	3.0	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 34	34	Py	HW	Waste	25	5.0	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	18	3.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 45	45	Py	MW	Waste	24	4.8	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	34	6.8	<0.1	<0.02	0.1	0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 50	50	Py	SW	Waste	2	0.4	<0.1	<0.02	0.5	0.1	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 74	74	Py	Fr	Waste	6	1.2	<0.1	<0.02	0.3	0.06	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	3	0.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 102	102	Pg	Fr	Ore	8	1.6	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02
14/09/2019	FRC214 - 116	116	Pg	Fr	Waste	2	0.4	<0.1	<0.02	0.2	0.04	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<1	<0.2	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02

Sample details													
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	Tin		Zinc		Soluble Metals by ICPMS - Lithium		Soluble Mercury by FIMS - Mercury	
						mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L
						0.1		0.1		0.01		0.0005	
10/09/2019	NRC129 - 4	4	Py	EW	Waste	<0.1	<0.02	<0.1	<0.02	<0.01	<0.002	<0.0005	<0.0001
10/09/2019	NRC129 - 20	20	Py	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.09	0.02	<0.0005	<0.0001
10/09/2019	NRC129 - 55	55	Py	SW	Waste	<0.1	<0.02	0.7	0.14	2.1	0.43	<0.0005	<0.0001
10/09/2019	NRC129 - 68	68	Sst	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.66	0.13	<0.0005	<0.0001
10/09/2019	NRC129 - 89	89	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	1.7	0.35	<0.0005	<0.0001
10/09/2019	NRC129 - 98	98	Pg	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.2	0.04	<0.0005	<0.0001
10/09/2019	NRC129 - 134	134	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	3.2	0.64	<0.0005	<0.0001
10/09/2019	FRC212 - 8	8	Pg	HW	Waste	<0.1	<0.02	<0.1	<0.02	0.02	0.004	<0.0005	<0.0001
10/09/2019	FRC212 - 15	15	Py	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.19	0.04	<0.0005	<0.0001
10/09/2019	FRC212 - 44	44	Py	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.31	0.06	<0.0005	<0.0001
10/09/2019	FRC212 - 53	53	Pg	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.10	0.02	<0.0005	<0.0001
11/09/2019	FRC212 - 66	66	Py	SW	Waste	<0.1	<0.02	<0.1	<0.02	0.92	0.18	<0.0005	<0.0001
11/09/2019	FRC212 - 81	81	Pg	Fr	Waste	0.2	0.04	1	0.20	0.97	0.19	<0.0005	<0.0001
11/09/2019	FRC212 - 88	88	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	1.6	0.32	<0.0005	<0.0001
11/09/2019	FRC212 - 92	92	Pg	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.90	0.18	<0.0005	<0.0001
11/09/2019	FRC212 - 97	97	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	0.61	0.12	<0.0005	<0.0001
