Feasibility Study of Improved Access

Emigrant Creek

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Prepared for: Ballina Shire Council

UPR	Description	Date Issued	Issued By
2703-1006	1st issue – draft for review	18/04/2018	Duncan Thomson

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1. Introduction

1.1 Background

Emigrant Creek is used by a variety of vessels, including those accessing the marine industrial precinct (e.g. trawlers, commercial vessels, yachts, recreational boats), boats mooring in Emigrant Creek, and recreational boats utilising the creek itself. The marine industrial precinct is located at Smith Drive on the northern bank of Emigrant Creek, approximately 3 km upstream of the confluence with the Richmond River.

Boat users and business owners in the marine industrial precinct advised Ballina Shire Council (Council) that siltation in the lower reaches of Emigrant Creek is restricting access for vessels. Council applied for funding from the Transport for NSW Boating Now Program to undertake a feasibility study of improving access along Emigrant Creek. Funding was subsequently allocated to enable this study to be completed.

1.2 Scope

The scope of the feasibility study was to undertake:

- Stakeholder consultation regarding boat access issues.
- Bathymetric survey of potential dredge areas.
- Collection and analysis of bed sediment samples.
- Development of potential dredge scope.

The purpose of this report is to present the findings of the study.

2. Stakeholder Consultation

2.1 Methodology

Consultation with key stakeholders was undertaken in September 2017. The stakeholders included:

- Business owners and landowners within the Smith Drive marine industrial precinct, including Ballina Slipway and Marine Services, owners of industrial sheds and owners of other buildings and moorings.
- Ballina Fishermen's Co-operative.
- Ozfish Unlimited Richmond River Chapter.
- Australian Seabird Rescue.
- NSW Roads and Maritime Services.
- NSW Department of Primary Industries: Fisheries.

Face-to-face meetings were held with most stakeholders, although some were contacted by email and telephone.

To guide the consultation and stimulate discussion, the following questions were put to each of the stakeholders:

- Do you have any comments on navigation of vessels up Emigrant Creek?
- What size vessels use the creek and how often?
- What are the length and draft of the vessels?
- How many vessel movements per year?
- What are the possible economic impacts of better access to your business/ organisation?
- Are there any other improvements which could improve the use of Emigrant Creek?
- Are there any specific environmental requirements that you would like addressed should dredging of the creek proceed?

Stakeholders were also asked to identify areas of shallow water on an aerial photo of Emigrant Creek.

2.2 Feedback

The key points coming out of the stakeholder consultation are summarised below. The feedback has been categorised into the following groups:

- Access and navigation issues.
- Characteristics of vessels.
- Potential economic impacts of improved access.
- Environmental issues.
- Other.

2.2.1 Access and navigation issues

- There are shallow areas in the lower reaches of Emigrant Creek, particularly near the mouth of the creek.
- There is also a shallow area approximately 1 km upstream from the mouth where the side channel originates.
- Further upstream as the channel gets narrower it also gets deeper.
- The channel is typically deeper alongside the rock wall.
- The navigation buoys, markers and beacons are generally adequate and assist with navigation.
- Vessels need to follow the navigation buoys and stick close to the rock wall.
- Larger boats (e.g. trawlers) and those with large drafts (e.g. single hull sailing boats) are at risk of running aground in shallow areas. These boats need to navigate the lower section of Emigrant Creek at high tide.
- Some boats can only safely navigate the creek during the highest spring tides. This sometimes requires boats to access the creek during the night.
- Most stakeholders had either run aground in vessels themselves or were aware of others who had.
- Further upstream (i.e. >1 km from mouth), the bed sediment is relatively silty and boats can push through shallow areas.
- Access is generally ok for most recreational fishers.
- Most stakeholders believed that the creek had become shallower over the past 10 years based on their observations and experience.
- At the moment, people manage and plan around the conditions, constraints and restrictions.

2.2.2 Characteristics of vessels

- The creek is used by a range of different vessels, including a variety of boats accessing the marine industrial precinct (e.g. trawlers, commercial vessels, yachts, recreational boats), boats mooring in Emigrant Creek, and recreational boats utilising the creek itself.
- Approximately 100 boats per year use the Ballina Slipway and Marine Services. Commercial fishing vessels come from Ballina, Tweed Heads, Brunswick Heads, Evans Head, Clarence and Coffs Harbour to use the slipway. Recreational boats will come from even further afield. Some catamarans from Sydney come to the slipway because it is cheaper than the alternative of having the boat craned out of the water for maintenance in Sydney. Generally, vessels moor at the wharf and then go up to the slipway.
- Up to 40 boats moor in Emigrant Creek, some within the channel and others on jetties or pontoons.
- Many recreational boats use Emigrant Creek and there has been a recent upgrade to facilities at the boat ramp located immediately west of the Ballina Waterfront Village on River Street.
- The largest boats that currently navigate Emigrant Creek are trawlers that access the Ballina Slipway and Marine Services for maintenance. Trawler maintenance is typically undertaken 1 to 3 times per year. Most of the trawlers have a draft of 1.8 to 2.0 m, while the largest trawlers have a draft of up to 3 m.
- Vessels with a draft of greater than 2 m have been built within the Smith Drive marine industrial precinct and launched into Emigrant Creek.

