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Sampling and Analysis Plan
Implementation Report 2019

Sediment Quality

Port of Bundaberg

Client: Gladstone Ports Corporation

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Future-Plus Environmental

Date: 4 February 2020



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EXECUTIVE SUMMARY

Gladstone Ports Cooperation (GPC) is responsible for capital and maintenance dredging for navigation purposes within the Port of Bundaberg. Dredging is presently managed under the Long-term Maintenance Dredging and Disposal Plan (LTMMMP), Port of Bundaberg 2012-2022 (WorleyParsons, 2010). The 2019 Sediment and Analysis Plan (SAP) was developed to maintain alignment with LTMMMP Appendix 8 - Sediment Sampling and Analysis Plan: 2014 and 2019, the National Assessment Guidelines for Dredging (NAGD) 2009 (LTMMMP Section 11.4) as well as ensuring that minor recent developments in the area have not had an impact on the sediment quality and sea disposal suitability.

Sediment from the Port of Bundaberg's designated dredge / navigation (i.e. Port and Entrance Channel) areas were characterised in accordance with the approved 2019 SAP. The historic upstream sampling locations (i.e. River) were once again included in the 2019 SAP. Sampling of these upstream locations provides GPC with an early indication of the likely presence / absence of contaminants upstream of the dredge area.

Particle Size Distribution (PSD) testing indicated that sediments in the River and Entrance Channel sediments were generally characterised by a higher portion of coarse material (i.e. sands and gravels) greater than 75µm in diameter. The sediments within the Port area however consisted of finer material (i.e. silt and clays) that generally overlaid coarser material (i.e. sands) at depth.

A range of laboratory analysis was required as per the 2019 SAP to determine the presence of contaminants within the sediment. As per the NAGD 2009 requirements, statistical calculations were applied in order to compare results to the NAGD (2009) screening levels. Laboratory analysis conducted under Phase II testing concluded that no analyte exceeded the 95% UCL for NAGD (2009) screening levels.

The Port and Entrance Channel sediments are not Actual Acid Sulfate Soils (AASS) but are Potential Acid Sulfate Soils (PASS) which contain significant concentrations of Acid Neutralising Capacity (ANC) which is likely present in the form of shells, coral fragments etc. Specific ASS management would not be required during the preferred option of sea disposal which achieves the best management practice of strategic reburial (i.e. placement of PASS directly below the water table). However, should land-based disposal be adopted for dredging, an ASS Management Plan (ASSMP) should be prepared to best manage the disturbance of PASS.

The assessment concludes that dredge material within the Port of Bundaberg's designated dredge / navigation areas meets the criteria for unconfined ocean disposal. Upstream sampling results were also inline with past results indicating recent minor developments in the area have not had an impact on the sediment quality. PASS material would require specific management if land-based disposal is proposed for the dredge sediment.

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1.0 INTRODUCTION

1.1 BACKGROUND

The 2019 SAP was undertaken as part of the second stage of the Department of the Environment and Energy (DOEE) approved Sediment Sampling and Analysis Plan: 2014 and 2019 as detailed in the LTMMP. The 2019 SAP was implemented by Future-Plus Environmental (FPE) with the objective to:

- Maintain alignment with the NADG (i.e. good quality data);
- Ensuring that recent minor developments in the area have not had an impact on the sediment quality;
- Continue to gather and updated data in upstream (i.e. River) sampling locations in order to gain a better understanding and allowing temporal comparisons of sediment characteristics for Burnett catchment area upstream of the dredge area; and
- Determine if the chemical and physical nature of the sediment to be dredged is suitable for unconfined ocean disposal.

1.2 DESCRIPTION OF STUDY AREA

The Port of Bundaberg is situated on the Burnett River approximately 5km upstream from the river mouth. GPC is required under the Queensland *Transport Infrastructure Act 1994* to maintain navigable depths within the port navigation areas. The current port navigation areas consist of Inner, Middle and Outer Reaches, these reaches are illustrated below in **Figure 1**.

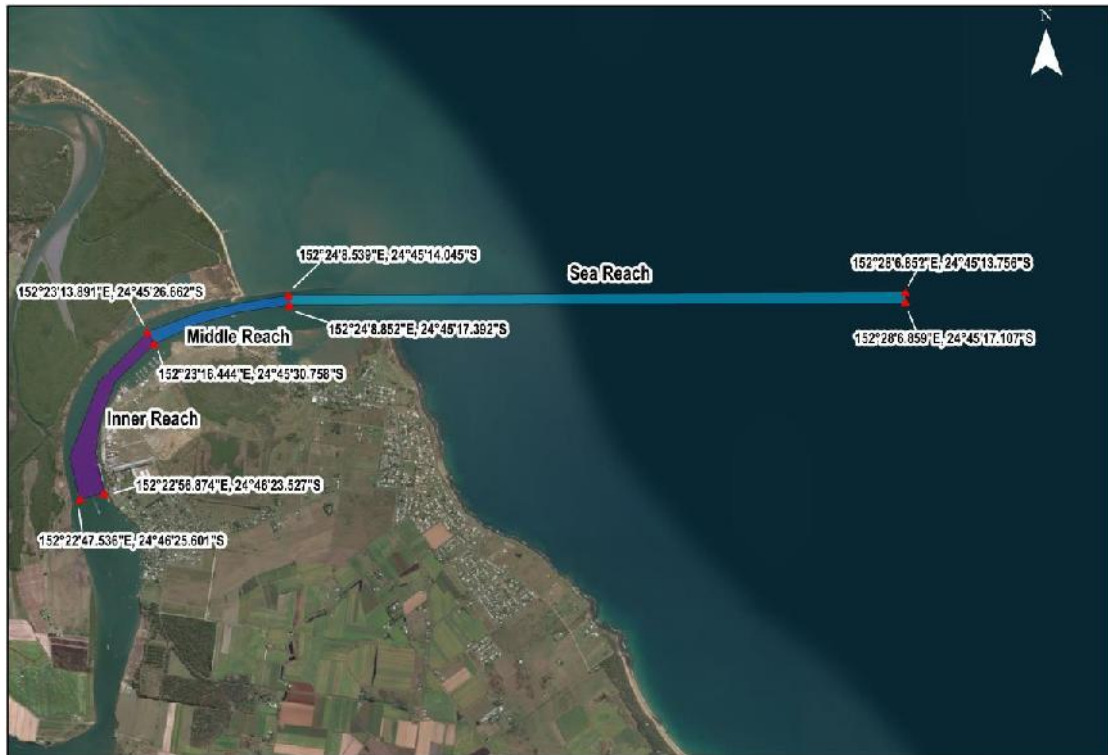


Figure 1. Port of Bundaberg Reaches

Consistent with previous SAP's the Inner and Middle Reaches have been classified as the Port area while the Sea Reach is classified as the Entrance Channel area. Dredging up to 1m depth of sediments is typically required during the annual maintenance campaigns over the Port and Entrance Channel areas.

The upstream sites were classified as the River area, consistent with previous studies.

2.0 METHODOLOGY

2.1 LEGISLATION

Dredging and sea disposal is highly regulated and subject to international agreements, Commonwealth and State legislative requirements. The implementation of the 2019 SAP was undertaken where applicable to the following legislation, guidelines and reference materials.

2.1.1 International

- 1996 London Protocol (previously known as the Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972).

2.1.2 Commonwealth

- Environment Protection (Sea Dumping) Act 1981 (the Sea Dumping Act);
- Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act); and
- Great Barrier Reef Marine Park Act 1975.

2.1.3 Queensland State Responsibilities

- Coastal Protection and Management Act 1995 (the Coastal Act);
- Fisheries Act 1994; and
- Environmental Protection Act 1994 (Environmental Protection Regulation, 1998).

2.2 GUIDELINES AND STANDARDS

- National Assessment Guidelines for Dredging, NAGD (2009);
- Australian and New Zealand Environmental Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (2018);
- Queensland Acid Sulfate Soils Investigation Team (QASSIT), Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland (1998) Revision 4;
- Queensland Acid Sulfate Soil Technical Manual (QASSTM): Soil Management Guidelines v4.0. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government (2014); and
- Handbook for Sediment Quality Assessment, 2005, CSIRO

2.3 SAMPLE LOCATIONS

The selection of sampling locations within the Port and Entrance Channel areas was determined in accordance with the grid method detailed in Appendix D of the NAGD. **Figure 2** illustrates the sample locations with grid overlay.

The upstream River locations were undertaken at the historic locations. As discussed above in Section 1.2, the upstream area is outside of the dredge area (i.e. not to be dredged) and therefore sample location selection with respect to dredge volumes (Appendix D of the NAGD) was not applicable. The collection, analysis and assessment of the River area sediment provides GPC with an early indication of the presence/absence of likely contaminants upstream of the dredge area. **Figure 3** shows the 2019 sample locations.



Figure 2. Showing the Port and Entrance Channel Sample Locations with Grid Overlay



Figure 3. 2019 SAP Sample Locations

2.4 ANALYTE LIST

In accordance with NAGD, metal analytes were selected based on a review of historic and current studies of potential contaminants. Physical properties of particle size and moisture content were selected for the assessment of settling potential. In addition to the NADG analytes, the SPOCAS suite was also undertaken in order to assess the sulfuric nature of the sediment.

Table 1 summarises the analytes tested for laboratory analysis, Practical Quantitation Limits (PQLs), NAGD screening levels and the subsequent laboratory limit of reporting.

Table 1. Summary of Laboratory Analysis

Parameter	Practical Quantitation Limit (as per NAGD (2009))	Screening level (as per NAGD (2009))	Limit of Reporting – Primary Laboratory
Particle Size Distribution (Including fine fraction by hydrometer)	NS	NS	1%
Moisture Content %	0.1	NS	0.5
pH _F and pH _{FOX}	NS	NS	-
Total organic carbon %	0.1	NS	0.1
SPOCAS Suite	NS	NS	-
Metals (mg/kg)			
Antimony	0.5	2	0.5
Arsenic	1	20	1
Cadmium	0.1	1.5	0.1
Chromium	1	80	1
Copper	1	65	1
Lead	1	50	1
Mercury	0.01	0.15	0.01
Nickel	1	21	1
Silver	0.1	1	0.1
Zinc	1	200	1
Organotin Compounds (µgSn/kg)			
Tributyltin as Sn	1	9	0.5

2.5 SAMPLE QUALITY CONTROL

Based on the 2019 SAP a total number of 20 core sediment samples were collected yielding 22 samples for laboratory analysis. This included two field core triplicate locations (each with a primary sample and two duplicate/triplicate samples) for assessment of sample variability and one duplicate split sample for assessment of laboratory precision.

2.6 SAMPLE ANALYSIS PLAN

Table 2 summarises the sampling location number, number of samples collected and analysis undertaken.

Table 2. Sediment Sampling and Analysis Plan

Sample Location Number	Dredge/Sample Area	Easting (X) GDA	Northing (Y) GDA	Core length (m)	Number of cores collected	Number of samples to be analysed	Analytes					
							Moisture	PSD	TOC	Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn)	Organotins (MBT, DTB, TBT)	SPOCAS
1	River	428,620	7,248,815	1	1	1	x	x		x		
2	River	435,190	7,250,408	1	1	1	x	x		x		
3	River	436,394	7,252,712	1	1	1	x	x		x		
4	River	435,320	7,255,787	1	1	1	x	x		x		
5	River	437,066	7,257,067	1	1	1	x	x		x		
6	River	437,619	7,258,811	1	1	1	x	x		x		
7	River	437,587	7,259,787	1	1	1	x	x		x		
8	Port Area	437,280	7,260,023	1	3 (triplicate core)	1	x	x	x	x	x	x
				1		QA ₁	x		x	x	x	x
				1		QB ₁	x		x	x	x	x

Sample Location Number	Dredge/Sample Area	Easting (X) GDA	Northing (Y) GDA	Core length (m)	Number of cores collected	Number of samples to be analysed	Analytes					
							Moisture	PSD	TOC	Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn)	Organotins (MBT, DTB, TBT)	SPOCAS
9	Port Area	437,434	7,260,317	1	1	1	x	x	x	x	x	x
10	Port Area	437,606	7,261,049	1	1 (laboratory split)	1	x	x	x	x	x	x
						QA ₂	x		x	x	x	x
						QB ₂	x		x	x	x	x
11	Port Area	438,069	7,261,650	1	1	1	x	x	x	x	x	x
12	Port Area	438,722	7,261,952	1	1	1	x	x	x	x	x	x
13	Port Area	439,341	7,262,089	1	1	1	x	x	x	x	x	x
14	Entrance Channel	440,241	7,262,129	1	3 (triplicate core)	1	x	x	x	x		x
				1		QA ₃	x		x	x		x
				1		QB ₃	x		x	x		x
15	Entrance Channel	442,933	7,262,139	1	1	1	x	x	x	x		x
16	Entrance Channel	445,634	7,262,139	1	1	1	x	x	x	x		x

2.6.1 Hold Samples

A 500ml hold sample (i.e. a small duplicate spilt taken from homogenised sample material) for each of the Port and Entrance Channel sample locations was also collected during the sampling campaign and submitted to the analytical laboratory for elutriate testing (if required). This material was collected and stored under the appropriate conditions.

2.7 FIELD SAMPLING

2.7.1 Sample Collection

Commercial qualified and experienced divers were used to collect sediment samples using a piston core auger. The following methodology was undertaken during the sampling works:

- Prior to the sampling work, the survey vessel including all work areas and sampling equipment was thoroughly inspected, cleaned and washed down;
- Sampling locations were located as per the site plan and coordinates provided with an appropriate field positioning system (handheld GPS) unit with +/- 5m horizontal accuracy which was cross checked against the survey vessels GPS unit;
- Sampling/coring was carried out within all the proposed SAP locations including additional QA/QC coring and sampling requirements (i.e. split samples and triplicate cores during the sampling) as per the approved SAP;
- The water depth was measured using the boat depth sounder;
- Using a sterile piston corer a diver retrieved a 1m (or refusal) core sample from the bed surface;
- Additional samples were collected to supplement sample volumes where/if required;
- One core was extruded into a logging board for photos prior to sampling for PSD with the next core extruded into a stainless steel container for COPC sampling. All containers were rinsed with Decon-90, deionised water and/or seawater, prior to reuse;
- Disposable, powder free gloves were used and changed after each sample;
- The retrieved sediment was appropriately stored in laboratory provided containers, chilled in field prior to transport to the NATA accredited laboratory;
- Intermittent checks were carried out to ensure that no material had been lost or disturbed (e.g. deformation of sediment layers); and
- Stored and processed (refer below) samples were placed into a chilled insulated esky and despatched for laboratory analysis within the holding times specified under the analytical laboratories NATA accreditation.

Appendix A presents the daily field sheets completed during the SAP implementation.

2.7.2 Sample Characteristics

The retrieved sediment cores were processed by specialists in coastal/marine sediment logging, in order to describe its structure and create samples for chemical analysis. A sediment log of each sample was photographed with the following information recorded:

- Colour;
- Particle size;
- Time and date of coring; and
- Core length.

Sediment logs for each of the sampling sites are presented in **Appendix B**.

2.8 LABORATORY ANALYSIS

NATA accredited laboratories were used to undertake the sediment analysis as specified in the 2019 SAP. The primary laboratory selected has substantial experience in analysing marine sediments and were able to achieve the required PQLs in accordance with the NAGD, and had a high degree of quality assurance and quality control.

To determine the potential for contaminants within the sediments, sampling and analysis of the proposed dredge material was undertaken in accordance with NAGD. To assess ASS risk (i.e. if land based disposal was to be undertaken) samples were analysed in accordance with *QASSIT (1998)*.

Table 3 summarises the laboratories used to undertake the sediment sampling analysis as stipulated by the above listed guidelines and specified within the approved SAP.

Table 3. Laboratories used for SAP

Laboratory	NATA Accreditation No	Laboratory Role
Australian Laboratory Service Pty Ltd Stafford QLD	825	Primary – Phase II Chemical and Physical analysis
Eurofins MGT Pty Ltd 1/21 Smallwood Place, QLD	14356	Inter – Laboratory– Phase II Physical Analysis

Laboratory Certificates of Analysis (COA) and Quality Assurance certificates for the primary laboratory are provided in **Appendix C**. **Appendix D** presents the Secondary Laboratories certificates.

3.0 RESULTS

3.1 FIELD OBSERVATIONS

The sediment investigation was undertaken between the 26th and 28th November 2019 within the hours of 6:00am to 6:00pm. Refusal was encountered at two locations Site 4 (0.3m) and Site 16 (0.25m). At these locations additional cores were collected and homogenised for sampling purposes.

3.2 PHYSICALS

3.2.1 Moisture Content

Moisture content across the samples ranged from 16.6% - 51.5%.

3.2.2 Particle Size Distribution

The Particle Size Distribution (PSD) results are presented below in **Table 4**.

Table 4. Particle Size Distribution Results

Study Area	Site	Percent Gravel (+2.0mm)	Percent Sand (2.0mm – 63µm)	Percent Silt and Clay (63µm)
River	1	16	83	1
	2	2	49	49
	3	26	73	1
	4	2	87	11
	5	13	84	3
	6	4	86	4
	7	6	81	7
Port	8	6	57	37
	9	13	48	39
	10	0	14	86
	11	1	33	66
	12	5	86	9
	13	16	72	12
Entrance Channel	14	7	87	6
	15	0	71	29
	16	39	56	5

The PSD analysis indicated:

- Sands and gravelly Sands are typical of the River sediments (sites 1, 3-7), with exception of site 2, where fine grained sediments were inferred to depth of investigation, these results are in line with historic PSD analysis at these River locations;
- Clays with some sand, gravelly Sands and silty / clayey Sands were inferred within the Port area (sites 8-13); and
- Sands with silts / clays and gravelly sands were confirmed at the outermost Entrance Channel sampling locations (sites 14-16).

3.3 METALS

The laboratory results for the metal analytes are summarised in Analytical Table 1: Summary of Inorganic Analytical Results presented in **Appendix E**. Statistical assessment included minimum and maximum values and the 95% Upper Confidence level (UCL) of the mean which are presented below in **Table 5**.

The 95% UCL calculated for each of the inorganic (i.e. metals) and organo-metal analyses performed in the Port area were all below the NAGD Screening Levels. All maximum concentrations for the Entrance Channel locations were also below the NAGD Screening Levels.

Table 5. 2019 Inorganic Analyte Results

Analyte	Screening Levels	River			Port			Entrance Channel		
	NAGD (mg/kg)	Min (mg/kg)	Max (mg/kg)	95% UCL	Min (mg/kg)	Max (mg/kg)	95% UCL	Min (mg/kg)	Max (mg/kg)	95% UCL
Antimony	2	<0.5		N/A	<0.5		N/A	<0.5		-
Arsenic	20	<1	5.71	5.1	1.5	10.3	8.3	2.12	14.9	-
Cadmium	1.5	<0.1		N/A	<0.1		N/A	<0.1		-
Chromium	80	3.2	18.6	14.2	6.6	27.8	22.3	4.6	13.3	-
Copper	65	<1	18	15.2	2.3	21.3	17.9	<1	8.5	-
Lead	50	<1	8.5	6.4	1.8	11.2	9.5	1.6	5.2	-
Nickel	21	2.2	12.1	9.2	4.2	17.4	14.0	1.9	8.4	-
Silver	1	<0.1		N/A	<0.1		N/A	<0.1		-
Zinc	200	3.9	39	25.8	8.6	42.5	37.2	3.6	19.2	-
Mercury	0.15	<0.01	0.04	0.03	<0.	0.04	0.03	<0.01		-
Tin (MBT)	-	N/A			<1	<1	N/A	N/A		
Tin (DBT)	-				<1	1	N/A			
Tin (TBT)	9				<0.	<0.5	N/A			

3.4 ACID SULFATE SOILS

The assessment of ASS is **not** required under the NAGD. ASS characterisation was undertaken as part of the SAP 2019 to determine the absence or presence of sulfates within the dredge sediment should land-based disposal be proposed and / or required.

Summaries of the laboratory analysis results including statistical analysis (i.e. minimum, maximum and mean) with results are tabulated in **Appendix E - Analytical Table 2: Summary of SPOCAS Analytical Results**.