11/09/2019	FRC212 - 109	109	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	16	3.2	<0.0005	<0.0001
11/09/2019	FRC212 - 122	122	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	16	3.2	<0.0005	<0.0001
11/09/2019	FRC212 - 131	131	Pg	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.39	0.08	<0.0005	<0.0001
11/09/2019	FRC212 - 143	143	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	2.2	0.44	<0.0005	<0.0001
11/09/2019	FRC213 - 5	5	Py	HW	Waste	<0.1	<0.02	<0.1	<0.02	0.07	0.01	<0.0005	<0.0001
11/09/2019	FRC213 - 26	26	Py	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.15	0.03	<0.0005	<0.0001
11/09/2019	FRC213 - 37	37	Pg	HW	Waste	<0.1	<0.02	0.1	0.02	0.06	0.01	<0.0005	<0.0001
11/09/2019	FRC213 - 58	58	Py	SW	Waste	<0.1	<0.02	0.1	0.02	0.75	0.15	<0.0005	<0.0001
11/09/2019	FRC213 - 62	62	Pg	SW	Waste	<0.1	<0.02	0.4	0.08	0.10	0.02	<0.0005	<0.0001
11/09/2019	FRC213 - 67	67	Pg	SW	Waste	<0.1	<0.02	0.6	0.12	0.09	0.02	<0.0005	<0.0001
11/09/2019	FRC213 - 86	86	Pg	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.53	0.11	<0.0005	<0.0001
11/09/2019	FRC213 - 107	107	Sst	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.84	0.17	<0.0005	<0.0001
11/09/2019	FRC213 - 131	131	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	2.1	0.41	<0.0005	<0.0001
14/09/2019	FRC213 - 142	142	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	0.91	0.18	<0.0005	<0.0001
14/09/2019	FRC213 - 148	148	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	12	2.4	<0.0005	<0.0001
14/09/2019	FRC213 - 156	156	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	1.7	0.34	<0.0005	<0.0001
14/09/2019	FRC213 - 170	170	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	18	3.5	<0.0005	<0.0001
14/09/2019	FRC213 - 178	178	Pg	Fr	Ore	<0.1	<0.02	0.5	0.10	21	4.1	<0.0005	<0.0001
14/09/2019	FRC213 - 187	187	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	1.6	0.32	<0.0005	<0.0001
14/09/2019	FRC214 - 6	6	Py	CW	Waste	<0.1	<0.02	<0.1	<0.02	0.08	0.02	<0.0005	<0.0001
14/09/2019	FRC214 - 13	13	Py/Qv	HW	Waste	<0.1	<0.02	<0.1	<0.02	0.07	0.01	<0.0005	<0.0001
14/09/2019	FRC214 - 20	20	Py	CW	Waste	<0.1	<0.02	<0.1	<0.02	0.06	0.01	<0.0005	<0.0001
14/09/2019	FRC214 - 34	34	Py	HW	Waste	<0.1	<0.02	<0.1	<0.02	0.16	0.03	<0.0005	<0.0001
14/09/2019	FRC214 - 45	45	Py	MW	Waste	<0.1	<0.02	<0.1	<0.02	0.20	0.04	<0.0005	<0.0001
14/09/2019	FRC214 - 50	50	Py	SW	Waste	<0.1	<0.02	<0.1	<0.02	0.20	0.04	<0.0005	<0.0001
14/09/2019	FRC214 - 74	74	Py	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.31	0.06	<0.0005	<0.0001
14/09/2019	FRC214 - 102	102	Pg	Fr	Ore	<0.1	<0.02	<0.1	<0.02	10	2.1	<0.0005	<0.0001
14/09/2019	FRC214 - 116	116	Pg	Fr	Waste	<0.1	<0.02	<0.1	<0.02	0.86	0.17	<0.0005	<0.0001