3.4.1 Qualitative Analysis

Field pH testing was undertaken in all Port and Entrance Channel samples. Testing included initial field pH tests (pH_F), after the addition of distilled water, to determine the presence of AASS, followed by field peroxide pH testing (pH_{FOX}) conducted after the addition of 30% hydrogen peroxide solution to test for sulfides or PASS. The results of field pH testing were then compared to the below criteria for interpreting field test results as specified in *QASSTM (2014)* to determine the likelihood of AASS/PASS:

- pH_F - A result of $pH < 4$ indicates oxidation has occurred in the past and that AASS is present; and
- pH_{FOX} - A result of $pH < 3$, plus a $pH\Delta$ reading > 2 pH units below the pH_F , plus a strong reaction with peroxide (i.e. > 3), strongly indicates the presence of PASS.

Field pH results ranged between 8.3 and 9.0 with a mean calculation of 8.62. There were no results below the trigger limit of pH_F of $pH < 4$ which would indicate the presence AASS. The results for pH_{FOX} ranged between 3.4 and 7.3 with a mean calculation of 6.28, $pH\Delta$ ranged between 1.2 and 5.1 with a mean of 2.34 while reaction rate ranged between 2 and 4 with a mean of 3.22. Although mean pH_{FOX} values were above 3 the significant mean $pH\Delta$ and reaction rates may indicate the sediments are likely PASS however contain significant acid buffering capacity (i.e. shell grit, corals, etc).

3.4.2 Quantitative Analysis

All Port and Entrance Channel samples were further subjected to more rigorous analytical testing using SPOCAS. Laboratory analysis using SPOCAS provides quantitative acid base accounting that measures the existing sulfuric acidity, potential sulfuric acidity and (if present) any neutralising capacity of the sediment samples. Total acidity trigger values, above which, action is required to prevent environmental harm due to potential release of acidic leachate are given below in **Table 6**.

Table 6. Action Criteria for Soils (if greater than 1000 tonnes disturbed) by Texture Categories¹

Texture Category	Texture Range (McDonald et al. 1990)	Approx. Clay Content (<0.002mm)	Action Level Total Acidity-%S)	Action Level (Total Acidity-mol H ⁺ /tonne)
Coarse	Sands to Loamy Sands	<5%	0.03	18
Medium	Sandy Loams to light clays	5-40%		
Fine	Medium to heavy clays	>40%		

As proposed soil disturbances are anticipated to be greater than 1,000 tonnes an Action Criteria of 0.03%S Total Acidity has been incorporated for the soil assessment.

Laboratory analysis indicated that:

- No AASS are present within the sediments with Titratable Actual Acidity (TAA) concentrations below the limit of reporting in all Port and Entrance Channel samples;
- Potentially oxidisable sulfur (POS) concentrations ranged from below the limit of reporting to 0.393%S in Port samples and from below the limit of reporting to 0.101%S in all samples. Mean POS was 0.19%S and 0.09%S for the Port and Entrance Channel areas respectively, both means exceed the QASSTM (2014) guidelines action criteria for Total Acidity (i.e. 0.03%S); and
- Significant acid neutralising capacity (ANC) exists within all samples with mean ANC (as %S units) of 0.42%S and 1.62%S for the Port and Entrance Channel areas respectively.

Statistical assessment included minimum value, maximum value and mean. The statistical results are presented below in Table 7.

Table 7. Summary of SPOCAS Statistical Results

Analyte	Assessment Levels	Port			Entrance Channel		
	ASS Management Guidelines (%S)	Min %S	Max %S	Mean %S	Min %S	Max %S	Mean %S
Titratable Actual Acidity	0.03%	<0.02		N/A	<0.02		N/A

¹ Qld ASS Technical Manual, Soil Management Guidelines V4.0 2014 (Table 4-1)

Analyte	Assessment Levels	Port			Entrance Channel		
	ASS Management Guidelines (%S)	Min %S	Max %S	Mean %S	Min %S	Max %S	Mean %S
Potential Oxidisable Sulfur	0.03%	<0.02	0.393	0.19	<0.02	0.101	0.09
Acid Neutralising Capacity	-	0.218	0.609	0.42	0.63	3.16	1.62

4.0 DATA VALIDATION

4.1 QUALITY CONTROL

Quality control (QC) sample analysis are provided in **Appendix C** (Primary Laboratory) and **Appendix D** (Secondary Laboratory). Calculated QC results are tabulated in **Appendix D** (Analytical Table 3: Quality Control).

Two field triplicates (spatial variation) and one duplicate spilt sample (sampling variation) were analysed by Relative Standard Deviation (RSD). Level of acceptability of RSD is +/- 50 per cent. The data quality objective is 95% compliance for all analyte groups. **Table 8** summarises the data validation results.

Table 8. Summary of Data Validation Results

Sample Location	QC Samples		Metals	TOC	TBT	Moisture Content
	Inter-lab	Intra-lab				
S8	QA1	QB1	30 Analytes	3 Analytes	9 Analytes	3 Analytes
S10	QA2	QB2	30 Analytes	3 Analytes	9 Analytes	3 Analytes
S14	QA3	QB3	30 Analytes	3 Analytes	-	3 Analytes
Total Number of QC Analytes			90 Analytes	9 Analytes	18 Analytes	9 Analytes
Total Number of Analytes Outside Level of Acceptability			5 Analytes	4 Analytes	0	2 Analytes
Percent Compliance (%)			96%	55%	100%	78%

Only TOC and moisture content QA samples failed to meet the 95% compliance objective for data evaluation. The discrepancies measured in TOC are considered minor with all measured concentrations ranging between <0.01 and 1.5% TOC, well below what would be considered a significant TOC concentration (i.e. >10%, ANZECC/ARMCANZ, 2018). The moisture content discrepancy occurred within the S14 triplicate core. The S14 cores, identified as gravelly sand, would be expected to drain pore water rapidly and thus any time difference between sediment retrieval and the completion of sample processing between cores would impact moisture content levels.

Based on the duplicate spilt and triplicate sample RPD results, the metals and TBT results are considered precise while the TOC and soil moisture results are considered estimates. As neither TOC nor soil moisture have associated NAGD Screening Levels, the RPD discrepancies of these analytes do not have any implication on the sediment characterization assessment of this report.

4.2 LABORATORY QUALITY ASSURANCE

Quality assurance (QA) procedures adopted by the analytical laboratory included holding times, matrix spikes and surrogate spikes (for organics) were undertaken during laboratory testing. Copies of the Sample Receipt Notification (SRN) and Statements of Laboratory QA Performances and Reports are provided in **Appendix C** and **Appendix D**.

4.2.1 Sample Preservation and Holding Times

All samples were collected in appropriated containers, kept refrigerated and couriered within the NATA within the specified holding times for all analytes as documented in the ALS SRN report).

4.2.2 Matrix Spikes

Matrix spikes are applied to all tests including metals before extraction or digestion and are used to prove that an analyte can be added to and then detected in sediment samples. No matrix spike outliers occurred for the analysis indicating the laboratory procedures were acceptable.

4.2.3 Surrogates

Surrogate spikes are known additions to samples, blanks and references that are similar to the analytes of interest and provide a means of checking that no gross errors have occurred during any stage of the procedure. There were no surrogate spike exceedances reported. It is therefore considered that surrogate spike procedures were acceptable.

4.2.4 Outliers

It is not uncommon for outliers to occur in chemical data sets and these may be due to laboratory or other control errors. There were no outliers recorded. It is therefore considered that the laboratory control procedures were acceptable.

5.0 CONCLUSIONS

The 2019 SAP has been implemented in order to characterise the physical and chemical properties of the sediment within the Port of Bundaberg's designated dredge / navigation areas (i.e. Port and Entrance Channel) and upstream (River). Assessment of the laboratory results was undertaken with the following conclusions:

- Physical sediment characterisation through Particle Size Distribution indicated that sediments in the River and Entrance Channel sediments were generally characterised by a higher portion of coarse material (i.e. sands and gravels) greater than 75µm in diameter. The sediment within the Port area however consisted of finer material (i.e. silt and clay) overlaying coarser material. The upstream results are in line with historic PSD analysis;
- Both sediment moisture and PSD results are in line with historic results indicating that the sediment will readily settle within the spoil ground (LTMMMP);
- A range of laboratory analysis was required as per the SAP to determine the presence of contaminants within the sediment. As per the NAGD requirements, statistical calculations were applied in order to compare results to the NAGD screening levels;
- The 95% UCL calculated for each of the inorganic (i.e. metals) and organo-metal analyses performed in the River and Port areas were all below the NAGD Screening Levels. No analyte within the Entrance Channel area exceeded the NAGD Screening Levels;
- Quality assurance sampling and testing protocols were followed and indicate that the samples were collected, stored and analysed in accordance with NAGD guidelines; and
- The sediments within the Port and Entrance Channels are not AASS but are PASS which contain significant ANC. The preferred option of sea disposal would constitute "direct reburial" (i.e. an ASS management option in accordance with Queensland ASS Management Guidelines) and would not require management. However, if land-based disposal is adopted, an ASS Management Plan (ASSMP) should be prepared to best manage the disturbance of PASS. The ASSMP would detail the proposed management and treatment (if required) techniques based on the proposed future use of the spoil.

The assessment concludes that dredge material from the Port of Bundaberg's navigation areas meets the criteria for unconfined ocean disposal for the COPC's assessed. Upstream (i.e. River) sampling results were also in line with historic results indicating that the recent minor developments in the area have not had an impact on the sediment quality.

6.0 REFERENCE DOCUMENTS

- ANZECC/ARMCANZ (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand
- Commonwealth of Australia (2009) *National Assessment Guidelines for Dredging*, Commonwealth of Australia, Canberra
- QASSTM (2014). Dear, S-E., Ahern, C. R., O'Brien, L. E., Dobos, S. K., McElnea, A. E., Moore, N. G. & Watling, K. M. (2014) *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines*. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government
- EPA (2006) *Queensland Water Quality Guidelines*. Environmental Protection Agency, Queensland
- Environmentally Relevant Activity (ERA) 16 (IPDE01723509)
- Nearshore Marine Science (2014) *Sediment Sampling and Analysis Plan. Port of Bundaberg maintenance Dredging Program*. Prepared by Nearshore Marine Science for the Gladstone Ports Corporation
- QASSIT (1998). *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland*. Queensland Acid Sulfate Soils Investigation Team, Department of Natural Resources and Mines (now Department of Natural Resources and Water). DNRQ980124
- Sea Dumping Permit Number: SD2012/2022
- Simpson, SL et al, (2005) *Handbook for Sediment Quality Assessment*, CSIRO, NSW
- WorleyParsons, (2012) *Long Term Management and Monitoring Plan for Maintenance Dredging and Disposal Port of Bundaberg 2012 – 2022*, Prepared by WorleyParsons for the Gladstone Ports Corporation
- WorleyParsons (2010). *Port of Bundaberg Maintenance Dredging: Sediment Sampling and Analysis Plan: 2014 and 2019*. Prepared by WorleyParsons for the Gladstone Ports Corporation
- WorleyParsons (2009). *Port of Bundaberg Maintenance Dredging: Sediment Characterisation Report*. Prepared by WorleyParsons for the Bundaberg Port Corporation

Appendix A.
Daily Field Sheets

2019 SAP – Port of Bundaberg – Area Sheet

Project Number	5643	Date	26/11/19	Time	12:30
Sample Area	Port Area.				
Field observations	Comments		Field observations	Comments	
Water colour/clarity	Cloudy		Wind direction/speed	North @ 11 knots.	
Weather Conditions	Fine		Surface scums	-	
Closest Tide	Low ~ 3hrs.		Algal or plant growth	-	
Tide strength/duration	Strong		Dead/dying vegetation	-	
Dumped material	-		Flotsam	-	
Closest Tides	High @ 8:07 am - 3.29 m Low @ 14:26 pm - 0.57 m		Odour	-	
General Comments					

2019 SAP – Port of Bundaberg – Area Sheet

Project Number	5643	Date	27/11/19	Time	7:00 am
Sample Area	River				
Field observations	Comments		Field observations	Comments	
Water colour/clarity	cloudy		Wind direction/speed	North @ 8 knots.	
Weather Conditions	Fine		Surface scums	-	
Closest Tide	High @ 8:50am		Algal or plant growth	-	
Tide strength/duration	-		Dead/dying vegetation	-	
Dumped material	-		Flotsam	✓	
Closest Tides	High @ 8:50 am – 3.21m Low @ 1:14 pm – 0.64m		Odour	✓	
General Comments					

2019 SAP – Port of Bundaberg – Area Sheet

Project Number	5643	Date	28/1/19	Time	6:00am
Sample Area	Entrance Channel.				
Field observations	Comments		Field observations	Comments	
Water colour/clarity	Cloudy		Wind direction/speed	Northeast @ 7 knots	
Weather Conditions	Fine		Surface scums	-	
Closest Tide	High @		Algal or plant growth	-	
Tide strength/duration	Moderate.		Dead/dying vegetation	-	
Dumped material	-		Flotsam	-	
Closest Tides	High @ 9:52 am – 3.23 m Low @ 15:59 pm – 0.76 m		Odour	-	
General Comments					

On Boat Core Log Sheet

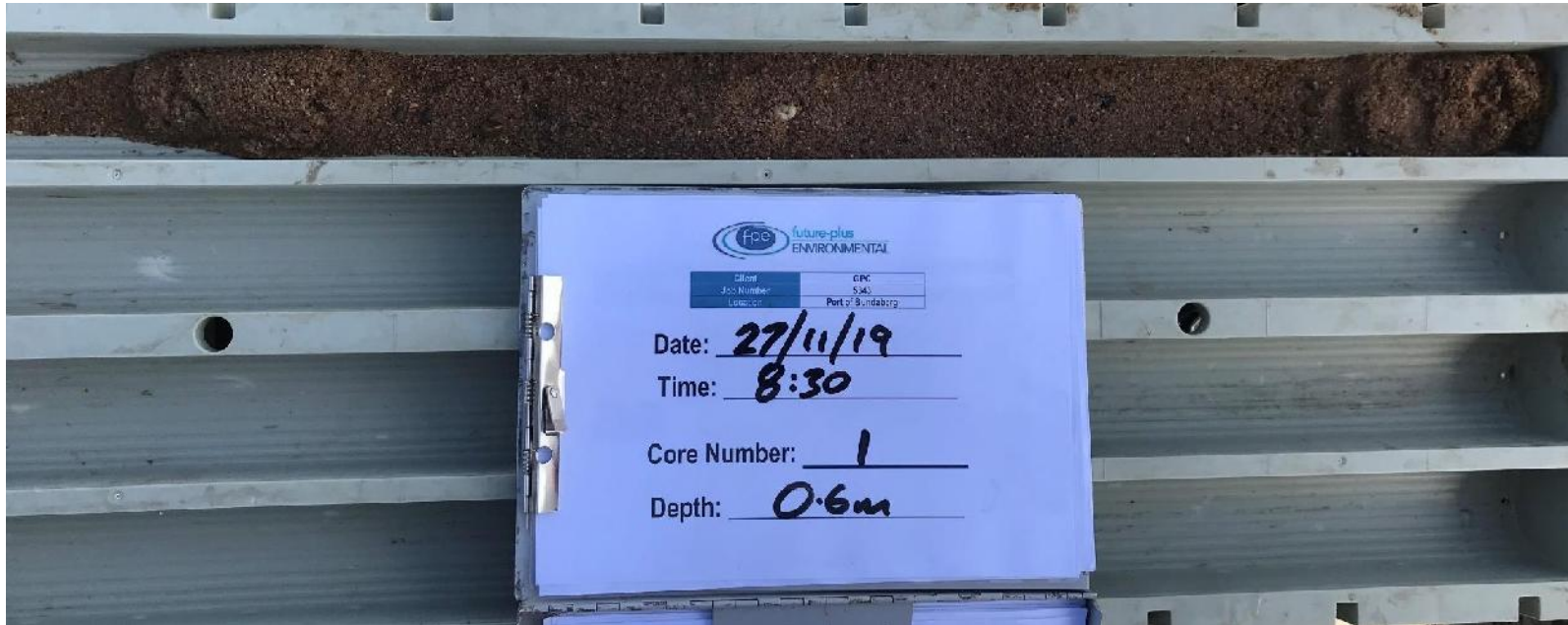
Sampling Area	River				
Core ID	Time	Water Depth (m)	Proposed Core Length (m)	Actual Core Length (m)	GPS Coordinates
1	27 th 8:00am	0.6m	1.0	1.0	OK
2	27 th 9:00am	7.0m	1.0	1.0	OK
3	27 th 9:30am	4.3m	1.0	1.0	OK
4	27 th 10:15am	6.5m	1.0	0.3	OK
5	27 th 10:45am	6.5m	1.0	1.0	OK
6	27 th 14:15pm	4.4m	1.0	1.0	OK
7	27 th 14:45pm	4.8m	1.0	1.0	OK
General Comments					

On Boat Core Log Sheet						
Sampling Area	Port / Entrance					
Core ID	Time	Water Depth (m)	Proposed Core Length (m)	Actual Core Length (m)	GPS Coordinates	
Trip 8	26 th	9.8 m	1.0 m	1.0 m	04	
9	26 th	9.2 m	1.0	1.0	04	
Dup 10	26 th	3.3 m	1.0	1.0	04	
11	26 th	9.8 m	1.0	1.0	04	
12	26 th	10.4 m	1.0	1.0	04	
13	26	9.6 m	1.0	1.0	04	
Trip 14	28 th	11.7 m	1.0	1.0	04	
15	28 th	11.5 m	1.0	1.0	04	
16	28 th	11.5 m	1.0	0.25	04	
General Comments						

Appendix B.
Core Photo Logs

Sediment Sampling Log Sheet

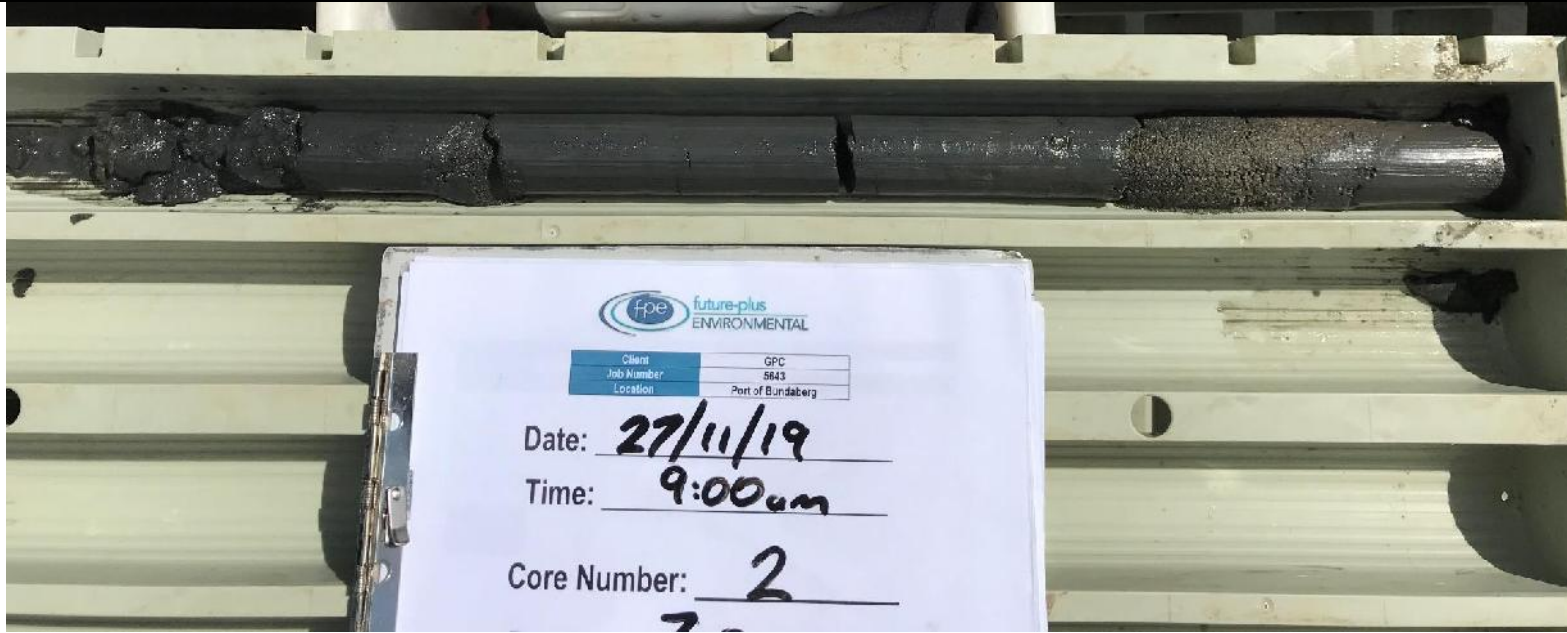
Sampling Area	River	Core Number	1	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-1.0m	Brown/White Grey	Fine to Course	gravelly Sand	None	Trace	<5%
General Comments	Gravels sub-round					

Sediment Sampling Log Sheet

Sampling Area	River	Core Number	2	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.6m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.8-0.9m	Dark Grey/Brown	Fine to Course	Sand	None	None	<5%
0.9-1.0m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%

General Comments	
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Sediment Sampling Log Sheet

Sampling Area	River	Core Number	3	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-1.0m	Brown/White/Grey	Fine to Course	gravelly Sand	None	No	<5%
General Comments	Gavels sub-angular					

Sediment Sampling Log Sheet							
Sampling Area	River	Core Number	4	Core Length/Depth	0.3m	QA sample	NO
							
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %	
0-0.1m	Dark Grey	Low – Medium Plasticity	Clay	None	Trace organics	<5%	
0.1-0.3m	Dark Grey/Brown	Fine to Course	Sand	None	None	<5%	
General Comments	Refusal at 0.3m after several attempts at alternative locations						

Sediment Sampling Log Sheet						
Sampling Area	River	Core Number	5	Core Length/Depth	1.0m	
				QA sample	NO	
						
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.15m	Dark Grey	Medium Plasticity	Clay	None	Trace organics	<5%
0.15-1.0m	Brown/White/Dark Grey	Fine to Course	Sand	None	No	<5%
General Comments						

Sediment Sampling Log Sheet

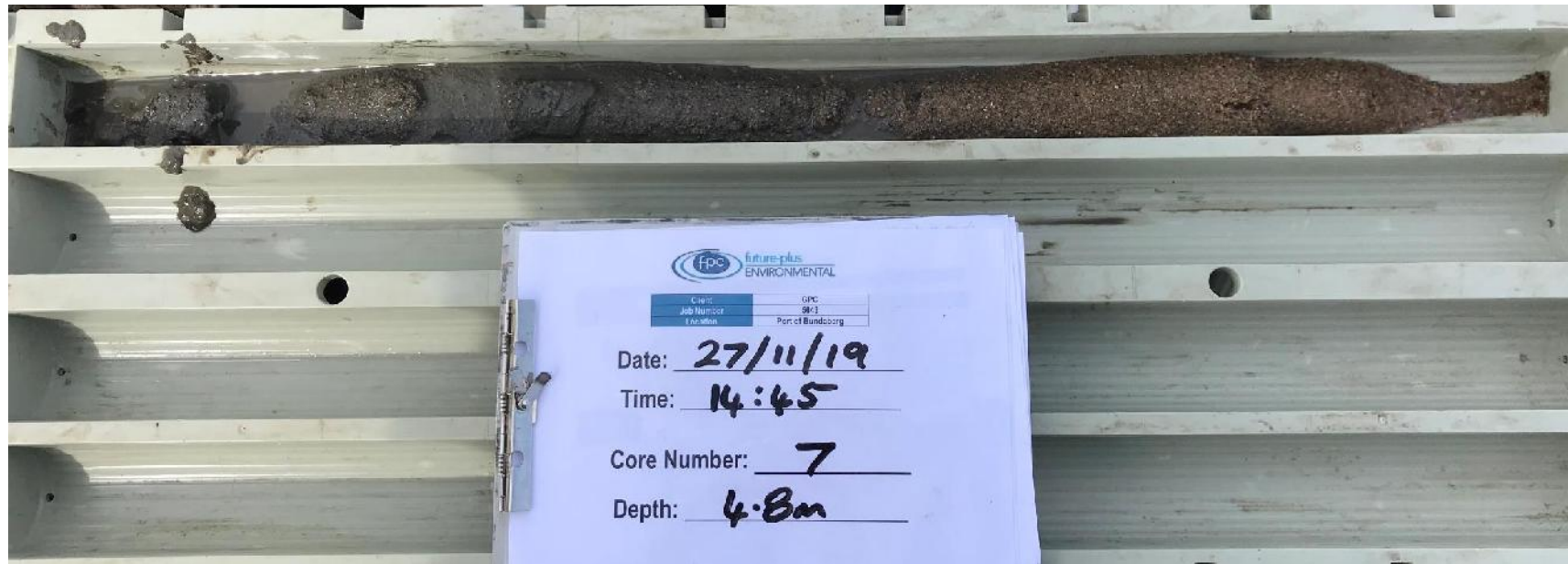
Sampling Area	River	Core Number	6	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.15m	Dark Grey	Medium Plasticity	Clay	None	Trace organics	<5%
0.15-1.0m	Brown/White Grey	Fine to Course	gravelly Sand	None	No	<5%
General Comments	Gravells sub-angular					

Sediment Sampling Log Sheet

Sampling Area	River	Core Number	7	Core Length/Depth	1.0m
				QA sample	NO



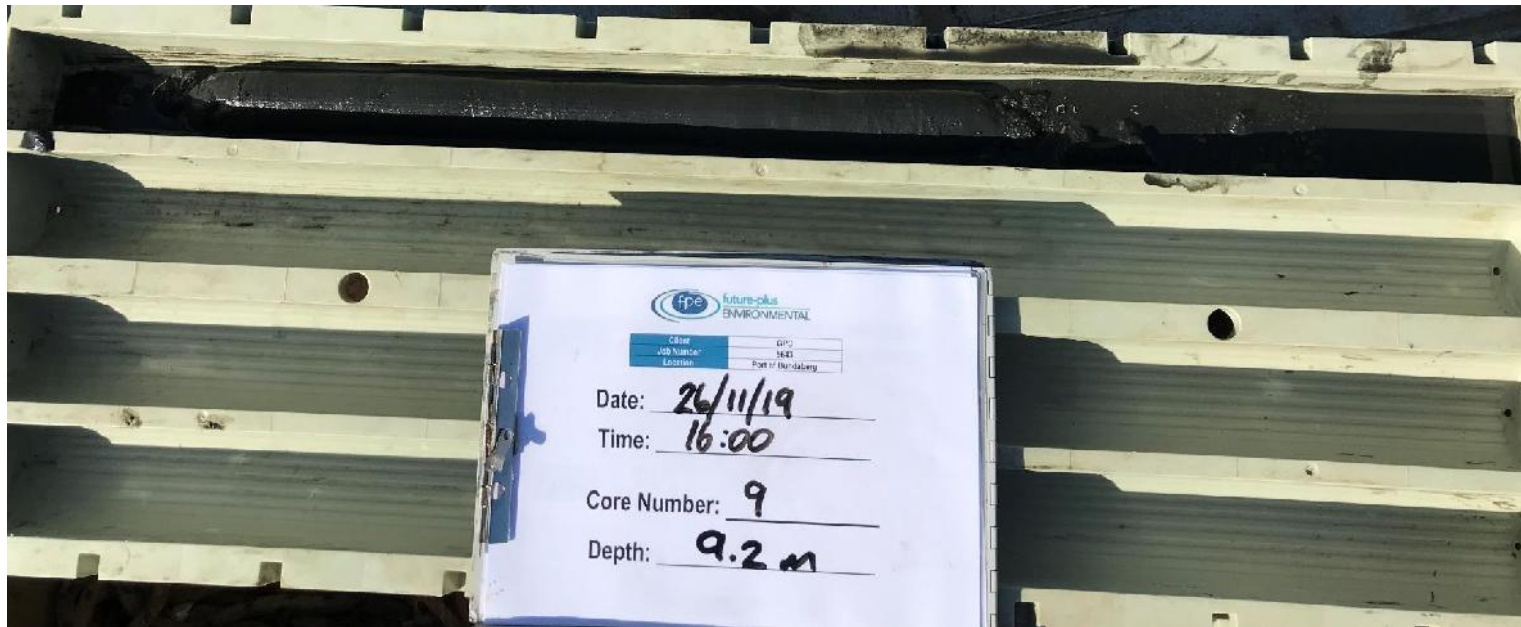
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.15m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.15-1.0m	Brown/White Grey	Fine to Course	Sand	None	No	<5%

General Comments	
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Sediment Sampling Log Sheet						
Sampling Area	Port	Core Number	8	Core Length/Depth	1.0m	
				QA sample	YES	
						
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.7m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.7-1.0m	Brown/White Grey	Fine to Course	Sand	None	No	<5%
General Comments						

Sediment Sampling Log Sheet

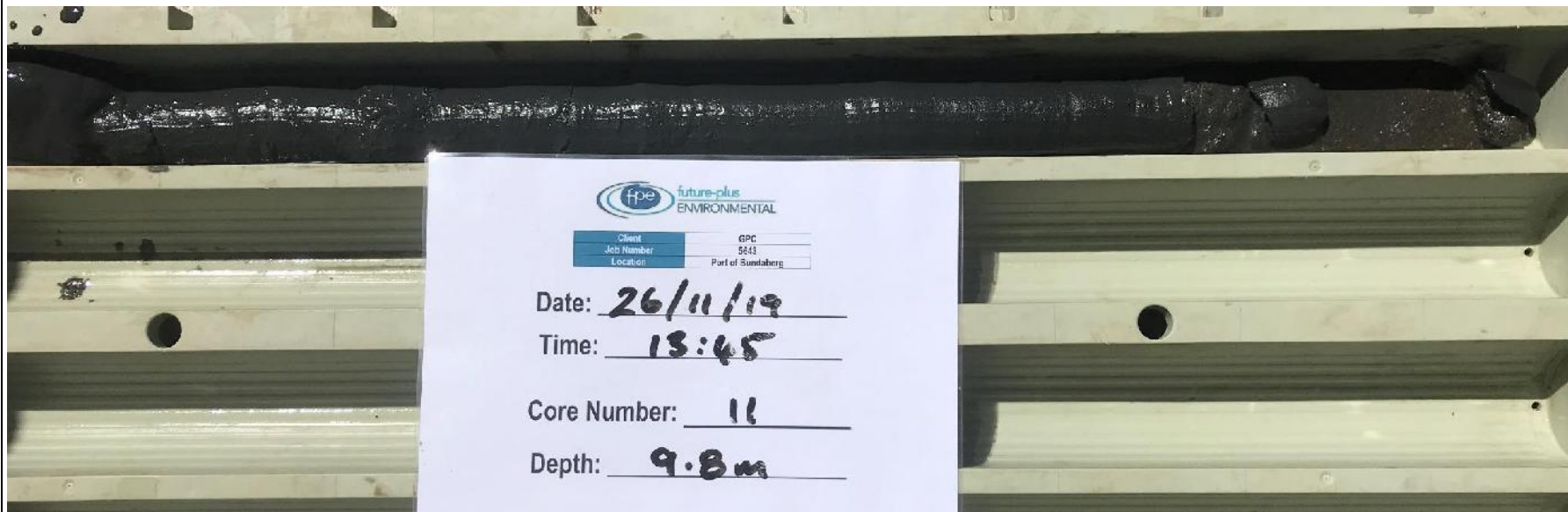
Sampling Area	Port	Core Number	9	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.7m	Dark grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.7-1.0m	Brown/White Grey	Fine to Course	Sand	None	No	<5%
General Comments						

Sediment Sampling Log Sheet						
Sampling Area	Port	Core Number	10	Core Length/Depth	1.0m	
				QA sample	YES	
						
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-1.0m	Dark grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
General Comments						

Sediment Sampling Log Sheet						
Sampling Area	Port	Core Number	11	Core Length/Depth	1.0m	
				QA sample	NO	



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.8m	Dark Grey/Black	Medium Plasticity	silty Clay	None	Trace organics	<5%
0.8-1.0m	Brown/Dark Grey	Fine to Course	Sand	None	No	<5%

General Comments						
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Sediment Sampling Log Sheet

Sampling Area	Port	Core Number	12	Core Length/Depth	1.0m
				QA sample	NO



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.3m	Dark Grey/Black	Medium Plasticity	silty Clay	None	Trace organics	<5%
0.3-1.0m	Brown/White/Grey	Fine to Course	Sand	None	No	5%

General Comments	
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Sediment Sampling Log Sheet						
Sampling Area	Port	Core Number	13	Core Length/Depth	1.0m	
				QA sample	NO	



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.2m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.2-1.0m	Brown/White/Grey	Fine to Course	gravelly Sand	None	No	5-10%
General Comments						

Sediment Sampling Log Sheet							
Sampling Area	Entrance	Core Number	14	Core Length/Depth	1.0m	QA sample	YES
							
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %	
0-0.15m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%	
0.15-1.0m	Brown/White/Grey	Fine to Course	gravelly Sand	None	No	5-10%	
General Comments							

Sediment Sampling Log Sheet						
Sampling Area	Entrance	Core Number	15	Core Length/Depth	1.0m	
				QA sample	NO	



Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %
0-0.4m	Dark Grey/Black	Medium Plasticity	Clay	None	Trace organics	<5%
0.4-1.0m	Dark Grey	Fine to Course	silty Sand	None	Trace organics	5-10%
General Comments						

Sediment Sampling Log Sheet							
Sampling Area	Entrance	Core Number	16	Core Length/Depth	0.25m	QA sample	NO
							
Sample Depth (m)	Sediment Colour	Field Texture	Sediment Type	Sediment Odour	Presence of organic material	Estimated shell/grit/biota %	
0-0.1m	Brown/Pale Red	Course	Gravel	None	None	>5%	
0.1-0.25m	Brown/Pale Red	Fine to Course	gravelly Sand	None	None	>10%	
General Comments	Gravels rounded / sub rounded. Refusal (bedrock?) at 0.25m.						

Appendix C.

Laboratory Certificates of Analysis (ALS)

CERTIFICATE OF ANALYSIS

Work Order : EB1932187 Amendment : 2 Client : FUTURE-PLUS ENVIRONMENTAL Contact : LUKE CRAIG Address : PO BOX 1250 BUDDINA QLD, AUSTRALIA 4575 Telephone : 07 5357 9169 Project : 5643 SAP Port of Bundaberg Order number : ---- C-O-C number : ---- Sampler : LUKE CRAIG Site : ---- Quote number : EN/222 No. of samples received : 20 No. of samples analysed : 19	Page : 1 of 14 Laboratory : Environmental Division Brisbane Contact : John Pickering Address : 2 Byth Street Stafford QLD Australia 4053 Telephone : +61 7 3552 8634 Date Samples Received : 29-Nov-2019 10:40 Date Analysis Commenced : 30-Nov-2019 Issue Date : 08-Jan-2020 13:37
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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

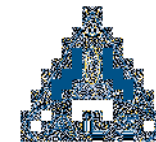
Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Bulk Density analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- **Amendment (16/12/2019): This report has been amended and re-released to allow the reporting of additional analytical data.**
- **Amendment 2 (06/01/2020): This report has been amended following the correction of metals method logged.**
- EP090 Organotin: Sample '5643-191126-S9' shows poor matrix spike recovery for Monobutyltin (MBT) due to matrix interference.
- ASS: EA029 (SPOCAS): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m³ in-situ soil, multiply reported results x wet bulk density of soil in t/m³.
- ALS is not NATA accredited for the analysis of bulk density in a soil matrix.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191127-S1	5643-191127-S2	5643-191127-S3	5643-191127-S4	5643-191127-S5
Client sampling date / time				27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1932187-001	EB1932187-002	EB1932187-003	EB1932187-004	EB1932187-005	EB1932187-005
				Result	Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	16.6	45.3	19.5	32.7	23.4	
EA150: Particle Sizing									
+75µm	----	1	%	99	49	99	88	96	
+150µm	----	1	%	99	48	99	86	96	
+300µm	----	1	%	98	46	99	80	94	
+425µm	----	1	%	96	39	97	68	77	
+600µm	----	1	%	78	22	88	34	52	
+1180µm	----	1	%	27	3	43	5	24	
+2.36mm	----	1	%	11	1	18	<1	9	
+4.75mm	----	1	%	8	<1	6	<1	3	
+9.5mm	----	1	%	7	<1	<1	<1	<1	
+19.0mm	----	1	%	<1	<1	<1	<1	<1	
+37.5mm	----	1	%	<1	<1	<1	<1	<1	
+75.0mm	----	1	%	<1	<1	<1	<1	<1	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	1	33	1	6	<1	
Silt (2-60 µm)	----	1	%	<1	16	<1	5	3	
Sand (0.06-2.00 mm)	----	1	%	83	49	73	87	84	
Gravel (>2mm)	----	1	%	16	2	26	2	13	
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.65	2.63	2.65	2.71	2.67	
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	
Arsenic	7440-38-2	1.00	mg/kg	<1.00	5.71	1.19	4.02	1.61	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	7440-47-3	1.0	mg/kg	3.2	18.6	3.2	6.9	6.7	
Copper	7440-50-8	1.0	mg/kg	<1.0	18.0	1.3	3.9	1.9	
Cobalt	7440-48-4	0.5	mg/kg	1.5	9.2	1.7	4.5	3.0	
Lead	7439-92-1	1.0	mg/kg	<1.0	8.5	1.7	2.8	1.9	
Nickel	7440-02-0	1.0	mg/kg	2.2	12.1	2.3	4.7	3.9	
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Zinc	7440-66-6	1.0	mg/kg	3.9	32.0	5.3	14.3	8.4	
EG035T: Total Recoverable Mercury by FIMS (Low Level)									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191127-S1	5643-191127-S2	5643-191127-S3	5643-191127-S4	5643-191127-S5
Client sampling date / time				27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1932187-001	EB1932187-002	EB1932187-003	EB1932187-004	EB1932187-005	EB1932187-005
				Result	Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS (Low Level) - Continued									
Mercury	7439-97-6	0.01	mg/kg	<0.01	0.04	<0.01	<0.01	<0.01	<0.01



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			5643-191127-S6	5643-191127-S7	5643-191127-S8	5643-191126-S9	5643-191126-S10	
Client sampling date / time		27-Nov-2019 00:00			27-Nov-2019 00:00		27-Nov-2019 00:00		26-Nov-2019 00:00	26-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1932187-006	EB1932187-007	EB1932187-008	EB1932187-009	EB1932187-010		
				Result	Result	Result	Result	Result		
EA029-A: pH Measurements										
pH KCl (23A)	----	0.1	pH Unit	----	----	8.5	9.0	8.4		
pH OX (23B)	----	0.1	pH Unit	----	----	6.7	8.2	7.9		
EA029-B: Acidity Trail										
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	<2	<2		
Titrateable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	<2	<2	<2		
Titrateable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	<2	<2	<2		
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	----	<0.020	<0.020	<0.020		
sulfidic - Titrateable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	----	<0.020	<0.020	<0.020		
sulfidic - Titrateable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	----	<0.020	<0.020	<0.020		
EA029-C: Sulfur Trail										
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	----	0.056	0.041	0.114		
Peroxide Sulfur (23De)	----	0.020	% S	----	----	0.230	0.121	0.507		
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	----	0.173	0.079	0.393		
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	108	50	245		
EA029-D: Calcium Values										
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	----	0.206	0.170	0.353		
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	----	0.275	0.478	0.867		
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	----	0.070	0.308	0.514		
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	35	154	256		
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	----	0.056	0.246	0.411		
EA029-E: Magnesium Values										
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	----	0.125	0.068	0.189		
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	----	0.150	0.116	0.329		
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	----	0.024	0.047	0.140		
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	20	39	115		
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	----	0.032	0.062	0.184		
EA029-F: Excess Acid Neutralising Capacity										
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	----	0.683	1.22	1.90		
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	136	244	380		
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	----	0.218	0.390	0.609		