APPENDIX C – TCLP Results

Sample details						TCLP Leach				Leachable Metals by ICPAES															
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	Initial pH	After HCl pH	Extraction Fluid Number	Final pH	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Selenium	Tin	Zinc	Lithium	Mercury
						pH Unit	pH Unit		pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
						0.1	**0.1**	**1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.05**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.05**	**0.1**	**0.1**	**0.001**	**0.001**
10/09/2019	NRC129 - 4	4	Py	EW	Waste	6.5	1.6	1	4.9	0.9	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	<0.1	<0.05	<0.1	0.2	0.002	<0.0010
10/09/2019	NRC129 - 20	20	Py	MW	Waste	7.05	1.7	1	4.9	0.35	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	1.5	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.0565	<0.1
10/09/2019	NRC129 - 55	55	Py	SW	Waste	8.5	1.7	1	4.9	0.4	<0.1	<0.1	<0.05	<0.1	<0.1	0.2	1.9	<0.1	0.2	<0.1	<0.05	<0.1	0.2	0.151	<0.0010
10/09/2019	NRC129 - 68	68	Sst	Fr	Waste	8.7	1.8	1	4.9	0.9	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	10.3	<0.1	0.2	<0.1	<0.05	<0.1	0.3	0.174	<0.0010
10/09/2019	NRC129 - 89	89	Py	Fr	Waste	8.5	1.7	1	4.9	1.2	<0.1	0.1	<0.05	<0.1	<0.1	<0.1	6.8	<0.1	0.2	0.1	<0.05	<0.1	0.2	0.206	<0.0010
10/09/2019	NRC129 - 98	98	Pg	Fr	Waste	8.7	1.7	1	4.9	0.7	<0.1	0.6	<0.05	<0.1	<0.1	<0.1	4	<0.1	0.1	<0.1	<0.05	<0.1	0.4	0.068	<0.0010
10/09/2019	NRC129 - 134	134	Py	Fr	Waste	9.2	1.5	1	4.9	1.5	<0.1	0.3	<0.05	<0.1	<0.1	<0.1	9.8	0.3	0.4	0.1	<0.05	<0.1	0.3	0.519	<0.0010
10/09/2019	FRC212 - 8	8	Pg	HW	Waste	8	1.4	1	4.9	0.4	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	1.8	<0.1	0.2	<0.1	<0.05	<0.1	0.6	0.008	<0.0010
10/09/2019	FRC212 - 15	15	Py	MW	Waste	8.1	1.7	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.4	<0.1	0.1	<0.1	<0.05	<0.1	0.1	0.069	<0.0010
10/09/2019	FRC212 - 44	44	Py	MW	Waste	8.1	1.6	1	4.9	0.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.4	<0.1	0.4	<0.1	<0.05	<0.1	0.1	0.064	<0.0010
10/09/2019	FRC212 - 53	53	Pg	MW	Waste	8	1.5	1	4.9	0.6	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	1.6	<0.1	0.2	<0.1	<0.05	<0.1	0.1	0.014	<0.0010
11/09/2019	FRC212 - 66	66	Py	SW	Waste	8.5	1.6	1	4.9	0.7	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	8.75	<0.1	0.2	0.1	<0.1	<0.1	0.2	0.148	<0.1
11/09/2019	FRC212 - 81	81	Pg	Fr	Waste	8.5	1.6	1	4.9	0.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	2.6	<0.1	0.9	<0.1	<0.05	<0.1	0.3	0.259	<0.0010
11/09/2019	FRC212 - 88	88	Py	Fr	Waste	8.5	1.6	1	4.9	1.1	<0.1	1.2	<0.05	<0.1	<0.1	<0.1	6.5	<0.1	0.2	<0.1	<0.05	<0.1	0.2	0.329	<0.0010
11/09/2019	FRC212 - 92	92	Pg	Fr	Waste	9	1.5	1	4.9	0.8	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	7	<0.1	0.3	<0.1	<0.05	<0.1	0.4	0.205	<0.0010
11/09/2019	FRC212 - 97	97	Pg	Fr	Ore	9	1.5	1	4.9	0.8	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	6.6	<0.1	0.3	<0.1	<0.05	<0.1	0.4	0.221	<0.0010
11/09/2019	FRC212 - 109	109	Pg	Fr	Ore	9.2	1.5	1	4.9	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	29.7	<0.1	5.4	0.1	<0.05	<0.1	0.8	2.03	<0.0010
11/09/2019	FRC212 - 122	122	Pg	Fr	Ore	9.3	1.5	1	4.9	0.65	<0.1	<0.1	<0.05	0.1	<0.1	<0.1	26.7	<0.1	0.4	<0.1	<0.05	<0.1	0.6	2.06	<0.0010
11/09/2019	FRC212 - 131	131	Pg	Fr	Waste	9.1	1.5	1	4.9	1	<0.1	0.3	<0.05	0.1	<0.1	<0.1	20.8	<0.1	0.2	<0.1	<0.05	<0.1	0.6	0.17	<0.0010
11/09/2019	FRC212 - 143	143	Py	Fr	Waste	9	1.5	1	4.9	1.9	<0.1	0.2	<0.05	<0.1	<0.1	<0.1	16.5	<0.1	0.2	<0.1	<0.05	<0.1	0.4	0.362	<0.0010