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191127-S6	5643-191127-S7	5643-191127-S8	5643-191126-S9	5643-191126-S10
Client sampling date / time				27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	
Compound	CAS Number	LOR	Unit	EB1932187-006	EB1932187-007	EB1932187-008	EB1932187-009	EB1932187-010	
				Result	Result	Result	Result	Result	
EA029-F: Excess Acid Neutralising Capacity - Continued									
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	----	----	1.5	1.5	1.5	
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	<0.02	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	<10	<10	
Liming Rate	----	1	kg CaCO3/t	----	----	<1	<1	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.17	0.08	0.39	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	108	50	245	
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	8	4	18	
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	----	----	8.3	8.5	8.5	
ø pH (Fox)	----	0.1	pH Unit	----	----	4.5	7.2	7.3	
ø Reaction Rate	----	1	-	----	----	4	4	4	
EA051 : Bulk Density									
ø Bulk Density	BULK_DENSITY	1	kg/m3	----	----	----	2090	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	21.2	24.7	49.2	38.3	50.5	
EA150: Particle Sizing									
+75µm	----	1	%	95	92	62	60	14	
+150µm	----	1	%	95	91	58	59	11	
+300µm	----	1	%	92	90	56	58	10	
+425µm	----	1	%	84	87	50	57	8	
+600µm	----	1	%	64	77	34	52	6	
+1180µm	----	1	%	21	24	12	25	<1	
+2.36mm	----	1	%	5	6	3	7	<1	
+4.75mm	----	1	%	<1	2	<1	<1	<1	
+9.5mm	----	1	%	<1	<1	<1	<1	<1	
+19.0mm	----	1	%	<1	<1	<1	<1	<1	
+37.5mm	----	1	%	<1	<1	<1	<1	<1	
+75.0mm	----	1	%	<1	<1	<1	<1	<1	
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	4	6	24	26	56	
Silt (2-60 µm)	----	1	%	<1	1	13	13	30	
Sand (0.06-2.00 mm)	----	1	%	86	81	57	48	14	
Gravel (>2mm)	----	1	%	10	12	6	13	<1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191127-S6	5643-191127-S7	5643-191127-S8	5643-191126-S9	5643-191126-S10
Client sampling date / time				27-Nov-2019 00:00	27-Nov-2019 00:00	27-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	
Compound	CAS Number	LOR	Unit	EB1932187-006	EB1932187-007	EB1932187-008	EB1932187-009	EB1932187-010	
				Result	Result	Result	Result	Result	
EA150: Soil Classification based on Particle Size - Continued									
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.60	2.61	2.62	2.83	2.50	
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	
Arsenic	7440-38-2	1.00	mg/kg	1.17	1.44	5.92	6.00	10.3	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	7440-47-3	1.0	mg/kg	4.0	4.1	17.4	15.0	27.8	
Copper	7440-50-8	1.0	mg/kg	1.4	3.0	15.2	11.2	21.3	
Cobalt	7440-48-4	0.5	mg/kg	1.8	2.8	9.6	6.6	11.8	
Lead	7439-92-1	1.0	mg/kg	1.3	1.5	7.9	6.4	11.2	
Nickel	7440-02-0	1.0	mg/kg	2.2	3.2	11.4	9.0	17.4	
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Zinc	7440-66-6	1.0	mg/kg	5.8	7.6	32.5	27.4	42.5	
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	0.02	<0.01	0.04	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	----	----	0.49	0.24	1.06	
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg	----	----	<1	<1	<1	
Dibutyltin	1002-53-5	1	µgSn/kg	----	----	<1	<1	1	
Tributyltin	56573-85-4	0.5	µgSn/kg	----	----	<0.5	<0.5	<0.5	
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%	----	----	87.1	91.3	111	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191126-S11	5643-191126-S12	5643-191126-S13	5643-191128-S14	5643-191128-S15
Client sampling date / time				26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	
Compound	CAS Number	LOR	Unit	EB1932187-011	EB1932187-012	EB1932187-013	EB1932187-014	EB1932187-015	
				Result	Result	Result	Result	Result	
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit	8.4	8.9	9.4	9.0	9.1	
pH OX (23B)	----	0.1	pH Unit	7.6	7.4	8.1	8.4	8.4	
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2	
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020	
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020	
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020	
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.020	% S	0.071	0.057	0.061	0.046	0.066	
Peroxide Sulfur (23De)	----	0.020	% S	0.298	0.139	0.061	0.147	0.152	
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	0.227	0.082	<0.020	0.101	0.085	
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	142	51	<10	63	53	
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	0.278	0.148	0.157	0.199	0.160	
Peroxide Calcium (23Wh)	----	0.020	% Ca	0.515	0.198	0.456	1.08	0.778	
Acid Reacted Calcium (23X)	----	0.020	% Ca	0.237	0.051	0.299	0.882	0.619	
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	118	25	149	440	309	
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	0.190	0.040	0.239	0.705	0.495	
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	0.184	0.072	0.050	0.079	0.054	
Peroxide Magnesium (23Tm)	----	0.020	% Mg	0.281	0.114	0.075	0.179	0.090	
Acid Reacted Magnesium (23U)	----	0.020	% Mg	0.097	0.041	0.026	0.100	0.037	
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	80	34	21	82	30	
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	0.128	0.054	0.034	0.132	0.048	
EA029-F: Excess Acid Neutralising Capacity									
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	1.49	0.765	1.80	3.31	1.97	
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	298	153	360	661	394	
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	0.477	0.245	0.577	1.06	0.630	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191126-S11	5643-191126-S12	5643-191126-S13	5643-191128-S14	5643-191128-S15
Client sampling date / time					26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00
Compound	CAS Number	LOR	Unit		EB1932187-011	EB1932187-012	EB1932187-013	EB1932187-014	EB1932187-015
				Result	Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.23	0.08	<0.02	0.10	0.08	0.08
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	142	51	<10	63	53	53
Liming Rate excluding ANC	----	1	kg CaCO3/t	11	4	<1	5	4	4
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	8.5	8.5	9.0	8.8	8.6	8.6
ø pH (Fox)	----	0.1	pH Unit	7.0	3.4	6.7	6.6	7.0	7.0
ø Reaction Rate	----	1	-	4	3	2	2	4	4
EA051 : Bulk Density									
ø Bulk Density	BULK_DENSITY	1	kg/m3	----	2160	----	----	2280	2280
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	51.5	26.7	37.2	30.2	35.8	35.8
EA150: Particle Sizing									
+75µm	----	1	%	32	90	87	93	70	70
+150µm	----	1	%	30	89	86	92	45	45
+300µm	----	1	%	27	82	85	89	31	31
+425µm	----	1	%	21	72	82	79	20	20
+600µm	----	1	%	9	52	71	53	5	5
+1180µm	----	1	%	1	15	30	13	<1	<1
+2.36mm	----	1	%	<1	<1	9	4	<1	<1
+4.75mm	----	1	%	<1	<1	2	1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%	43	5	8	6	19	19
Silt (2-60 µm)	----	1	%	23	4	4	<1	10	10
Sand (0.06-2.00 mm)	----	1	%	33	86	72	87	71	71
Gravel (>2mm)	----	1	%	1	5	16	7	<1	<1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191126-S11	5643-191126-S12	5643-191126-S13	5643-191128-S14	5643-191128-S15
Client sampling date / time				26-Nov-2019 00:00	26-Nov-2019 00:00	26-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	
Compound	CAS Number	LOR	Unit	EB1932187-011	EB1932187-012	EB1932187-013	EB1932187-014	EB1932187-015	
				Result	Result	Result	Result	Result	
EA150: Soil Classification based on Particle Size - Continued									
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1	
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.48	2.71	2.67	2.65	2.59	
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	
Arsenic	7440-38-2	1.00	mg/kg	7.72	1.54	3.54	2.12	5.48	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium	7440-47-3	1.0	mg/kg	19.9	6.6	8.0	5.9	13.3	
Copper	7440-50-8	1.0	mg/kg	16.5	2.3	3.9	1.8	8.5	
Cobalt	7440-48-4	0.5	mg/kg	9.4	3.0	4.0	3.0	5.9	
Lead	7439-92-1	1.0	mg/kg	8.8	1.8	3.0	1.6	5.2	
Nickel	7440-02-0	1.0	mg/kg	12.6	4.2	5.1	3.6	8.4	
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
Zinc	7440-66-6	1.0	mg/kg	34.6	8.6	12.1	7.9	19.2	
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg	0.03	<0.01	<0.01	<0.01	<0.01	
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.76	0.15	0.05	0.27	0.18	
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	<1	----	----	
Dibutyltin	1002-53-5	1	µgSn/kg	<1	<1	<1	----	----	
Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	<0.5	----	----	
EP090S: Organotin Surrogate									
Tripopyltin	----	0.5	%	135	89.6	65.0	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			5643-191128-S16	5643-191127-QA1	5643-191126-QA2	5643-191128-QA3	----
Client sampling date / time		28-Nov-2019 00:00			28-Nov-2019 00:00		28-Nov-2019 00:00		28-Nov-2019 00:00
Compound	CAS Number	LOR	Unit	EB1932187-016	EB1932187-017	EB1932187-018	EB1932187-019	-----	
				Result	Result	Result	Result	----	
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit	9.7	8.4	8.3	9.3	----	
pH OX (23B)	----	0.1	pH Unit	8.5	5.4	7.9	8.2	----	
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	----	
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	3	<2	<2	----	
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	3	<2	<2	----	
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	----	
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	----	
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	----	
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.020	% S	0.038	0.063	0.102	0.048	----	
Peroxide Sulfur (23De)	----	0.020	% S	0.051	0.600	0.523	0.066	----	
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	<0.020	0.538	0.421	<0.020	----	
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	335	263	11	----	
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	0.183	0.245	0.342	0.142	----	
Peroxide Calcium (23Wh)	----	0.020	% Ca	3.94	1.09	0.971	0.421	----	
Acid Reacted Calcium (23X)	----	0.020	% Ca	3.76	0.843	0.630	0.279	----	
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	1880	421	314	139	----	
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	3.01	0.675	0.504	0.223	----	
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	0.043	0.157	0.200	0.045	----	
Peroxide Magnesium (23Tm)	----	0.020	% Mg	0.165	0.422	0.370	0.082	----	
Acid Reacted Magnesium (23U)	----	0.020	% Mg	0.122	0.266	0.170	0.037	----	
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	101	218	139	30	----	
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	0.161	0.350	0.224	0.049	----	
EA029-F: Excess Acid Neutralising Capacity									
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	9.89	----	2.22	1.16	----	
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	1980	----	443	231	----	
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	3.16	----	0.709	0.370	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	5643-191128-S16	5643-191127-QA1	5643-191126-QA2	5643-191128-QA3	----
Client sampling date / time			28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1932187-016	EB1932187-017	EB1932187-018	EB1932187-019	-----
				Result	Result	Result	Result	----
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	0.18	<0.02	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	114	<10	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	8	<1	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	0.54	0.42	<0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	335	263	11	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	25	20	<1	----
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	8.9	8.3	8.6	8.9	----
ø pH (Fox)	----	0.1	pH Unit	6.8	4.5	7.4	6.5	----
ø Reaction Rate	----	1	-	2	4	4	2	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.7	47.5	53.2	28.8	----
EA150: Particle Sizing								
+75µm	----	1	%	94	----	----	----	----
+150µm	----	1	%	93	----	----	----	----
+300µm	----	1	%	88	----	----	----	----
+425µm	----	1	%	81	----	----	----	----
+600µm	----	1	%	70	----	----	----	----
+1180µm	----	1	%	51	----	----	----	----
+2.36mm	----	1	%	34	----	----	----	----
+4.75mm	----	1	%	17	----	----	----	----
+9.5mm	----	1	%	<1	----	----	----	----
+19.0mm	----	1	%	<1	----	----	----	----
+37.5mm	----	1	%	<1	----	----	----	----
+75.0mm	----	1	%	<1	----	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	4	----	----	----	----
Silt (2-60 µm)	----	1	%	1	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%	56	----	----	----	----
Gravel (>2mm)	----	1	%	39	----	----	----	----
Cobbles (>6cm)	----	1	%	<1	----	----	----	----
EA152: Soil Particle Density								



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	5643-191128-S16	5643-191127-QA1	5643-191126-QA2	5643-191128-QA3	----
Client sampling date / time				28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	28-Nov-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1932187-016	EB1932187-017	EB1932187-018	EB1932187-019	-----	-----
				Result	Result	Result	Result	-----	-----
EA152: Soil Particle Density - Continued									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.64	----	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	----	----
Arsenic	7440-38-2	1.00	mg/kg	14.9	5.50	10.5	1.90	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	----
Chromium	7440-47-3	1.0	mg/kg	4.6	16.1	27.2	5.0	----	----
Copper	7440-50-8	1.0	mg/kg	<1.0	15.0	21.2	1.8	----	----
Cobalt	7440-48-4	0.5	mg/kg	1.9	9.3	12.3	2.6	----	----
Lead	7439-92-1	1.0	mg/kg	1.6	7.4	11.3	1.6	----	----
Nickel	7440-02-0	1.0	mg/kg	1.9	11.1	17.4	3.0	----	----
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	----
Zinc	7440-66-6	1.0	mg/kg	3.6	31.2	41.8	6.4	----	----
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg	<0.01	0.03	0.05	<0.01	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%	0.06	0.88	0.68	0.07	----	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg	----	<1	<1	----	----	----
Dibutyltin	1002-53-5	1	µgSn/kg	----	<1	<1	----	----	----
Tributyltin	56573-85-4	0.5	µgSn/kg	----	<0.5	<0.5	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%	----	72.4	55.5	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130

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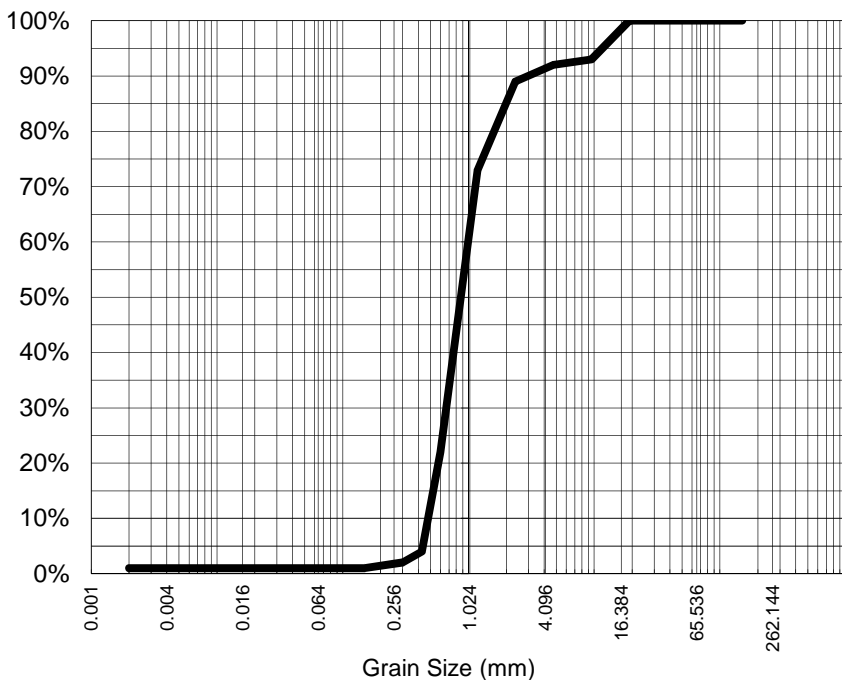
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S1

Particle Size Distribution



Particle Size (mm)	% Passing
19.0	100%
9.50	93%
4.75	92%
2.36	89%
1.18	73%
0.600	22%
0.425	4%
0.300	2%
0.150	1%
0.075	1%
Particle Size (microns)	
58	1%
41	1%
29	1%
20	1%
15	1%
11	1%
7	1%
5	1%
2	1%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.918
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65



Satish Trivedi
Soil Senior Chemist
Authorised Signatory

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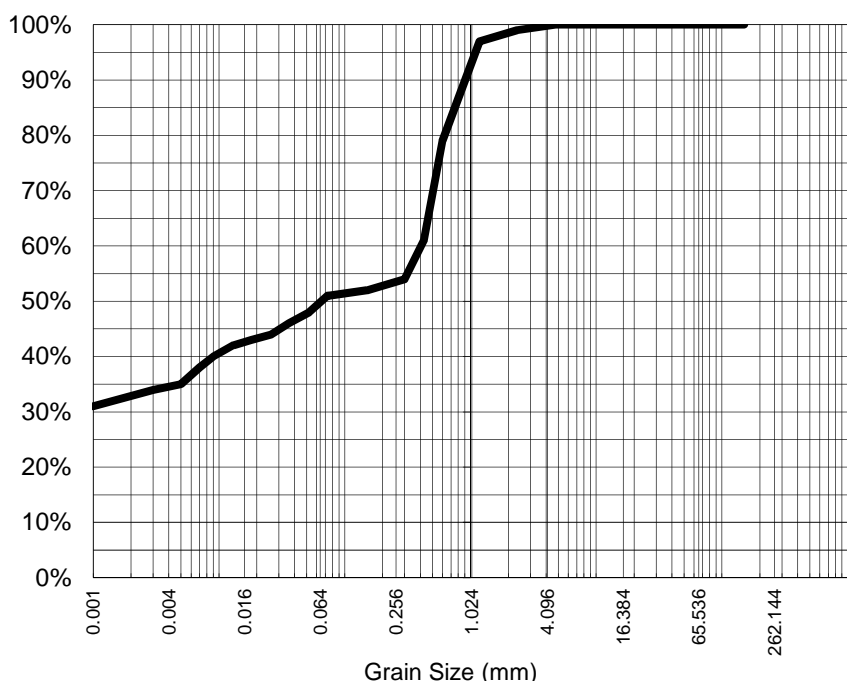
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S2

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	97%
0.600	79%
0.425	61%
0.300	54%
0.150	52%
0.075	51%
Particle Size (microns)	
52	48%
36	46%
26	44%
18	43%
13	42%
9	40%
7	38%
5	35%
1	31%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.066
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

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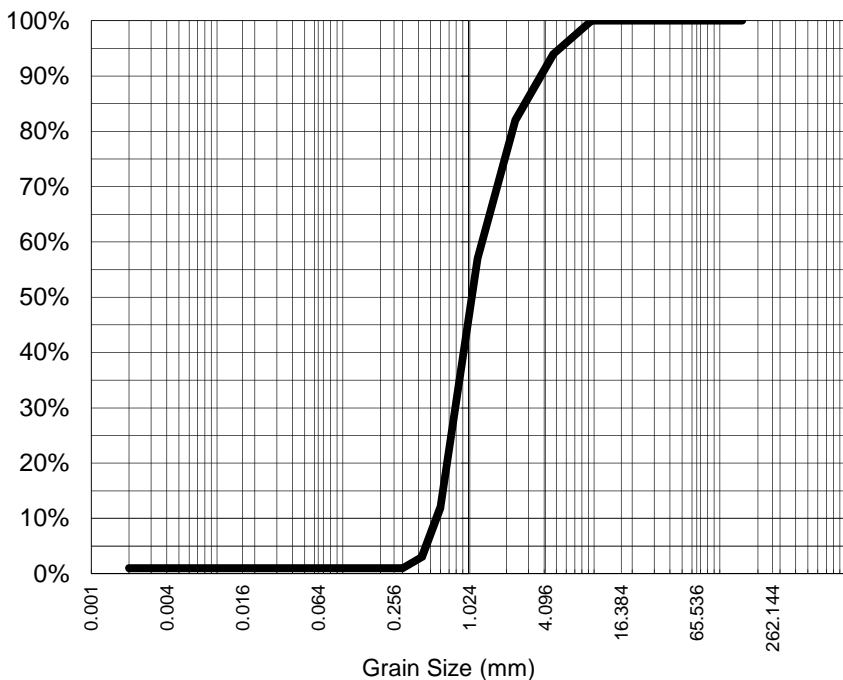
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S3

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	94%
2.36	82%
1.18	57%
0.600	12%
0.425	3%
0.300	1%
0.150	1%
0.075	1%
Particle Size (microns)	
58	1%
41	1%
29	1%
20	1%
15	1%
11	1%
7	1%
5	1%
2	1%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	1.090
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65



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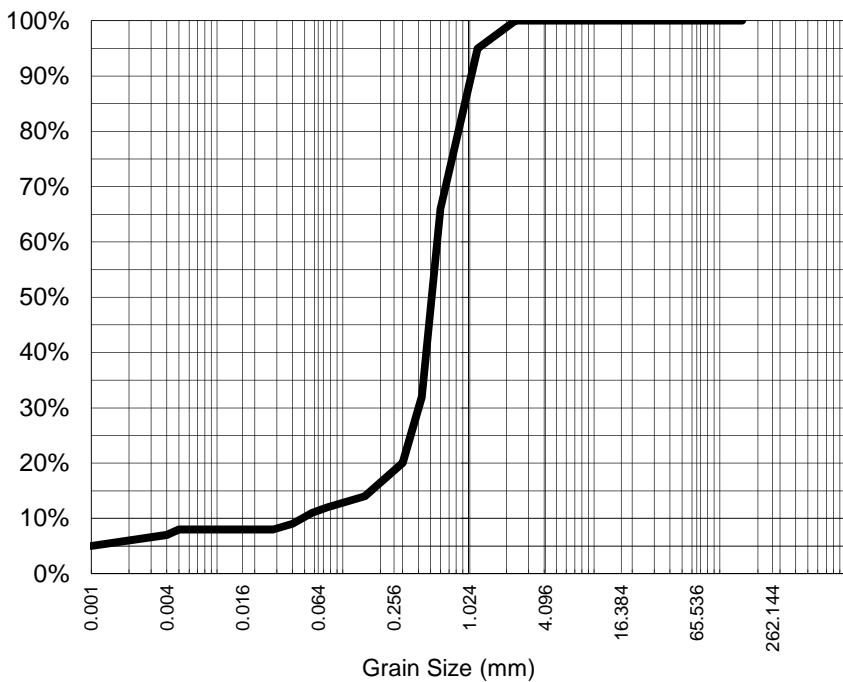
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S4

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	95%
0.600	66%
0.425	32%
0.300	20%
0.150	14%
0.075	12%
Particle Size (microns)	
57	11%
40	9%
28	8%
20	8%
15	8%
10	8%
7	8%
5	8%
1	5%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.518
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.71



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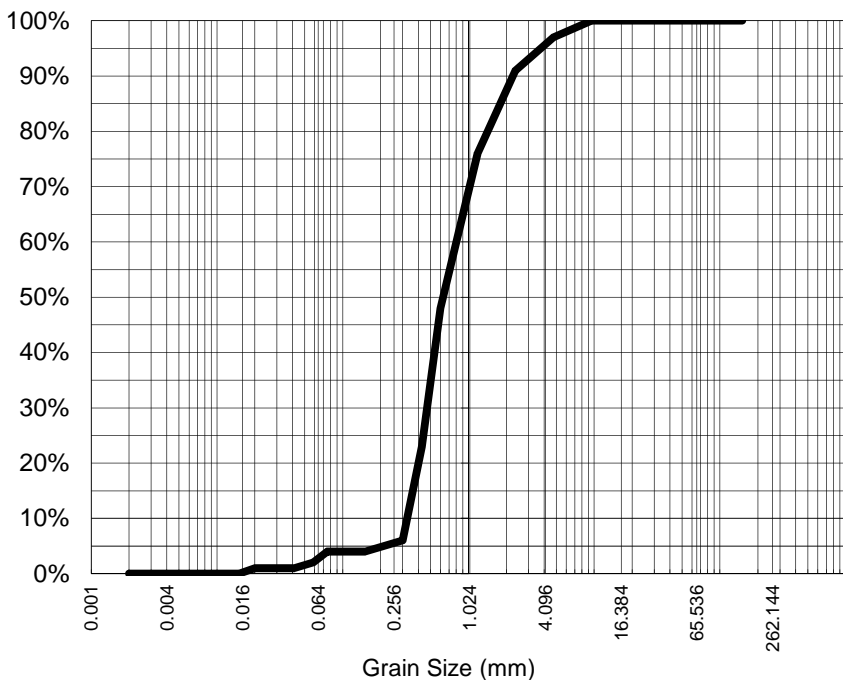
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S5

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	97%
2.36	91%
1.18	76%
0.600	48%
0.425	23%
0.300	6%
0.150	4%
0.075	4%
Particle Size (microns)	
58	2%
41	1%
29	1%
20	1%
15	0%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.641
----------------------------	-------

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.67



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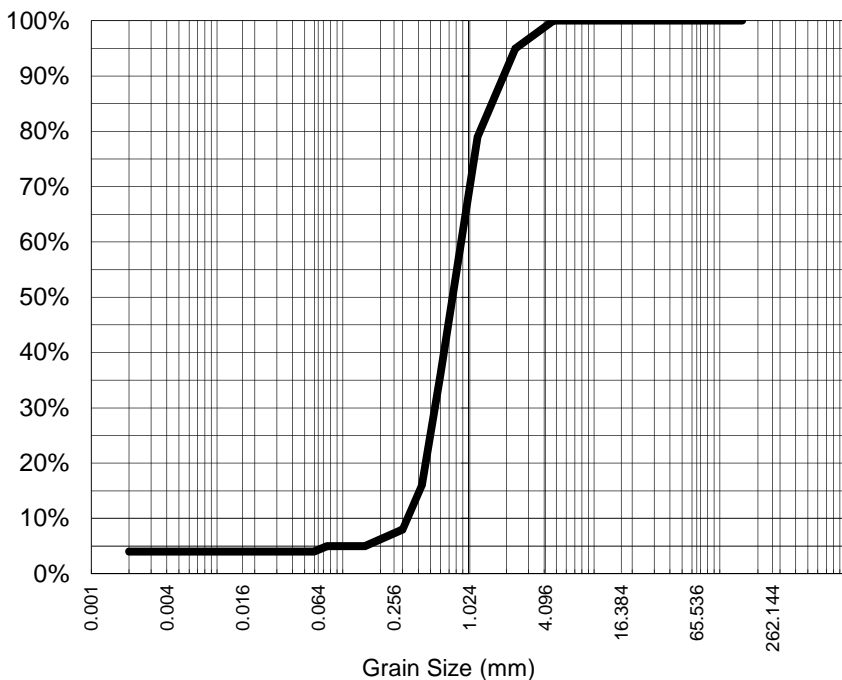
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S6

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	95%
1.18	79%
0.600	36%
0.425	16%
0.300	8%
0.150	5%
0.075	5%
Particle Size (microns)	
59	4%
41	4%
29	4%
21	4%
15	4%
11	4%
8	4%
5	4%
2	4%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.789
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.6



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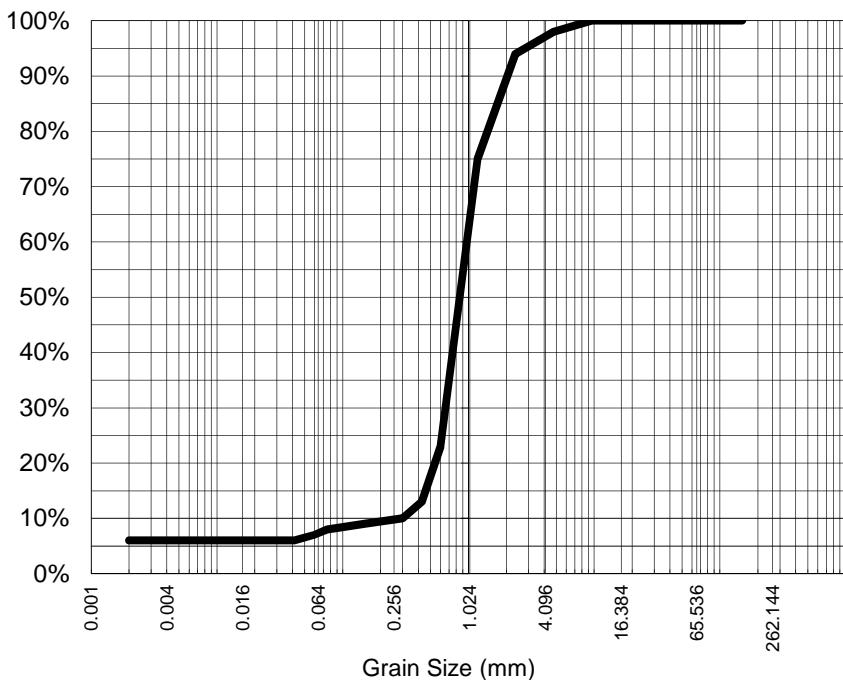
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S7

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	98%
2.36	94%
1.18	75%
0.600	23%
0.425	13%
0.300	10%
0.150	9%
0.075	8%
Particle Size (microns)	
59	7%
41	6%
29	6%
21	6%
15	6%
11	6%
8	6%
5	6%
2	6%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.901
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.61



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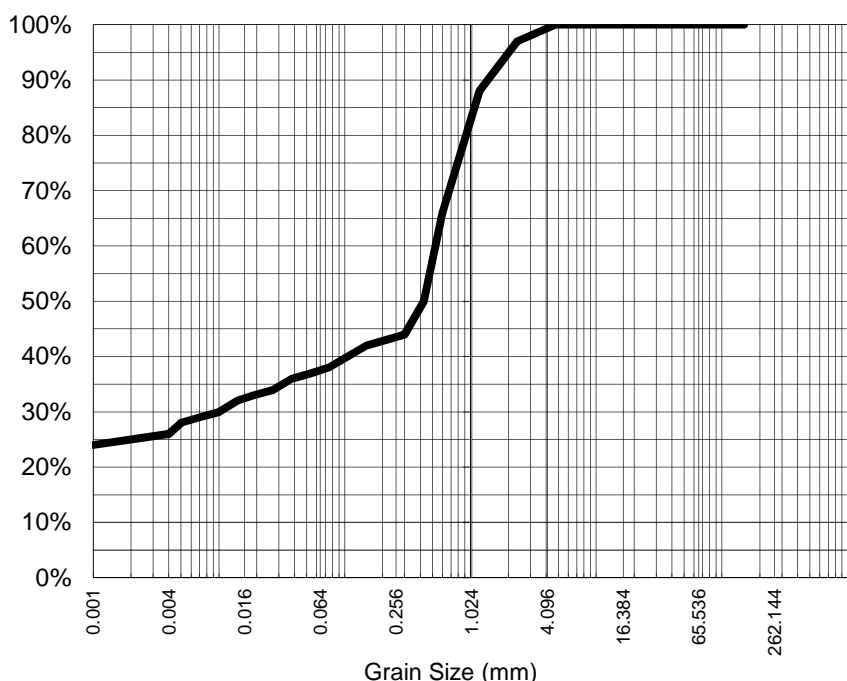
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ADDRESS: Po Box 1250 **REPORT NO:** EB1932187-008 / PSD
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 Qld, Australia
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191127-S8

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	97%
1.18	88%
0.600	66%
0.425	50%
0.300	44%
0.150	42%
0.075	38%
Particle Size (microns)	
54	37%
38	36%
27	34%
19	33%
14	32%
10	30%
7	29%
5	28%
1	24%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.425
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.62

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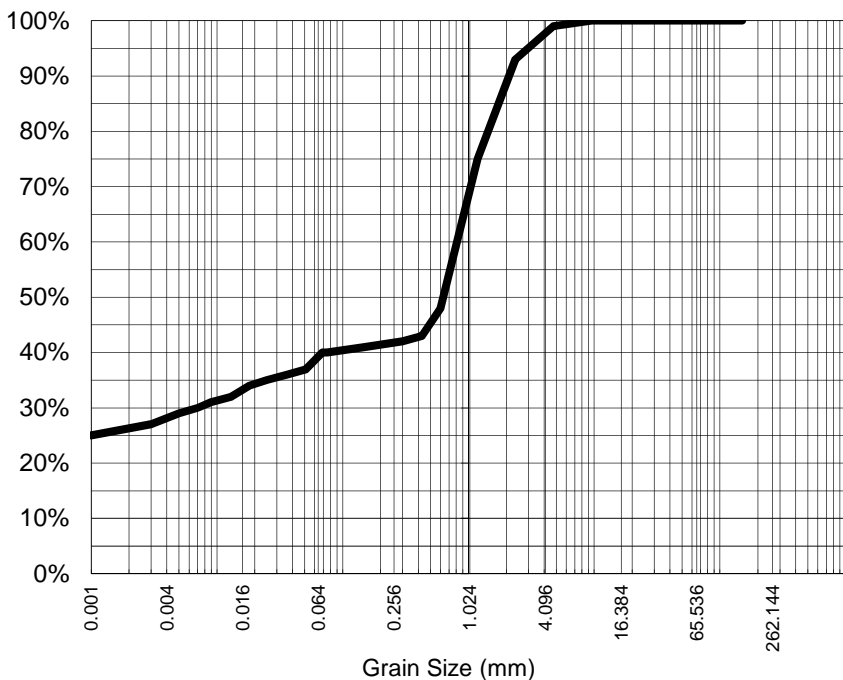
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PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191126-S9

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	99%
2.36	93%
1.18	75%
0.600	48%
0.425	43%
0.300	42%
0.150	41%
0.075	40%
Particle Size (microns)	
51	37%
36	36%
25	35%
18	34%
13	32%
9	31%
7	30%
5	29%
1	25%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.643
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.83

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Certificate of Analysis

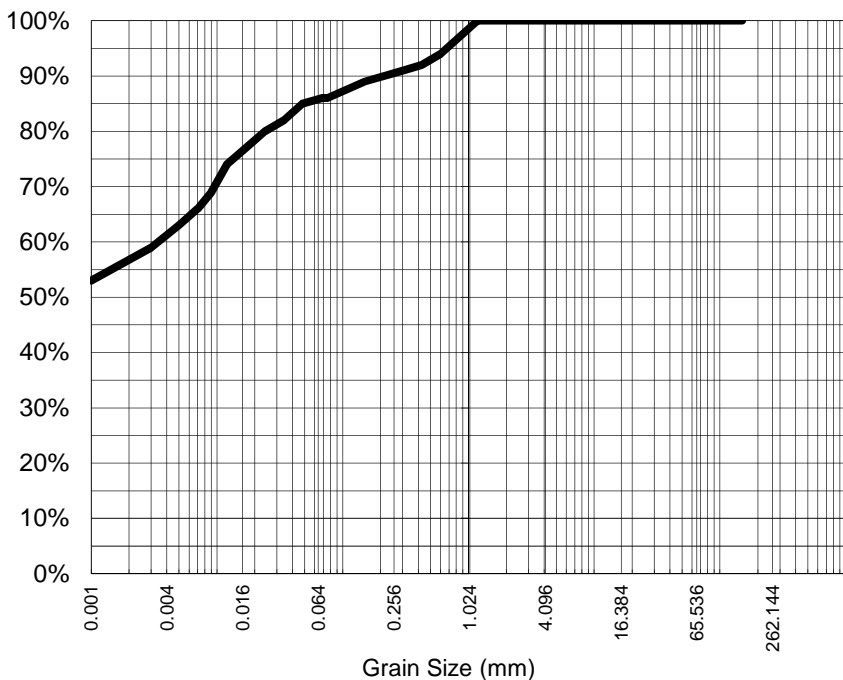
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina **REPORT NO:** EB1932187-010 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191126-S10

Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	94%
0.425	92%
0.300	91%
0.150	89%
0.075	86%
Particle Size (microns)	
48	85%
34	82%
24	80%
17	77%
12	74%
9	69%
7	66%
5	63%
1	53%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	<0.007
----------------------------	--------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.5

NATA Accreditation: 825 Site: Brisbane
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Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

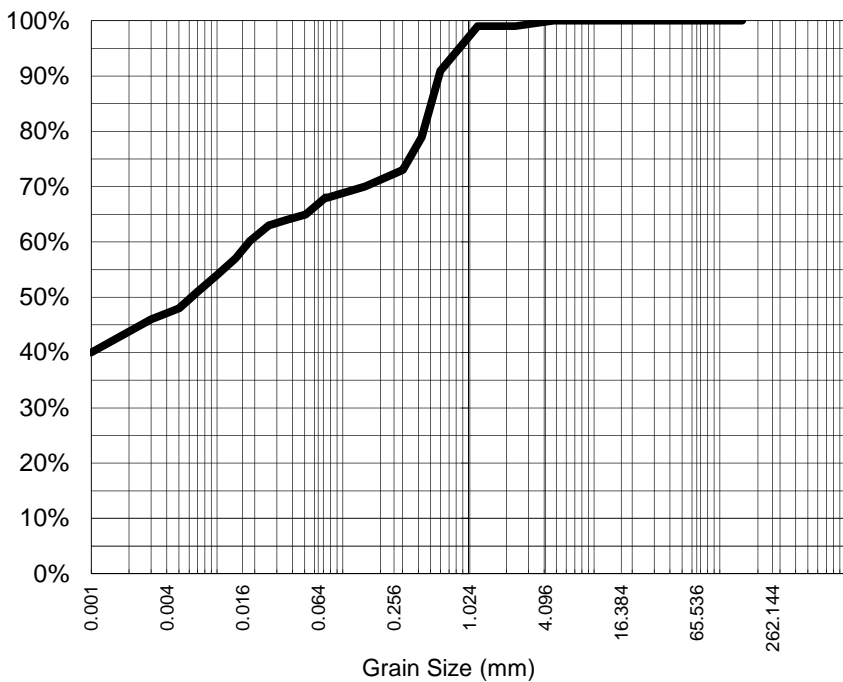
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina **REPORT NO:** EB1932187-011 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191126-S11

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	99%
0.600	91%
0.425	79%
0.300	73%
0.150	70%
0.075	68%
Particle Size (microns)	
51	65%
36	64%
26	63%
18	60%
14	57%
10	54%
7	51%
5	48%
1	40%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	<0.007
----------------------------	--------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.48

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Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

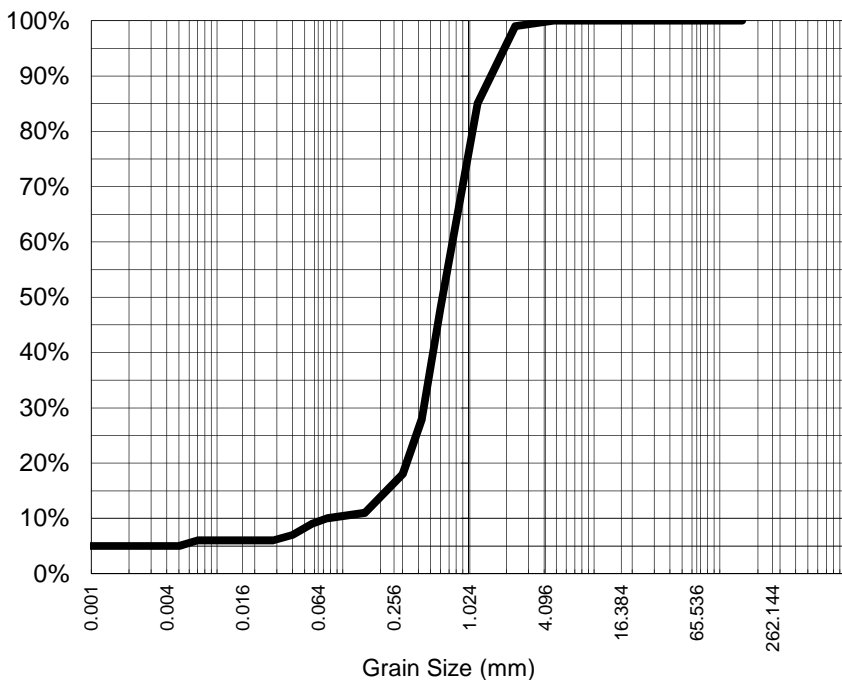
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina Qld, Australia **REPORT NO:** EB1932187-012 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191126-S12

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	85%
0.600	48%
0.425	28%
0.300	18%
0.150	11%
0.075	10%
Particle Size (microns)	
57	9%
40	7%
28	6%
20	6%
15	6%
10	6%
7	6%
5	5%
1	5%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.631
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.71



Satish Trivedi
Soil Senior Chemist
Authorised Signatory

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Certificate of Analysis

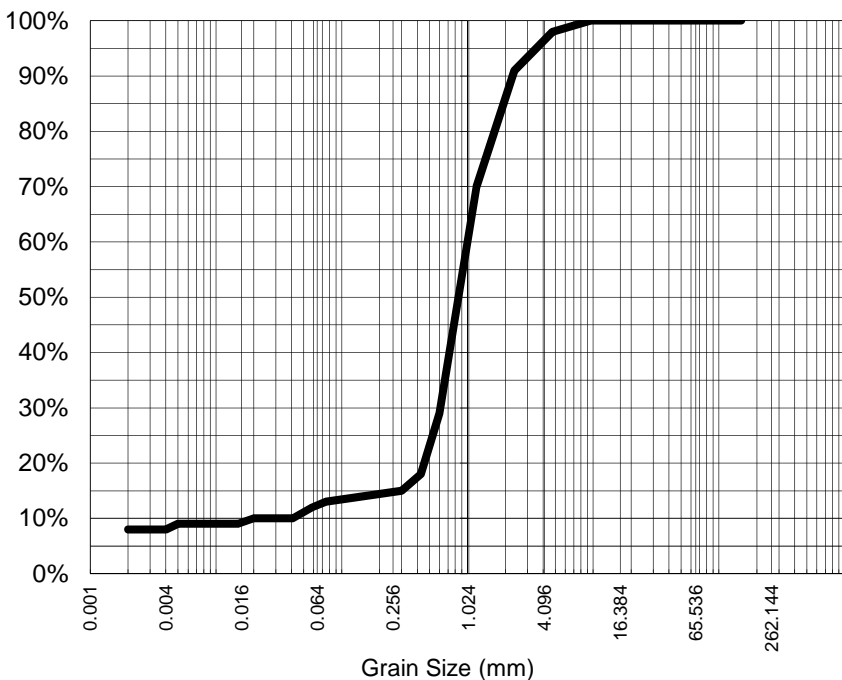
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina Qld, Australia **REPORT NO:** EB1932187-013 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191126-S13