11/09/2019	FRC213 - 5	5	Py	HW	Waste	8	1.6	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.05	<0.1	0.1	0.019	<0.0010
11/09/2019	FRC213 - 26	26	Py	MW	Waste	7.9	1.5	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.9	<0.1	0.2	<0.1	<0.05	<0.1	0.1	0.081	<0.0010
11/09/2019	FRC213 - 37	37	Pg	HW	Waste	7.9	1.6	1	4.9	0.4	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.7	<0.1	1	<0.1	<0.05	<0.1	0.3	0.046	<0.0010
11/09/2019	FRC213 - 58	58	Py	SW	Waste	8.3	1.6	1	4.9	0.4	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	4.8	<0.1	0.2	<0.1	<0.05	<0.1	0.2	0.136	<0.0010
11/09/2019	FRC213 - 62	62	Pg	SW	Waste	8.2	1.6	1	4.9	0.5	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	3.2	<0.1	0.2	<0.1	<0.05	<0.1	0.4	0.022	<0.0010
11/09/2019	FRC213 - 67	67	Pg	SW	Waste	8.3	1.7	1	4.9	0.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	1.6	<0.1	0.4	<0.1	<0.05	<0.1	0.4	0.032	<0.0010
11/09/2019	FRC213 - 86	86	Pg	Fr	Waste	8.75	1.6	1	4.9	0.85	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	8	<0.1	0.1	<0.1	<0.05	<0.1	0.2	0.1905	<0.0010
11/09/2019	FRC213 - 107	107	Sst	Fr	Waste	8.7	1.6	1	4.9	1.4	<0.1	0.2	<0.05	<0.1	<0.1	<0.1	16.2	<0.1	0.3	<0.1	<0.05	<0.1	0.3	0.274	<0.0010
11/09/2019	FRC213 - 131	131	Py	Fr	Waste	9	1.6	1	4.9	1	<0.1	0.2	<0.05	0.1	<0.1	<0.1	22.5	<0.1	0.4	<0.1	<0.05	<0.1	0.3	0.319	<0.0010
14/09/2019	FRC213 - 142	142	Pg	Fr	Ore	8	1.3	1	5	0.4	<0.1	0.1	<0.05	<0.1	<0.1	<0.1	18.2	<0.1	0.7	<0.1	<0.05	<0.1	0.3	0.467	<0.0010
14/09/2019	FRC213 - 148	148	Pg	Fr	Ore	8.6	1.2	1	5	0.7	<0.1	<0.1	<0.05	0.1	<0.1	<0.1	22.4	<0.1	0.5	<0.1	<0.05	<0.1	0.6	1.27	<0.0010
14/09/2019	FRC213 - 156	156	Pg	Fr	Ore	7.7	1.3	1	5.1	0.8	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	7.2	<0.1	0.3	<0.1	<0.05	<0.1	1.4	0.255	<0.0010
14/09/2019	FRC213 - 170	170	Pg	Fr	Ore	8.9	1.3	1	5.2	1.1	<0.1	<0.1	<0.05	0.2	<0.1	<0.1	37.8	<0.1	0.6	<0.1	<0.05	<0.1	0.8	2.2	<0.0010
14/09/2019	FRC213 - 178	178	Pg	Fr	Ore	8.8	1.3	1	5	0.9	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	12.85	<0.1	1.05	<0.1	<0.05	<0.1	0.5	1.88	<0.0010
14/09/2019	FRC213 - 187	187	Py	Fr	Waste	8.8	1.2	1	5.2	2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	9.6	0.2	0.3	<0.1	<0.05	<0.1	0.6	0.291	<0.0010
14/09/2019	FRC214 - 6	6	Py	CW	Waste	7.4	1.3	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.05	<0.1	0.1	0.022	<0.0010
14/09/2019	FRC214 - 13	13	Py/Qv	HW	Waste	7.4	1.4	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.05	<0.1	0.2	0.024	<0.0010
14/09/2019	FRC214 - 20	20	Py	CW	Waste	6.2	1.3	1	4.9	0.2	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.05	<0.1	0.1	0.02	<0.0010
14/09/2019	FRC214 - 34	34	Py	HW	Waste	6.4	1.3	1	4.9	0.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	5	<0.1	0.2	<0.1	<0.05	<0.1	0.1	0.086	<0.0010
14/09/2019	FRC214 - 45	45	Py	MW	Waste	6.9	1.3	1	4.9	0.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	4	<0.1	0.3	<0.1	<0.05	<0.1	0.1	0.081	<0.0010
14/09/2019	FRC214 - 50	50	Py	SW	Waste	7.6	1.3	1	4.9	0.8	<0.1	0.1	<0.05	<0.1	<0.1	<0.1	11.8	<0.1	0.2	<0.1	<0.05	<0.1	0.2	0.106	<0.0010
14/09/2019	FRC214 - 74	74	Py	Fr	Waste	7.9	1.3	1	4.9	0.6	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	12.4	<0.1	0.2	<0.1	<0.05	<0.1	0.1	0.17	<0.0010
14/09/2019	FRC214 - 102	102	Pg	Fr	Ore	8.4	1.4	1	5	0.8	<0.1	<0.1	<0.05	0.2	<0.1	<0.1	37.6	<0.1	1.2	0.1	<0.05	<0.1	0.6	1.09	<0.0010
14/09/2019	FRC214 - 116	116	Pg	Fr	Waste	8.2	1.4	1	4.9	1.3	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	12	<0.1	0.2	<0.1	<0.05	<0.1	0.5	0.213	<0.0010

APPENDIX D – Naturally Occurring Radioactive Materials (NORM)

Sample details						NORM	
Sample Date	Sample ID	Depth	Lithology	Weathering	Sample Type	Radeye B20 Contamination Meter Alpha/Beta/Gamma SN 32215 Calibrated 15/04/19	
						µSv/h	mSv/yr[1]
						Bkd 0.10	**0.22**
10/09/2019	NRC129 - 4	4	Py	EW	Waste	0.14	0.30
10/09/2019	NRC129 - 20	20	Py	MW	Waste	0.13	0.27
10/09/2019	NRC129 - 55	55	Py	SW	Waste	0.14	0.30
10/09/2019	NRC129 - 68	68	Sst	Fr	Waste	0.13	0.28
10/09/2019	NRC129 - 89	89	Py	Fr	Waste	0.12	0.26
10/09/2019	NRC129 - 98	98	Pg	Fr	Waste	0.14	0.30
10/09/2019	NRC129 - 134	134	Py	Fr	Waste	0.15	0.32
10/09/2019	FRC212 - 8	8	Pg	HW	Waste	0.16	0.35
10/09/2019	FRC212 - 15	15	Py	MW	Waste	0.14	0.30
10/09/2019	FRC212 - 44	44	Py	MW	Waste	0.15	0.32
10/09/2019	FRC212 - 53	53	Pg	MW	Waste	0.12	0.26
11/09/2019	FRC212 - 66	66	Py	SW	Waste	0.18	0.38
11/09/2019	FRC212 - 81	81	Pg	Fr	Waste	0.22	0.48
11/09/2019	FRC212 - 88	88	Py	Fr	Waste	0.20	0.43
11/09/2019	FRC212 - 92	92	Pg	Fr	Waste	0.15	0.32
11/09/2019	FRC212 - 97	97	Pg	Fr	Ore	0.11	0.24
11/09/2019	FRC212 - 109	109	Pg	Fr	Ore	0.17	0.37
11/09/2019	FRC212 - 122	122	Pg	Fr	Ore	0.17	0.37
11/09/2019	FRC212 - 131	131	Pg	Fr	Waste	0.15	0.32
11/09/2019	FRC212 - 143	143	Py	Fr	Waste	0.17	0.37
11/09/2019	FRC213 - 5	5	Py	HW	Waste	0.13	0.28
11/09/2019	FRC213 - 26	26	Py	MW	Waste	0.17	0.37
11/09/2019	FRC213 - 37	37	Pg	HW	Waste	0.14	0.30
11/09/2019	FRC213 - 58	58	Py	SW	Waste	0.13	0.28
11/09/2019	FRC213 - 62	62	Pg	SW	Waste	0.16	0.35
11/09/2019	FRC213 - 67	67	Pg	SW	Waste	0.17	0.37
11/09/2019	FRC213 - 86	86	Pg	Fr	Waste	0.14	0.30
11/09/2019	FRC213 - 107	107	Sst	Fr	Waste	0.16	0.35
11/09/2019	FRC213 - 131	131	Py	Fr	Waste	0.17	0.37
14/09/2019	FRC213 - 142	142	Pg	Fr	Ore	0.11	0.24
14/09/2019	FRC213 - 148	148	Pg	Fr	Ore	0.14	0.30
14/09/2019	FRC213 - 156	156	Pg	Fr	Ore	0.15	0.32
14/09/2019	FRC213 - 170	170	Pg	Fr	Ore	0.13	0.28
14/09/2019	FRC213 - 178	178	Pg	Fr	Ore	0.17	0.36
14/09/2019	FRC213 - 187	187	Py	Fr	Waste	0.19	0.41

Sample details						NORM	
Sample Date	**Sample ID**	**Depth**	**Lithology**	**Weathering**	**Sample Type**	**Radeye B20 Contamination Meter Alpha/Beta/Gamma SN 32215 Calibrated 15/04/19**	
						µSv/h	**mSv/yr[1]**
						Bkd 0.10	**0.22**
14/09/2019	FRC214 - 6	6	Py	CW	Waste	0.22	0.48
14/09/2019	FRC214 - 13	13	Py/Qv	HW	Waste	0.21	0.45
14/09/2019	FRC214 - 20	20	Py	CW	Waste	0.15	0.32
14/09/2019	FRC214 - 34	34	Py	HW	Waste	0.15	0.32
14/09/2019	FRC214 - 45	45	Py	MW	Waste	0.19	0.41
14/09/2019	FRC214 - 50	50	Py	SW	Waste	0.16	0.35
14/09/2019	FRC214 - 74	74	Py	Fr	Waste	0.14	0.30
14/09/2019	FRC214 - 102	102	Pg	Fr	Ore	0.18	0.39
14/09/2019	FRC214 - 116	116	Pg	Fr	Waste	0.12	0.26