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	98%
2.36	91%
1.18	70%
0.600	29%
0.425	18%
0.300	15%
0.150	14%
0.075	13%
Particle Size (microns)	
58	12%
41	10%
29	10%
20	10%
15	9%
11	9%
7	9%
5	9%
2	8%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.897
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.67

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Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

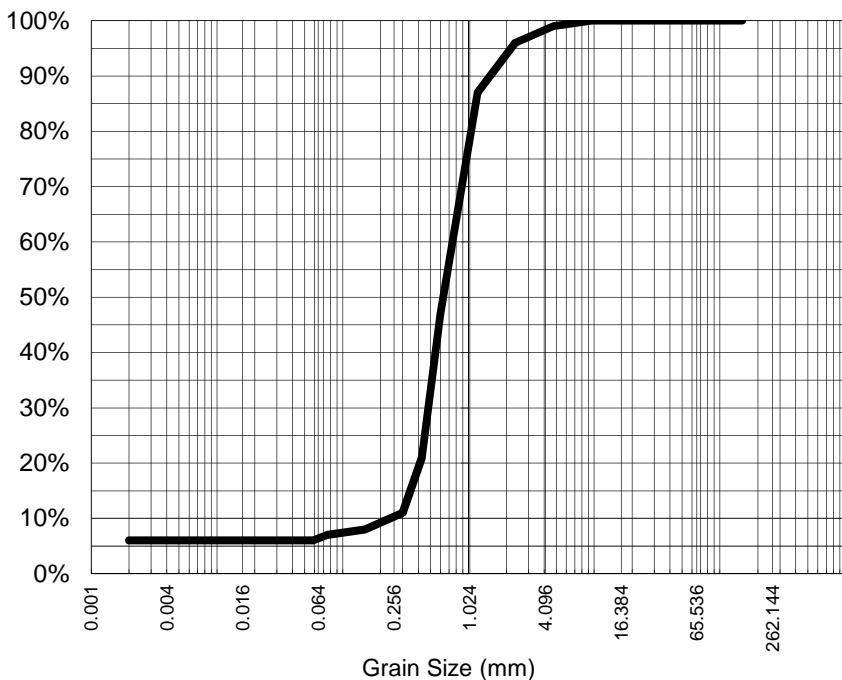
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina Qld, Australia **REPORT NO:** EB1932187-014 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191128-S14

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	99%
2.36	96%
1.18	87%
0.600	47%
0.425	21%
0.300	11%
0.150	8%
0.075	7%
Particle Size (microns)	
58	6%
41	6%
29	6%
20	6%
15	6%
11	6%
7	6%
5	6%
2	6%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.644
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65



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Soil Senior Chemist
Authorised Signatory

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Certificate of Analysis

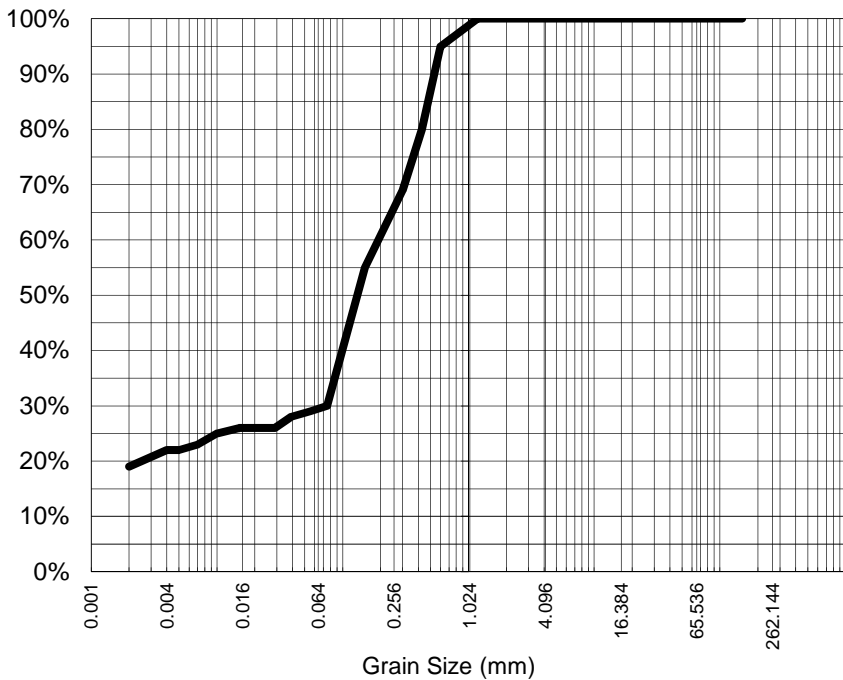
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina **REPORT NO:** EB1932187-015 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191128-S15

Particle Size Distribution



Particle Size (mm)	% Passing
1.18	100%
0.600	95%
0.425	80%
0.300	69%
0.150	55%
0.075	30%
Particle Size (microns)	
55	29%
39	28%
29	26%
20	26%
15	26%
10	25%
7	23%
5	22%
2	19%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.135
----------------------------	-------

Sample Comments:

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.59

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Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

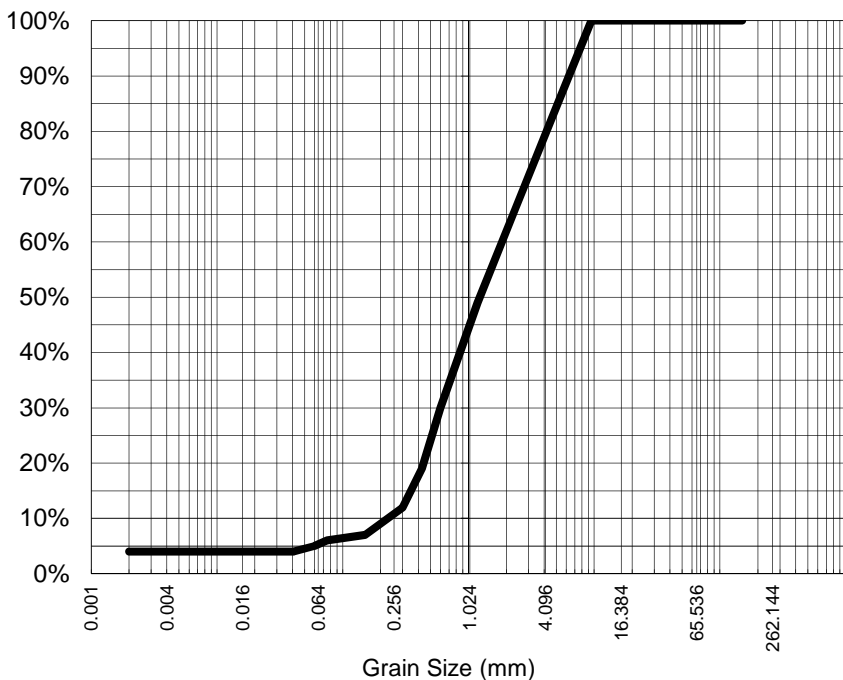
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane QLD



CLIENT: LUKE CRAIG **DATE REPORTED:** 13-Dec-2019
COMPANY: FUTURE-PLUS ENVIRONMENTAL **DATE RECEIVED:** 29-Nov-2019
ADDRESS: Po Box 1250 Buddina Qld, Australia **REPORT NO:** EB1932187-016 / PSD
PROJECT: 5643 SAP Port of Bundaberg **SAMPLE ID:** 5643-191128-S16

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	83%
2.36	66%
1.18	49%
0.600	30%
0.425	19%
0.300	12%
0.150	7%
0.075	6%
Particle Size (microns)	
59	5%
41	4%
29	4%
21	4%
15	4%
11	4%
8	4%
5	4%
2	4%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	1.249
----------------------------	-------

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 8-Dec-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64



Satish Trivedi
Soil Senior Chemist
Authorised Signatory

NATA Accreditation: 825 Site: Brisbane
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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EB1932187

Client	: FUTURE-PLUS ENVIRONMENTAL	Laboratory	: Environmental Division Brisbane
Contact	: LUKE CRAIG	Contact	: Customer Services EB
Address	: PO BOX 1250 BUDDINA QLD, AUSTRALIA 4575	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: luke.craig@future-plus.com.au	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: 07 5357 9169	Telephone	: +61 7 3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 5643 SAP Port of Bundaberg	Page	: 1 of 4
Order number	: ----	Quote number	: EB2017FUPE0003 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUKE CRAIG		

Dates

Date Samples Received	: 29-Nov-2019 10:40	Issue Date	: 29-Nov-2019
Client Requested Due Date	: 13-Dec-2019	Scheduled Reporting Date	: 13-Dec-2019

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 8	Temperature	: 27.6°C, 27.8°C, 0.2°C, 1.9°C, 0.2°C, 0.4°C, 0.2°C, 0.1°C, 0.1°, 0.2°C
Receipt Detail	: Medium Esky	No. of samples received / analysed	: 20 / 19

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Bulk Density analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA037 ASS Field Screening Analysis	SOIL - EA055-103 Moisture Content	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - EP090 (solids) Organotins	SOIL - S-02 8 Metals (incl. Digestion)
EB1932187-001	27-Nov-2019 00:00	5643-191127-S1		✓	✓	✓			✓
EB1932187-002	27-Nov-2019 00:00	5643-191127-S2		✓	✓	✓			✓
EB1932187-003	27-Nov-2019 00:00	5643-191127-S3		✓	✓	✓			✓
EB1932187-004	27-Nov-2019 00:00	5643-191127-S4		✓	✓	✓			✓
EB1932187-005	27-Nov-2019 00:00	5643-191127-S5		✓	✓	✓			✓
EB1932187-006	27-Nov-2019 00:00	5643-191127-S6		✓	✓	✓			✓
EB1932187-007	27-Nov-2019 00:00	5643-191127-S7		✓	✓	✓			✓
EB1932187-008	27-Nov-2019 00:00	5643-191127-S8	✓	✓	✓	✓	✓	✓	✓
EB1932187-009	26-Nov-2019 00:00	5643-191126-S9	✓	✓	✓	✓	✓	✓	✓
EB1932187-010	26-Nov-2019 00:00	5643-191126-S10	✓	✓	✓	✓	✓	✓	✓
EB1932187-011	26-Nov-2019 00:00	5643-191126-S11	✓	✓	✓	✓	✓	✓	✓
EB1932187-012	26-Nov-2019 00:00	5643-191126-S12	✓	✓	✓	✓	✓	✓	✓
EB1932187-013	26-Nov-2019 00:00	5643-191126-S13	✓	✓	✓	✓	✓	✓	✓
EB1932187-014	28-Nov-2019 00:00	5643-191128-S14	✓	✓	✓	✓	✓		✓
EB1932187-015	28-Nov-2019 00:00	5643-191128-S15	✓	✓	✓	✓	✓		✓
EB1932187-016	28-Nov-2019 00:00	5643-191128-S16	✓	✓	✓	✓	✓		✓
EB1932187-017	28-Nov-2019 00:00	5643-191127-QA1	✓	✓		✓	✓	✓	✓
EB1932187-018	28-Nov-2019 00:00	5643-191126-QA2	✓	✓		✓	✓	✓	✓
EB1932187-019	28-Nov-2019 00:00	5643-191128-QA3	✓	✓		✓	✓		✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA029 SPOCAS	SOIL - EA051 Bulk Density
EB1932187-008	27-Nov-2019 00:00	5643-191127-S8	✓	
EB1932187-009	26-Nov-2019 00:00	5643-191126-S9	✓	✓
EB1932187-010	26-Nov-2019 00:00	5643-191126-S10	✓	
EB1932187-011	26-Nov-2019 00:00	5643-191126-S11	✓	
EB1932187-012	26-Nov-2019 00:00	5643-191126-S12	✓	✓



			SOIL - EA029 SPOCAS	SOIL - EA051 Bulk Density
EB1932187-013	26-Nov-2019 00:00	5643-191126-S13	✓	
EB1932187-014	28-Nov-2019 00:00	5643-191128-S14	✓	
EB1932187-015	28-Nov-2019 00:00	5643-191128-S15	✓	✓
EB1932187-016	28-Nov-2019 00:00	5643-191128-S16	✓	
EB1932187-017	28-Nov-2019 00:00	5643-191127-QA1	✓	
EB1932187-018	28-Nov-2019 00:00	5643-191126-QA2	✓	
EB1932187-019	28-Nov-2019 00:00	5643-191128-QA3	✓	

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) WATER No analysis requested
EB1932187-020	28-Nov-2019 00:00	5643 Seawater	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

QUALITY CONTROL REPORT

Work Order	: EB1932187	Page	: 1 of 8
Amendment	: 2		
Client	: FUTURE-PLUS ENVIRONMENTAL	Laboratory	: Environmental Division Brisbane
Contact	: LUKE CRAIG	Contact	: John Pickering
Address	: PO BOX 1250 BUDDINA QLD, AUSTRALIA 4575	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 5357 9169	Telephone	: +61 7 3552 8634
Project	: 5643 SAP Port of Bundaberg	Date Samples Received	: 29-Nov-2019
Order number	: ----	Date Analysis Commenced	: 30-Nov-2019
C-O-C number	: ----	Issue Date	: 08-Jan-2020
Sampler	: LUKE CRAIG		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 20		
No. of samples analysed	: 19		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 2768463)									
EB1932187-001	5643-191127-S1	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	<0.01	0.00	0% - 20%
EB1932187-011	5643-191126-S11	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.03	0.03	0.00	0% - 20%
EA029-A: pH Measurements (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: pH KCl (23A)	----	0.1	pH Unit	8.5	8.5	0.00	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	6.7	6.7	0.00	0% - 20%
EB1932187-018	5643-191126-QA2	EA029: pH KCl (23A)	----	0.1	pH Unit	8.3	8.3	0.00	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.9	8.0	1.26	0% - 20%
EA029-B: Acidity Trail (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.00	No Limit
EB1932187-018	5643-191126-QA2	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.00	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.00	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.00	No Limit
EA029-C: Sulfur Trail (QC Lot: 2754544)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-C: Sulfur Trail (QC Lot: 2754544) - continued									
EB1932187-008	5643-191127-S8	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.056	0.056	0.00	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.230	0.238	3.81	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.173	0.183	5.33	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	108	114	5.33	0% - 50%
EB1932187-018	5643-191126-QA2	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.102	0.107	5.07	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.523	0.619	16.8	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.421	0.512	19.4	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	263	319	19.4	0% - 20%
EA029-D: Calcium Values (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.206	0.202	1.50	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.275	0.287	4.19	0% - 50%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.070	0.084	19.3	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.056	0.068	19.3	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	35	42	19.3	No Limit
EB1932187-018	5643-191126-QA2	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.342	0.365	6.58	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.971	1.09	11.6	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.630	0.726	14.3	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.504	0.581	14.3	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	314	362	14.3	0% - 20%
EA029-E: Magnesium Values (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.125	0.124	0.865	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.150	0.157	4.65	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.024	0.033	28.7	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.032	0.043	28.7	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	20	27	28.7	No Limit
EB1932187-018	5643-191126-QA2	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.200	0.214	6.33	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.370	0.435	16.2	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.170	0.222	26.6	0% - 50%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.224	0.292	26.6	0% - 50%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	139	182	26.6	0% - 50%
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.683	0.700	2.43	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.218	0.224	2.43	0% - 50%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 2754544) - continued									
EB1932187-008	5643-191127-S8	EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	136	140	2.43	0% - 50%
EB1932187-018	5643-191126-QA2	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	2.22	2.25	1.56	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.709	0.720	1.56	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	443	450	1.56	0% - 20%
EA029-H: Acid Base Accounting (QC Lot: 2754544)									
EB1932187-008	5643-191127-S8	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.00	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.00	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.17	0.18	0.00	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.00	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	8	8	0.00	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.00	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	108	114	5.33	0% - 50%
EB1932187-018	5643-191126-QA2	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.00	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.00	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.42	0.51	19.4	0% - 20%
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.00	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	20	24	19.4	0% - 20%
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.00	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	263	319	19.4	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 2761788)									
EB1927888-013	Anonymous	EA037: pH (F)	----	0.1	pH Unit	6.9	6.9	0.00	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	4.8	4.7	0.00	0% - 20%
EB1932187-012	5643-191126-S12	EA037: pH (F)	----	0.1	pH Unit	8.5	8.5	0.00	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	3.4	3.4	0.00	0% - 20%
EA051: Bulk Density (QC Lot: 2747882)									
EB1931388-001	Anonymous	EA051: Bulk Density	BULK_DENSITY	1	kg/m3	1400	1380	1.20	0% - 20%
EB1931388-014	Anonymous	EA051: Bulk Density	BULK_DENSITY	1	kg/m3	1700	1680	1.48	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2735708)									
EB1932187-001	5643-191127-S1	EA055: Moisture Content	----	0.1	%	16.6	17.0	2.86	0% - 50%
EB1932187-011	5643-191126-S11	EA055: Moisture Content	----	0.1	%	51.5	52.0	0.871	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 2794922)									
EB1932187-001	5643-191127-S1	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	<0.50	0.00	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	1.5	1.4	7.11	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	<1.00	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 2794922) - continued									
EB1932187-001	5643-191127-S1	EG020-SD: Chromium	7440-47-3	1	mg/kg	3.2	3.0	5.33	No Limit
		EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	<1.0	0.00	No Limit
		EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	<1.0	0.00	No Limit
		EG020-SD: Nickel	7440-02-0	1	mg/kg	2.2	1.8	18.9	No Limit
		EG020-SD: Zinc	7440-66-6	1	mg/kg	3.9	3.9	0.00	No Limit
EB1932187-011	5643-191126-S11	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	<0.50	0.00	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	9.4	9.5	0.00	0% - 50%
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	7.72	8.23	6.37	No Limit
		EG020-SD: Chromium	7440-47-3	1	mg/kg	19.9	21.0	5.50	0% - 20%
		EG020-SD: Copper	7440-50-8	1	mg/kg	16.5	16.7	1.25	0% - 50%
		EG020-SD: Lead	7439-92-1	1	mg/kg	8.8	8.9	2.12	No Limit
		EG020-SD: Nickel	7440-02-0	1	mg/kg	12.6	12.9	2.31	0% - 50%
EG020-SD: Zinc	7440-66-6	1	mg/kg	34.6	36.1	4.25	0% - 20%		
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 2760653)									
EB1932187-008	5643-191127-S8	EP003: Total Organic Carbon	----	0.02	%	0.49	0.47	5.57	0% - 20%
EB1932187-018	5643-191126-QA2	EP003: Total Organic Carbon	----	0.02	%	0.68	0.77	12.4	0% - 20%
EP090: Organotin Compounds (QC Lot: 2735707)									
EB1932187-008	5643-191127-S8	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.00	No Limit
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.00	No Limit
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	<1	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 2768463)									
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.0847 mg/kg	83.8	70.0	130	
EA029-A: pH Measurements (QCLot: 2754544)									
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.4 pH Unit	100	70.0	130	
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	4.2 pH Unit	107	70.0	130	
EA029-B: Acidity Trail (QCLot: 2754544)									
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	20.1 mole H+ / t	90.0	70.0	130	
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	27.5 mole H+ / t	115	70.0	130	
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----	
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----	
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----	
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----	
EA029-C: Sulfur Trail (QCLot: 2754544)									
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.055 % S	87.6	70.0	130	
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.184 % S	91.8	70.0	130	
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----	
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----	
EA029-D: Calcium Values (QCLot: 2754544)									
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.124 % Ca	121	70.0	130	
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.223 % Ca	96.8	70.0	130	
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----	
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----	
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----	
EA029-E: Magnesium Values (QCLot: 2754544)									
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.196 % Mg	94.4	70.0	130	
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.218 % Mg	93.5	70.0	130	
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----	
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----	
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----	
EA029-F: Excess Acid Neutralising Capacity (QCLot: 2754544)									
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.020	----	----	----	----	
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----	
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.020	----	----	----	----	



Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EA029-H: Acid Base Accounting (QCLot: 2754544)									
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----	
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----	
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----	
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----	
EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----	
EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----	
EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----	
EA152: Soil Particle Density (QCLot: 2739044)									
EA152: Soil Particle Density (Clay/Silt/Sand)	----	----	g/cm3	----	2.68 g/cm3	100	80.0	120	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2794922)									
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	----	----	----	----	
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	96.1 mg/kg	101	80.0	124	
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.74 mg/kg	97.9	87.0	122	
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	15.3 mg/kg	107	79.0	129	
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	44.8 mg/kg	100	85.0	118	
EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	<0.5	----	----	----	----	
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	52.8 mg/kg	105	86.0	119	
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	12.2 mg/kg	101	77.0	123	
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	----	----	----	----	
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	114 mg/kg	100	71.0	127	
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 2760653)									
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.44 %	102	70.0	130	
				<0.02	0.48 %	97.4	70.0	130	
EP090: Organotin Compounds (QCLot: 2735707)									
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	63.5	36.0	128	
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	88.9	42.0	132	
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	120	52.0	139	

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report				
				Spike Concentration	Spike Recovery(%)		Recovery Limits (%)	
					MS	Low	High	
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 2768463)								
EB1932187-002	5643-191127-S2	EG035T-LL: Mercury	7439-97-6	0.5 mg/kg	80.6	70.0	130	
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2794922)								



Sub-Matrix: **SOIL**

				<i>Matrix Spike (MS) Report</i>			
				<i>Spike</i>	<i>SpikeRecovery(%)</i>	<i>Recovery Limits (%)</i>	
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>Concentration</i>	<i>MS</i>	<i>Low</i>	<i>High</i>
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 2794922) - continued							
EB1932187-002	5643-191127-S2	EG020-SD: Arsenic	7440-38-2	100 mg/kg	89.7	70.0	130
		EG020-SD: Cadmium	7440-43-9	25 mg/kg	91.7	70.0	130
		EG020-SD: Chromium	7440-47-3	100 mg/kg	100.0	70.0	130
		EG020-SD: Copper	7440-50-8	100 mg/kg	97.4	70.0	130
		EG020-SD: Cobalt	7440-48-4	100 mg/kg	98.1	70.0	130
		EG020-SD: Lead	7439-92-1	100 mg/kg	99.8	70.0	130
		EG020-SD: Nickel	7440-02-0	100 mg/kg	93.1	70.0	130
		EG020-SD: Zinc	7440-66-6	100 mg/kg	92.1	70.0	130
EP090: Organotin Compounds (QCLot: 2735707)							
EB1932187-009	5643-191126-S9	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# 13.8	20.0	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	126	20.0	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	112	20.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1932187	Page	: 1 of 11
Amendment	: 2		
Client	: FUTURE-PLUS ENVIRONMENTAL	Laboratory	: Environmental Division Brisbane
Contact	: LUKE CRAIG	Telephone	: +61 7 3552 8634
Project	: 5643 SAP Port of Bundaberg	Date Samples Received	: 29-Nov-2019
Site	: ----	Issue Date	: 08-Jan-2020
Sampler	: LUKE CRAIG	No. of samples received	: 20
Order number	: ----	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP090: Organotin Compounds	EB1932187--009	5643-191126-S9	Monobutyltin	78763-54-9	13.8 %	20.0-130%	Recovery less than lower data quality objective

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP090S: Organotin Surrogate	EB1932187-011	5643-191126-S11	Tripropyltin	----	135 %	35.0-130 %	Recovery greater than upper data quality objective

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Soil Particle Density	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA029-A: pH Measurements							
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8	27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓



Matrix: SOIL

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA029-B: Acidity Trail								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
EA029-C: Sulfur Trail								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
EA029-D: Calcium Values								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA029-E: Magnesium Values								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
EA029-F: Excess Acid Neutralising Capacity								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
EA029-G: Retained Acidity								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA029-H: Acid Base Accounting								
Snap Lock Bag - frozen (EA029) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	11-Dec-2019	21-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191127-S8		27-Nov-2019	11-Dec-2019	22-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
Snap Lock Bag - frozen (EA029) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	11-Dec-2019	23-Aug-2022	✓	11-Dec-2019	10-Mar-2020	✓
EA037: Ass Field Screening Analysis								
Snap Lock Bag - frozen (EA037) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	13-Dec-2019	24-May-2020	✓	13-Dec-2019	24-May-2020	✓
Snap Lock Bag - frozen (EA037) 5643-191127-S8		27-Nov-2019	13-Dec-2019	25-May-2020	✓	13-Dec-2019	25-May-2020	✓
Snap Lock Bag - frozen (EA037) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	13-Dec-2019	26-May-2020	✓	13-Dec-2019	26-May-2020	✓
EA051 : Bulk Density								
Soil Glass Jar - Unpreserved (EA051) 5643-191126-S9,	5643-191126-S12	26-Nov-2019	----	----	----	06-Dec-2019	24-May-2020	✓
Soil Glass Jar - Unpreserved (EA051) 5643-191128-S15		28-Nov-2019	----	----	----	06-Dec-2019	26-May-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	----	----	----	30-Nov-2019	10-Dec-2019	✓
Soil Glass Jar - Unpreserved (EA055) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	----	----	----	30-Nov-2019	11-Dec-2019	✓
Soil Glass Jar - Unpreserved (EA055) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	----	----	----	30-Nov-2019	12-Dec-2019	✓



Matrix: SOIL

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA150: Particle Sizing								
Snap Lock Bag (EA150H) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	----	----	----	11-Dec-2019	24-May-2020	✓
Snap Lock Bag (EA150H) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	----	----	----	11-Dec-2019	25-May-2020	✓
Snap Lock Bag (EA150H) 5643-191128-S14, 5643-191128-S16	5643-191128-S15,	28-Nov-2019	----	----	----	11-Dec-2019	26-May-2020	✓
EA150: Soil Classification based on Particle Size								
Snap Lock Bag (EA150H) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	----	----	----	11-Dec-2019	24-May-2020	✓
Snap Lock Bag (EA150H) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	----	----	----	11-Dec-2019	25-May-2020	✓
Snap Lock Bag (EA150H) 5643-191128-S14, 5643-191128-S16	5643-191128-S15,	28-Nov-2019	----	----	----	11-Dec-2019	26-May-2020	✓
EA152: Soil Particle Density								
Snap Lock Bag (EA152) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	----	----	----	11-Dec-2019	24-May-2020	✓
Snap Lock Bag (EA152) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	----	----	----	11-Dec-2019	25-May-2020	✓
Snap Lock Bag (EA152) 5643-191128-S14, 5643-191128-S16	5643-191128-S15,	28-Nov-2019	----	----	----	11-Dec-2019	26-May-2020	✓



Matrix: SOIL

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved (EG020-SD) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	06-Jan-2020	24-May-2020	✓	07-Jan-2020	24-May-2020	✓
Soil Glass Jar - Unpreserved (EG020-SD) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	06-Jan-2020	25-May-2020	✓	07-Jan-2020	25-May-2020	✓
Soil Glass Jar - Unpreserved (EG020-SD) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	06-Jan-2020	26-May-2020	✓	07-Jan-2020	26-May-2020	✓
EG035T: Total Recoverable Mercury by FIMS (Low Level)								
Soil Glass Jar - Unpreserved (EG035T-LL) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	16-Dec-2019	24-Dec-2019	✓	18-Dec-2019	24-Dec-2019	✓
Soil Glass Jar - Unpreserved (EG035T-LL) 5643-191127-S1, 5643-191127-S3, 5643-191127-S5, 5643-191127-S7,	5643-191127-S2, 5643-191127-S4, 5643-191127-S6, 5643-191127-S8	27-Nov-2019	16-Dec-2019	25-Dec-2019	✓	18-Dec-2019	25-Dec-2019	✓
Soil Glass Jar - Unpreserved (EG035T-LL) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	16-Dec-2019	26-Dec-2019	✓	18-Dec-2019	26-Dec-2019	✓
EP003: Total Organic Carbon (TOC) in Soil								
Pulp Bag (EP003) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	12-Dec-2019	24-Dec-2019	✓	12-Dec-2019	24-Dec-2019	✓
Pulp Bag (EP003) 5643-191127-S8		27-Nov-2019	12-Dec-2019	25-Dec-2019	✓	12-Dec-2019	25-Dec-2019	✓
Pulp Bag (EP003) 5643-191128-S14, 5643-191128-S16, 5643-191126-QA2,	5643-191128-S15, 5643-191127-QA1, 5643-191128-QA3	28-Nov-2019	12-Dec-2019	26-Dec-2019	✓	12-Dec-2019	26-Dec-2019	✓



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP090: Organotin Compounds								
Soil Glass Jar - Unpreserved (EP090) 5643-191126-S9, 5643-191126-S11, 5643-191126-S13	5643-191126-S10, 5643-191126-S12,	26-Nov-2019	03-Dec-2019	10-Dec-2019	✓	05-Dec-2019	12-Jan-2020	✓
Soil Glass Jar - Unpreserved (EP090) 5643-191127-S8		27-Nov-2019	03-Dec-2019	11-Dec-2019	✓	05-Dec-2019	12-Jan-2020	✓
Soil Glass Jar - Unpreserved (EP090) 5643-191127-QA1,	5643-191126-QA2	28-Nov-2019	03-Dec-2019	12-Dec-2019	✓	05-Dec-2019	12-Jan-2020	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Bulk Density	EA051	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Soil Particle Density	EA152	0	16	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	12	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Analysis	EP090	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Soil Particle Density	EA152	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Analysis	EP090	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Analysis	EP090	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	SOIL	In house: Referenced to Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines, version 2.1 June 2004. As received samples are tested for pH field and pH fox and assessed for a reaction rating.
Bulk Density	* EA051	SOIL	The Determination of bulk density requires the measurements of the mass of soil in a measured volume
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 6.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NODG.
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO ₂) is automatically measured by infra-red detector.
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270D Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quantified against an established calibration curve.
Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.



<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Dry and Pulverise (up to 100g)	GEO30	SOIL	#
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Appendix D.
Laboratory Certificates of Analysis (Eurofins)

Future-Plus Environmental
4/40 Technology Drive
Warana
QLD 4575



NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Attention: **Michael B**

Report **691295-S**
 Project name **BUNDABERG SAP**
 Project ID **5643**
 Received Date **Nov 29, 2019**

Client Sample ID			5643-191127-QB1	5643-191126-QB2	5643-191128-QB3
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			B19-De01644	B19-De01645	B19-De01646
Date Sampled			Nov 27, 2019	Nov 26, 2019	Nov 28, 2019
Test/Reference	LOR	Unit			
Total Organic Carbon	0.1	%	1.0	1.5	< 0.1
Organotins (MBT, DBT, TBT)			ATTACHED	ATTACHED	-
% Moisture	1	%	46	52	17
Sample Comment					
Heavy Metals					
Antimony	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Arsenic	1	mg/kg	6.8	12	< 2
Cadmium	0.1	mg/kg	< 0.1	< 0.1	< 0.2
Chromium	1	mg/kg	29	50	6.6
Cobalt	0.5	mg/kg	12	16	3.6
Copper	1	mg/kg	19	28	< 2
Lead	1	mg/kg	9.4	14	< 2
Mercury	0.01	mg/kg	0.04	0.04	< 0.05
Nickel	1	mg/kg	17	29	3.3
Silver	0.1	mg/kg	< 0.1	< 0.1	< 0.2
Zinc	1	mg/kg	46	64	8.0
Acid Sulfate Soils Field pH Test					
pH-F (Field pH test)*	0.1	pH Units	8.2	8.7	8.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.7	7.1	7.3
Reaction Ratings**S05		comment	4.0	4.0	4.0
SPOCAS Suite					
pH-KCL	0.1	pH Units	8.5	8.6	9.4
pH-OX	0.1	pH Units	6.8	7.8	7.9
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2
Acid trail - Titratable Peroxide Acidity	2	mol H+/t	< 2	< 2	< 2
Acid trail - Titratable Sulfidic Acidity	2	mol H+/t	< 2	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003
sulfidic - TPA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	< 0.02
sulfidic - TSA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	< 0.02
Sulfur - KCl Extractable	0.02	% S	0.04	0.06	0.02
Sulfur - Peroxide	0.02	% S	0.27	0.41	0.04
Sulfur - Peroxide Oxidisable Sulfur	0.02	% S	0.23	0.35	< 0.02
acidity - Peroxide Oxidisable Sulfur	10	mol H+/t	140	220	< 10
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a

Client Sample ID			5643-191127-QB1	5643-191126-QB2	5643-191128-QB3
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			B19-De01644	B19-De01645	B19-De01646
Date Sampled			Nov 27, 2019	Nov 26, 2019	Nov 28, 2019
Test/Reference	LOR	Unit			
SPOCAS Suite					
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite ^{S02}	0.02	% S	n/a	n/a	n/a
Calcium - KCl Extractable	0.02	% Ca	0.24	0.29	0.11
Calcium - Peroxide	0.02	% Ca	0.35	0.72	0.18
Acid Reacted Calcium	0.02	% Ca	0.10	0.43	0.07
acidity - Acid Reacted Calcium	10	mol H+/t	52	210	34
sulfidic - Acid Reacted Ca equiv. S% pyrite	0.02	% S	0.08	0.34	0.06
Magnesium - KCl Extractable	0.02	% Mg	0.15	0.19	0.03
Magnesium - Peroxide	0.02	% Mg	0.21	0.31	0.05
Acid Reacted Magnesium	0.02	% Mg	0.06	0.12	< 0.02
acidity - Acid Reacted Magnesium	10	mol H+/t	47	100	< 10
sulfidic - Acid Reacted Mg equiv. S% pyrite	0.02	% S	0.08	0.16	< 0.02
Acid Neutralising Capacity (ANCE)	0.02	% CaCO ₃	0.44	1.4	0.47
Acid Neutralising Capacity - Acidity units (a-ANCE)	10	mol H+/t	88	280	94
Acid Neutralising Capacity - equivalent S% pyrite(s-ANCE)	0.02	% S	0.14	0.45	0.15
ANC Fineness Factor		factor	1.5	1.5	1.5
SPOCAS - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02
SPOCAS - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10
SPOCAS - Liming rate	1	kg CaCO ₃ /t	< 1	< 1	< 1
Extraneous Material					
<2mm Fraction	0.005	g	42	50	97
>2mm Fraction	0.005	g	< 0.005	< 0.005	0.38
Analysed Material	0.1	%	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	0.4

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Total Organic Carbon - Method: LTM-INO-4060 Total Organic Carbon in water and soil	Melbourne	Dec 04, 2019	28 Days
Heavy Metals - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Brisbane	Jan 10, 2020	180 Days
Acid Sulfate Soils Field pH Test - Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests	Brisbane	Dec 03, 2019	7 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Melbourne	Dec 04, 2019	14 Days
SPOCAS Suite			
SPOCAS Suite - Method: LTM-GEN-7050	Brisbane	Dec 03, 2019	6 Week
Extraneous Material - Method: LTM-GEN-7050/7070	Brisbane	Dec 03, 2019	6 Week

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
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16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Future Plus Environmental
Address: 4/40 Technology Drive
Warana
QLD 4575

Project Name: BUNDABERG SAP
Project ID: 5643

Order No.:
Report #: 691295
Phone: 07 5450 2688
Fax: 07 5450 2686

Received: Jan 7, 2020 8:46 AM
Due: Jan 9, 2020
Priority: 2 Day
Contact Name: Michael B

Eurofins Analytical Services Manager : Ryan Gilbert

Sample Detail						Antimony	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Organotins (MBT, DBT, TBT)	Sample Comment	Silver	Total Organic Carbon	Zinc	Acid Sulfate Soils Field pH Test	SPOCAS Suite	Moisture Set	
Melbourne Laboratory - NATA Site # 1254 & 14271																X		X				X	
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X	X	X	X	X			X		X			
Brisbane Laboratory - NATA Site # 20794																				X	X		
Perth Laboratory - NATA Site # 23736																							
External Laboratory															X								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID																		
1	5643-191127-QB1	Nov 27, 2019		Soil	B19-De01644	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	5643-191126-QB2	Nov 26, 2019		Soil	B19-De01645	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	5643-191128-QB3	Nov 28, 2019		Soil	B19-De01646	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	
Test Counts						5	5	5	5	4	5	5	5	5	5	2	3	5	3	3	3	3	

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code	
Method Blank								
Total Organic Carbon	%	< 0.1			0.1	Pass		
Method Blank								
Heavy Metals								
Antimony	mg/kg	< 0.5			0.5	Pass		
Arsenic	mg/kg	< 1			1	Pass		
Cadmium	mg/kg	< 0.1			0.1	Pass		
Cobalt	mg/kg	< 0.5			0.5	Pass		
Copper	mg/kg	< 1			1	Pass		
Lead	mg/kg	< 1			1	Pass		
Nickel	mg/kg	< 1			1	Pass		
Silver	mg/kg	< 0.1			0.1	Pass		
Zinc	mg/kg	< 1			1	Pass		
LCS - % Recovery								
Total Organic Carbon	%	106			70-130	Pass		
LCS - % Recovery								
Heavy Metals								
Antimony	%	88			70-130	Pass		
Arsenic	%	97			70-130	Pass		
Cadmium	%	103			70-130	Pass		
Chromium	%	89			70-130	Pass		
Cobalt	%	87			70-130	Pass		
Copper	%	85			70-130	Pass		
Lead	%	87			70-130	Pass		
Mercury	%	95			70-130	Pass		
Nickel	%	85			70-130	Pass		
Silver	%	96			70-130	Pass		
Zinc	%	87			70-130	Pass		
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Heavy Metals				Result 1				
Antimony	S20-Ja02826	NCP	%	92		70-130	Pass	
Arsenic	S20-Ja02826	NCP	%	109		70-130	Pass	
Cadmium	S20-Ja02826	NCP	%	104		70-130	Pass	
Chromium	S20-Ja02826	NCP	%	102		70-130	Pass	
Cobalt	S20-Ja02826	NCP	%	97		70-130	Pass	
Copper	S20-Ja02826	NCP	%	102		70-130	Pass	
Lead	S20-Ja02826	NCP	%	87		70-130	Pass	
Mercury	S20-Ja02826	NCP	%	109		70-130	Pass	
Nickel	S20-Ja02826	NCP	%	102		70-130	Pass	
Silver	S20-Ja02826	NCP	%	96		70-130	Pass	
Zinc	S20-Ja02826	NCP	%	130		70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Duplicate								
				Result 1	Result 2	RPD		
Total Organic Carbon	S19-No42018	NCP	%	1.4	1.7	19	30%	Pass

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Antimony	S20-Ja02917	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Arsenic	S20-Ja02917	NCP	mg/kg	18	15	15	30%	Pass	
Cadmium	S20-Ja02917	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S20-Ja02917	NCP	mg/kg	25	28	11	30%	Pass	
Cobalt	S20-Ja02917	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Copper	S20-Ja02917	NCP	mg/kg	16	36	75	30%	Fail	Q15
Lead	S20-Ja02917	NCP	mg/kg	25	25	2.0	30%	Pass	
Mercury	S20-Ja02917	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S20-Ja02917	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Silver	S20-Ja02917	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Zinc	S20-Ja02917	NCP	mg/kg	5.5	18	110	30%	Fail	Q15
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B19-De01636	NCP	pH Units	7.6	7.5	pass	30%	Pass	
Reaction Ratings*	B19-De01636	NCP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
SPOCAS Suite				Result 1	Result 2	RPD			
pH-KCL	B19-De01646	CP	pH Units	9.4	9.5	<1	30%	Pass	
pH-OX	B19-De01646	CP	pH Units	7.9	7.9	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	B19-De01646	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
Acid trail - Titratable Peroxide Acidity	B19-De01646	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
Acid trail - Titratable Sulfidic Acidity	B19-De01646	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	B19-De01646	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
sulfidic - TPA equiv. S% pyrite	B19-De01646	CP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
sulfidic - TSA equiv. S% pyrite	B19-De01646	CP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
Sulfur - KCl Extractable	B19-De01646	CP	% S	0.02	0.02	2.0	30%	Pass	
Sulfur - Peroxide	B19-De01646	CP	% S	0.04	0.04	2.0	30%	Pass	
Sulfur - Peroxide Oxidisable Sulfur	B19-De01646	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
acidity - Peroxide Oxidisable Sulfur	B19-De01646	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
HCl Extractable Sulfur	B19-De01646	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	B19-De01646	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	B19-De01646	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	B19-De01646	CP	% S	n/a	n/a	n/a	30%	Pass	
Calcium - KCl Extractable	B19-De01646	CP	% Ca	0.11	0.11	4.0	30%	Pass	
Calcium - Peroxide	B19-De01646	CP	% Ca	0.18	0.17	3.0	30%	Pass	
Acid Reacted Calcium	B19-De01646	CP	% Ca	0.07	0.07	1.0	30%	Pass	
acidity - Acid Reacted Calcium	B19-De01646	CP	mol H+/t	34	34	1.0	30%	Pass	
sulfidic - Acid Reacted Ca equiv. S% pyrite	B19-De01646	CP	% S	0.06	0.05	1.0	30%	Pass	
Magnesium - KCl Extractable	B19-De01646	CP	% Mg	0.03	0.03	3.0	30%	Pass	
Magnesium - Peroxide	B19-De01646	CP	% Mg	0.05	0.04	8.0	30%	Pass	
Acid Reacted Magnesium	B19-De01646	CP	% Mg	< 0.02	< 0.02	<1	30%	Pass	
acidity - Acid Reacted Magnesium	B19-De01646	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
sulfidic - Acid Reacted Mg equiv. S% pyrite	B19-De01646	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
Acid Neutralising Capacity (ANCE)	B19-De01646	CP	% CaCO ₃	0.47	0.47	1.0	30%	Pass	
Acid Neutralising Capacity - Acidity units (a-ANCE)	B19-De01646	CP	mol H+/t	94	93	1.0	30%	Pass	
ANC Fineness Factor	B19-De01646	CP	factor	1.5	1.5	<1	30%	Pass	
SPOCAS - Liming rate	B19-De01646	CP	kg CaCO ₃ /t	< 1	< 1	<1	30%	Pass	