1. Calculated assuming exposure across a 1 year period using a 45 h working week on average

APPENDIX E – Soil Characterisation

APPENDIX E: Soil characterisation

Parameter	Units	LOR	NRC129 - 0	FRC212 - 0	FRC213 - 0	FRC214 - 0
Sample Location						
Easting			694439	694384	694362	694455
Northing			8593567	8593490	8593491	8593410
Sample Description						
Depth			0	0	0	0
Lithology			Soil (SO)	Soil (SO)	Soil (SO)	Soil (SO)
Color			Dark Gray	Light Olive Brown	Grayish Brown	Dark Gray
Texture			Sandy Loam	Sandy Clay Loam	Clay Loam	Loamy Sand
Weathering			Completely Weathered	Completely Weathered	Completely Weathered	Completely Weathered
General						
Bulk Density	kg/m3	1	3180	3170	3160	2030
Moisture Content	%	0.1	3	0.4	1.1	<0.1
Emerson Class Number			7	7	7	7
pH Value	pH Unit	0.1	5.7	5.7	5.8	5.3
Electrical Conductivity @ 25Â°C	ÂµS/cm	1	17	33	17	14
Particle sizing						
+75Âµm	%	1	67	61	----	65
+150Âµm	%	1	37	36	----	26
+300Âµm	%	1	19	26	----	8
+425Âµm	%	1	16	25	----	5
+600Âµm	%	1	14	24	----	3
+1180Âµm	%	1	13	22	----	<1
+2.36mm	%	1	12	19	----	<1
+4.75mm	%	1	10	14	----	<1
+9.5mm	%	1	2	2	----	<1
+19.0mm	%	1	<1	<1	----	<1
+37.5mm	%	1	<1	<1	----	<1
+75.0mm	%	1	<1	<1	----	<1
Classification based on particle size						
Clay (<2 Âµm)	%	1	11	9	----	7
Silt (2-60 Âµm)	%	1	18	23	----	22
Sand (0.06-2.00 mm)	%	1	59	48	----	71
Gravel (>2mm)	%	1	12	20	----	<1
Cobbles (>6cm)	%	1	<1	<1	----	<1
Exchangeable Cations						
Cation Exchange Capacity	meq/100g	0.1	0.6	0.9	0.6	0.3
Exchangeable Calcium	meq/100g	0.1	0.2	0.4	0.2	<0.1
Exchangeable Magnesium	meq/100g	0.1	0.4	0.4	0.4	0.2
Exchangeable Potassium	meq/100g	0.1	<0.1	0.1	<0.1	<0.1
Exchangeable Sodium	meq/100g	0.1	<0.1	<0.1	<0.1	<0.1
Exchangeable Aluminium	meq/100g	0.1	<0.1	<0.1	<0.1	<0.1
Exchangeable Sodium Percentage	%	0.1	n/a	n/a	n/a	n/a
Calcium/Magnesium Ratio		0.1	0.5	1	0.5	n/a
Total Metals by ICP-MS						
Arsenic	mg/kg	0.1	6	14.9	5.7	0.8
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	0.1	5.1	12.3	6	1.9
Copper	mg/kg	0.1	2.5	5.2	2.9	0.9
Nickel	mg/kg	0.1	2.4	4.7	3	0.9
Lead	mg/kg	0.1	4.3	5.6	4.1	1.8
Zinc	mg/kg	0.5	3.9	11.7	6.5	1.7
Lithium	mg/kg	0.1	7.6	33.1	13.9	7
Tin	mg/kg	0.1	0.8	0.8	0.6	0.4
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nutrients						
Nitrite + Nitrate as N (Sol.)	mg/kg	0.1	0.7	<0.1	<0.1	0.3
Total Kjeldahl Nitrogen as N	mg/kg	20	790	780	470	410
Total Nitrogen as N	mg/kg	20	790	780	470	410
Bicarbonate Ext. P (Colwell)	mg/kg	5	<5	<5	<5	<5
Bicarbonate Extractable K (Colwell)	mg/kg	100	129	135	341	<100
KCl Extractable Sulfur (23Ce)	% S	0.02	<0.02	<0.02	<0.02	<0.02
Organic Matter						
Organic Matter	%	0.5	2	1.3	1.3	1
Total Organic Carbon	%	0.5	1.1	0.8	0.7	0.6

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ENVIRONMENTAL GEOCHEMISTRY
INTERNATIONAL PTY LTD

ABN 48 600 298 271

81A COLLEGE STREET
BALMAIN, NSW 2041 AUSTRALIA

T +61 2 9810 8100
E EGI@GEOCHEMISTRY.COM.AU
W WWW.GEOCHEMISTRY.COM.AU