Comments

Organotin Compounds conducted by Eurofins GfA Lab Service GmbH, Deutsche AKKreditierungsstelle D-PL-14629-01-00, Analytical Reports AR-20-GF-000850-01, AR-20-GF-000926-01

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Ryan Gilbert	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Metal (NSW)
Julie Kay	Senior Analyst-Inorganic (VIC)
Myles Clark	Senior Analyst-SPOCAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)
Steven Trout	Senior Analyst-Metal (QLD)


Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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Person in charge Dr. D. Stegemann
ASM Dr. D. Stegemann

Report date 08.01.2020

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Analytical report AR-20-GF-000926-01



Sample Code 710-2019-28521001

Reference	SEDIMENT
	005-10530-0002143998
Sample sender	Invoices
Reception date time	18.12.2019
Transport by	DHL
Client Purchase order nr.	B19-435211-691295
Purchase order date	05.12.2019
Client sample code	5643-191127-QB1 De01644
Number of containers	1
Reception temperature	room temperature
End analysis	08.01.2020

Test results

GFDRY	Dry Residue (°) (#)		
Method	Internal, Gravimetry		
dry residue		51.9	%
GFU61	organotin compounds (8 OTC): environmental material, soil, solids, sludge, liquids (°) (#)		
Method	Internal, GLS OC 600:2019-01-18, GC-MS		
Monobutyltin (MBT)		< 0.91	µg/kg dw
Monobutyltin (MBT) - Sn		< 0.62	µg/kg dw
Dibutyltin (DBT)		< 0.91	µg/kg dw
Dibutyltin (DBT) - Sn		< 0.46	µg/kg dw
Tributyltin (TBT)		< 0.91	µg/kg dw
Tributyltin (TBT) - Sn		< 0.37	µg/kg dw
Tetrabutyltin (TTBT)		< 0.91	µg/kg dw

The results of examination refer exclusively to the checked samples.
Duplicates - even in parts - must be authorized by the test laboratory in written form.
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Headquarters: Eurofins GfA Lab Service GmbH – Neuländer Kamp 1a D-21079 Hamburg
HRB 115907 AG Hamburg
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Durch die Deutsche Akkreditierungsstelle
GmbH (DAkkS) akkreditiertes Prüflaboratorium
DIN EN ISO/IEC 17025:2005
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aufgeführten Prüfverfahren

Our General Terms & Conditions, available upon request and online at
<http://www.eurofins.de/lebensmittel/kontakt/avb.aspx>, shall apply.

Tetrabutyltin (TTBT) - Sn	< 0.31	µg/kg dw
Monooctyltin (MOT)	< 0.91	µg/kg dw
Monooctyltin (MOT) - Sn	< 0.47	µg/kg dw
Diocetyltn (DOT)	< 0.91	µg/kg dw
Diocetyltn (DOT) - Sn	< 0.31	µg/kg dw
Triphenyltin (TPHT)	< 0.91	µg/kg dw
Triphenyltin (TPHT) - Sn	< 0.31	µg/kg dw
Tricyclohexyltin (TCyT)	< 1.9	µg/kg dw
Tricyclohexyltin (TCyT) - Sn	< 0.62	µg/kg dw

(°) = The test was performed at the laboratory site: Am Neuländer Gewerbepark 4

(#) = Eurofins GfA Lab Service GmbH (Hamburg) is accredited for this test.

< - Concentration below the indicated limit of quantification (LOQ)



Analytical Services Manager, ASM (Dieter Stegemann)

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Person in charge Dr. D. Stegemann
ASM Dr. D. Stegemann

Report date 08.01.2020

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Analytical report AR-20-GF-000850-01



Sample Code 710-2019-28521002

Reference	SEDIMENT
	005-10530-0002143999
Sample sender	Invoices
Reception date time	18.12.2019
Transport by	DHL
Client Purchase order nr.	B19-435211-691295
Purchase order date	05.12.2019
Client sample code	5643-191127-QB2 De01645
Number of containers	1
Reception temperature	room temperature
End analysis	08.01.2020

Test results

GFDRY	Dry Residue (°) (#)		
Method	Internal, Gravimetry		
dry residue		46.1	%
GFU61	organotin compounds (8 OTC): environmental material, soil, solids, sludge, liquids (°) (#)		
Method	Internal, GLS OC 600:2019-01-18, GC-MS		
Monobutyltin (MBT)		< 1.1	µg/kg dw
Monobutyltin (MBT) - Sn		< 0.73	µg/kg dw
Dibutyltin (DBT)		< 1.1	µg/kg dw
Dibutyltin (DBT) - Sn		< 0.55	µg/kg dw
Tributyltin (TBT)		2.8	µg/kg dw
Tributyltin (TBT) - Sn		1.1	µg/kg dw

Tetrabutyltin (TTBT)	< 1.1	µg/kg dw
Tetrabutyltin (TTBT) - Sn	< 0.37	µg/kg dw
Monooctyltin (MOT)	< 1.1	µg/kg dw
Monooctyltin (MOT) - Sn	< 0.55	µg/kg dw
Diocetyltn (DOT)	< 1.1	µg/kg dw
Diocetyltn (DOT) - Sn	< 0.37	µg/kg dw
Triphenyltin (TPhT)	< 1.1	µg/kg dw
Triphenyltin (TPhT) - Sn	< 0.37	µg/kg dw
Tricyclohexyltin (TCyT)	< 2.6	µg/kg dw
Tricyclohexyltin (TCyT) - Sn	< 0.85	µg/kg dw

(*) = The test was performed at the laboratory site: Am Neuländer Gewerbepark 4

(#) = Eurofins GfA Lab Service GmbH (Hamburg) is accredited for this test.

< - Concentration below the indicated limit of quantification (LOQ)



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Address: 4/40 Technology Drive
Warana
QLD 4575

Project Name: BUNDABERG SAP
Project ID: 5643

Order No.:
Report #: 691295
Phone: 07 5450 2688
Fax: 07 5450 2686

Received: Jan 7, 2020 8:46 AM
Due: Jan 9, 2020
Priority: 2 Day
Contact Name: Michael B

Eurofins Analytical Services Manager : Ryan Gilbert

Sample Detail						Antimony	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Organotins (MBT, DBT, TBT)	Sample Comment	Silver	Total Organic Carbon	Zinc	Acid Sulfate Soils Field pH Test	SPOCAS Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271																X		X				X
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X	X	X	X	X		X		X			
Brisbane Laboratory - NATA Site # 20794																				X	X	
Perth Laboratory - NATA Site # 23736																						
External Laboratory															X							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID																	
1	5643-191127-QB1	Nov 27, 2019		Soil	B19-De01644	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	5643-191126-QB2	Nov 26, 2019		Soil	B19-De01645	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	5643-191128-QB3	Nov 28, 2019		Soil	B19-De01646	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X
Test Counts						5	5	5	5	4	5	5	5	5	5	2	3	5	3	3	3	3

Appendix E.
Tabulated Analytical Results

Table 1 - Summary of Inorganic Analytical Results

Sample ID	Sample Location	Sample Date	Heavy Metals									Organotin Compounds			Other		
			Antimony	Arsenic, As	Cadmium, Cd	Chromium, Cr	Copper, Cu	Lead, Pb	Nickel, Ni	Silver	Zinc, Zn	Mercury	Monobutyltin	Dibutyltin	Tributyltin	Total Organic Carbon	Moisture Content
Unit			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µgSn/kg	µgSn/kg	µgSn/kg	%	%	
National Assessment Guidelines for Dredging (2009) Appendix A Table 2: Sediment Quality Screening Levels			2	20	1.5	80	65	50	21	1	200	0.15	NS	NS	9	NS	NS
Practical Quantitation Limit			0.5	1	0.1	1	1	1	1	0.1	1	0.01	-	-	1	0.1	0.1
Limit of Reporting			0.5	1	0.1	1	1	1	1	0.1	1	0.01	1	1	0.5	0.02	1
5643-191127-S1	River	27/11/2019	<0.50	<1.00	<0.1	3.2	<1.0	2.2	<0.1	3.9	<0.01	----	----	----	----	16.6	
5643-191127-S2	River	27/11/2019	<0.50	5.71	<0.1	18.6	18	8.5	12.1	<0.1	32	0.04	----	----	----	45.3	
5643-191127-S3	River	27/11/2019	<0.50	1.19	<0.1	3.2	1.3	1.7	2.3	<0.1	5.3	<0.01	----	----	----	19.5	
5643-191127-S4	River	27/11/2019	<0.50	4.02	<0.1	6.9	3.9	2.8	4.7	<0.1	14.3	<0.01	----	----	----	32.7	
5643-191127-S5	River	27/11/2019	<0.50	1.61	<0.1	6.7	1.9	1.9	3.9	<0.1	8.4	<0.01	----	----	----	23.4	
5643-191127-S6	River	27/11/2019	<0.50	1.17	<0.1	4	1.4	1.3	2.2	<0.1	5.8	<0.01	----	----	----	21.2	
5643-191127-S7	River	27/11/2019	<0.50	1.44	<0.1	4.1	3	1.5	3.2	<0.1	7.6	<0.01	----	----	----	24.7	
5643-191127-S8	Port	27/11/2019	<0.50	5.92	<0.1	17.4	15.2	7.9	11.4	<0.1	32.5	0.02	<1	<1	<0.5	0.49	49.2
5643-191126-S9	Port	26/11/2019	<0.50	6	<0.1	15	11.2	6.4	9	<0.1	27.4	<0.01	<1	<1	<0.5	0.24	38.3
5643-191126-S10	Port	26/11/2019	<0.50	10.3	<0.1	27.8	21.3	11.2	17.4	<0.1	42.5	0.04	<1	1	<0.5	1.06	50.5
5643-191126-S11	Port	26/11/2019	<0.50	7.72	<0.1	19.9	16.5	8.8	12.6	<0.1	34.6	0.03	<1	<1	<0.5	0.76	51.5
5643-191126-S12	Port	26/11/2019	<0.50	1.54	<0.1	6.6	2.3	1.8	4.2	<0.1	8.6	<0.01	<1	<1	<0.5	0.15	26.7
5643-191126-S13	Port	26/11/2019	<0.50	3.54	<0.1	8	3.9	3	5.1	<0.1	12.1	<0.01	<1	<1	<0.5	0.05	37.2
5643-191128-S14	Entrance	28/11/2019	<0.50	2.12	<0.1	5.9	1.8	1.6	3.6	<0.1	7.9	<0.01	----	----	----	0.27	30.2
5643-191128-S15	Entrance	28/11/2019	<0.50	5.48	<0.1	13.3	8.5	5.2	8.4	<0.1	19.2	<0.01	----	----	----	0.18	35.8
5643-191128-S16	Entrance	28/11/2019	<0.50	14.9	<0.1	4.6	<1.0	1.6	1.9	<0.1	3.6	<0.01	----	----	----	0.06	20.7

River	Minimum	0	0	0	3.2	0	0	2.2	0	3.9	0	0	0	0	0	16.6
	Maximum	0	5.71	0	18.6	18	8.5	12.1	0	32	0.04	0	0	0	0	45.3
	UCL	NR	5.09	NR	14.21	15.17	6.43	9.17	NR	25.75	0.03	-	-	-	-	33.42
Port	Minimum	0	1.54	0	6.6	2.3	1.8	4.2	0	8.6	0	0	0	0	0.05	26.7
	Maximum	0	10.3	0	27.8	21.3	11.2	17.4	0	42.5	0.04	0	1	0	1.06	51.5
	UCL	NR	8.37	NR	22.26	17.86	9.45	14.02	NR	37.23	0.03	NR	NR	NR	0.78	50.33
Entrance	Minimum	0	2.12	0	4.6	0	1.6	1.9	0	3.6	0	0	0	0	0.06	20.7
	Maximum	0	14.9	0	13.3	8.5	5.2	8.4	0	19.2	0	0	0	0	0.27	35.8
	UCL	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	-	-	-	NR	NR

Table 2 - Summary of SPOCAS Analytical Results

Sample ID	Sample Location	Sample Date	Acid Sulphate Soils																		
			pH KCl	pH OX	TAA	Sulfidic - TAA	POS	acidity POS	Excess ANC	acidity - ANC	sulfidic - ANC	Net Acidity (sulfur units)	Net Acidity (acidity units)	Liming Rate	Net Acidity excluding ANC (sulfur units)	Net Acidity excluding ANC (acidity units)	Liming Rate excluding ANC	pH (F)	pH (Fox)	Reaction Rate	
Unit			pH Unit	pH Unit	mole H+ / t	% pyrite S	% S	mole H+ / t	% CaCO3	mole H+ / t	% pyrite S	% S	mole H+ / t	kg CaCO3/t	% S	mole H+ / t	kg CaCO3/t	pH Unit	pH Unit		
Queensland Acid Sulfate Soil Technical Manual (2014) Soil Management Guidelines v4.0			-	-	18	0.03	0.03	18	-	-	-	-	-	-	-	-	-	-	<4	<3	>2
Limit of Reporting			0.1	0.1	2	0.02	0.02	10	0.02	10	0.02	0.02	10	1	0.02	10	1	0.1	0.1	1	
5643-191127-S8	Port	27/11/2019	8.5	6.7	<2	<0.02	0.173	108	0.683	136	0.218	<0.02	<10	<1	0.17	108	8	8.3	4.5	4	
5643-191126-S9	Port	26/11/2019	9	8.2	<2	<0.02	0.079	50	1.22	244	0.39	<0.02	<10	<1	0.08	50	4	8.5	7.2	4	
5643-191126-S10	Port	26/11/2019	8.4	7.9	<2	<0.02	0.393	245	1.9	380	0.609	<0.02	<10	<1	0.39	245	18	8.5	7.3	4	
5643-191126-S11	Port	26/11/2019	8.4	7.6	<2	<0.02	0.227	142	1.49	298	0.477	<0.02	<10	<1	0.23	142	11	8.5	7	4	
5643-191126-S12	Port	26/11/2019	8.9	7.4	<2	<0.02	0.082	51	0.765	153	0.245	<0.02	<10	<1	0.08	51	4	8.5	3.4	3	
5643-191126-S13	Port	26/11/2019	9.4	8.1	<2	<0.02	<0.02	<10	1.8	360	0.577	<0.02	<10	<1	<0.02	<10	<1	9	6.7	2	
5643-191128-S14	Entrance	28/11/2019	9	8.4	<2	<0.02	0.101	63	3.31	661	1.06	<0.02	<10	<1	0.1	63	5	8.8	6.6	2	
5643-191128-S15	Entrance	28/11/2019	9.1	8.4	<2	<0.02	0.085	53	1.97	394	0.63	<0.02	<10	<1	0.08	53	4	8.6	7	4	
5643-191128-S16	Entrance	28/11/2019	9.7	8.5	<2	<0.02	<0.02	<10	9.89	1980	3.16	<0.02	<10	<1	<0.02	<10	<1	8.9	6.8	2	

Port	MINIMUM	8.4	6.7	0	0	0	0	0.683	136	0.218	0	0	0	0	0	0	0	8.3	3.4	2
	MAXIMUM	9.4	8.2	0	0	0.393	245	1.9	380	0.609	0	0	0	0.39	245	18	9	7.3	4	
	MEAN	8.77	7.65	0.00	0.00	0.19	119.20	1.31	261.83	0.42	0.00	0.00	0.00	0.19	119.20	9.00	8.55	6.02	3.50	

Entrance	MINIMUM	9	8.4	0	0	0	0	1.97	394	0.63	0	0	0	0	0	0	0	8.6	6.6	2
	MAXIMUM	9.7	8.5	0	0	0.101	63	9.89	1980	3.16	0	0	0	0.1	63	5	8.9	7	4	
	MEAN	9.27	8.43	0.00	0.00	0.09	58.00	5.06	1011.67	1.62	0.00	0.00	0.00	0.09	58.00	4.50	8.77	6.80	2.67	

Field Duplicates																
Sample Id	Sample Type	Heavy Metals										TOC	MC	Organotin Compounds		
		Antimony	Arsenic, As	Cadmium, Cd	Chromium, Cr	Copper, Cu	Lead, Pb	Nickel, Ni	Silver	Zinc, Zn	Mercury	Total Organic Carbon	Moisture Content	Monobutyltin	Diobutyltin	Tributyltin
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	µgSn/kg	µgSn/kg	µgSn/kg
Triplicate Core																
5643-191127-S8	Primary Sample	<0.5	5.92	<0.1	17.4	15.2	7.9	11.4	<0.1	32.5	0.02	0.49	49.2	<1	<1	<0.5
5643-191127-QA1	Duplicate Sample	<0.5	5.5	<0.1	16.1	15	7.4	11.1	<0.1	31.2	0.03	0.88	47.5	<1	<1	<0.5
5643-191127-QB1	Inter-laboratory Duplicate	<0.5	6.8	<0.1	29	19	9.4	17	<0.1	46	0.04	1	46	<0.62	<0.46	<0.37
RPD% (Primary / Duplicate)		0%	7%	0%	8%	1%	7%	3%	0%	4%	40%	57%	4%	0%	0%	0%
RPD% (Primary / Inter-laboratory Duplicate)		0%	14%	0%	50%	22%	17%	39%	0%	34%	67%	68%	7%	0%	0%	0%
RPD% (Duplicate / Inter-laboratory Duplicate)		0%	21%	0%	57%	24%	24%	42%	0%	38%	29%	13%	3%	0%	0%	0%
Duplicate Split																
5643-191126-S10	Primary Sample	<0.5	10.3	<0.1	27.8	21.3	11.2	17.4	<0.1	42.5	0.04	1.06	50.5	<1	1	<0.5
5643-191126-QA2	Duplicate Sample	<0.5	10.5	<0.1	27.2	21.2	11.3	17.4	<0.1	41.8	0.05	0.68	53.2	<1	<1	<0.5
5643-191126-QB2	Inter-laboratory Duplicate	<0.5	12	<0.1	50	28	14	29	<0.1	64	0.04	1.5	52	<0.73	<0.55	1.1
RPD% (Primary / Duplicate)		0%	2%	0%	2%	0%	1%	0%	0%	2%	22%	44%	5%	0%	0%	0%
RPD% (Primary / Inter-laboratory Duplicate)		0%	15%	0%	57%	27%	22%	50%	0%	40%	0%	34%	3%	0%	0%	0%
RPD% (Duplicate / Inter-laboratory Duplicate)		0%	13%	0%	59%	28%	21%	50%	0%	42%	22%	75%	2%	0%	0%	0%
Triplicate Core																
5643-191128-S14	Primary Sample	<0.5	2.12	<0.1	5.9	1.8	1.6	3.6	<0.1	7.9	<0.01	0.27	30.2	-	-	-
5643-191128-QA3	Duplicate Sample	<0.5	1.9	<0.1	5	1.8	1.6	3	<0.1	6.4	<0.01	0.07	28.8	-	-	-
5643-191128-QB3	Inter-laboratory Duplicate	<0.5	<2	<0.2	6.6	<2	<2	3.3	<0.2	8	<0.05	<0.1	17	-	-	-
RPD% (Primary / Duplicate)		0%	11%	0%	17%	0%	0%	18%	0%	21%	0%	118%	5%	NA	NA	NA
RPD% (Primary / Inter-laboratory Duplicate)		0%	0%	0%	11%	0%	0%	9%	0%	1%	0%	0%	56%	NA	NA	NA
RPD% (Duplicate / Inter-laboratory Duplicate)		0%	0%	0%	28%	0%	0%	10%	0%	22%	0%	0%	52%	NA	NA	NA