2.2.3 Potential economic impacts of improved access

- There is high demand for services at the Ballina Slipway and Marine Services, with bookings taken 12 months in advance. Improved access would likely lead to higher demand. Also, the slipway would be able to cater for larger boats. Some jobs have been turned away due to the risk of larger boats not being able to access the slipway via Emigrant Creek.
- Boat owners need to meet their booking time at the slipway, otherwise they miss an opportunity. The access issues need to be considered when making a booking and mean that there is a risk of boat owners missing a booked time.
- When the prawns are running, commercial prawn fishers would prefer not to have their trawler at the slipway for maintenance. The access issues mean that there is limited flexibility with the timing of maintenance (i.e. they need to use the highest spring tides to get their trawlers up the creek and into the slipway, regardless of whether they would prefer to delay maintenance).
- Improved access would provide an opportunity for larger boats to be built in the precinct. The existing 'on land' facilities can cater for larger boats, but the current constraint is the restricted access in Emigrant Creek to enable such boats to be launched. For example, there is a large boat building shed that could accommodate a 75 to 85-foot vessel.
- The access issues are a deterrent to owners mooring their boats in Emigrant Creek. Despite this, demand for moorings is high and there is a waiting list. Improved access would likely lead to higher demand.
- Improved access could make it more viable to establish retail marine activities in the precinct.
- Improved access could give existing and potential future marine business owners the confidence to invest in the precinct.
- Dredging the creek may lead to improved flushing of the creek and improved ecosystem health, which would benefit commercial and recreational fishing.

2.2.4 Environmental issues

- It would be preferable to avoid dredging during the mullet run (late April to end of July), prawn run (August and September) or the mud crab season (September to Christmas).
- There is no knowledge of seagrass within the potential dredge area.
- There is a seagrass bed on the eastern side of the Richmond River, opposite the Emigrant Creek mouth. The potential impact of dredging on this seagrass bed would need to be considered. This bed would potentially benefit from better flushing of Emigrant Creek.
- There is no significant bird habitat in the potential dredge area.
- A benefit of dredging the shallow areas to deepen the navigation channel is that this would prevent silty material being regularly stirred up by boats pushing through this material as currently happens.

2.2.5 Other

- The Coffs Harbour slipway has closed.
- Information suggests that Emigrant Creek was last dredged in 1974 as part of a continuous dredging program that moved back and forth along the area from Emigrant Creek to the mouth of the Richmond River. North Creek was dredged at the same time by a different company with a tractor and an excavator.
- An unknown is how quickly the creek would silt up again after dredging.
- A dredge proposal should aim for a balance between the scope/ depth/ extent of the initial dredge vs. the required frequency of maintenance/ ongoing dredging. Sometimes it is better to increase the scope of the initial dredge to delay the requirement for follow up maintenance dredging.

- The dredged material could potentially be utilised as fill for nearby land development sites.
- The dredged material is unlikely to be suitable for beach nourishment.
- The Trawler Harbour master plan specifically excludes marine industrial facilities, because they are incompatible with residential land use.
- The challenge with navigating the Ballina bar is the key issue restricting the maritime and boating industry in Ballina. This should be the priority.
- The boat building infrastructure and facilities at the Smith Drive marine industrial precinct are currently underutilised.

3. Bathymetric Survey

3.1 2017 Bathymetric Survey

A bathymetric survey was undertaken by GPS & Hydrographic Services in October 2017. The survey plan is provided in **Appendix A**. Note that north is towards the left of the page. The datum for the survey is Lowest Astronomical Tide (LAT). Levels noted on the plan are presented as 'depth below LAT'. So, a level of 1_5 is 1.5 m below LAT, while a level of -0_3 is -0.3 m below LAT (or 0.3 m above LAT).

As noted on the plan, 0 mLAT is 0.83 m below Australian Height Datum (AHD) and 2.0 m below the Highest Astronomical Tide (HAT) level. Mean Sea Level (MSL) is approximately 0.03 mAHD.

The colour shading on the plan ranges from dark blue (deepest) through green (mid depth) to yellow and orange (shallowest). The plan indicates that there are three distinct zones of shallow depth (light green) along the navigation channel:

- Zone 1: Approximately 50 m long section at the creek mouth.
- Zone 2: Approximately 500 m long section near the entrance to the southern embayment.
- Zone 3: Approximately 250 m long section near the upstream entrance to the side channel.

3.2 2005 Bathymetric Survey

A bathymetric survey was undertaken by Qasco Surveys in April 2005 to provide input to the Ballina Flood Study. A plan showing the survey transects is provided in **Appendix B**. The datum for the survey is Australian Height Datum (AHD). To compare with the levels in the 2017 bathymetric survey in **Appendix A**, the levels from the 2005 survey need to be converted as follows:

- 2005 level (mAHD) + 0.83 m x -1

3.3 Comparison of Surveys

The coverage of the 2005 bathymetric survey is not as detailed as the 2017 bathymetric survey. Therefore, it is only possible to undertake a comparison of the levels at locations where the survey points overlap. Within the shallow zones noted above, the limiting bed levels appear to be 0.35 m to 0.65 m higher in the 2017 survey compared to the 2005 survey (i.e. these pinch points appear to have become shallower).

4. Bed Sediment Analysis

4.1 Methodology

The potential quantity of material to be dredged from Emigrant Creek was initially estimated as being up to 40,000 m³. The National Assessment Guidelines for Dredging (DEWHA, 2009) recommend that a sample effort of 11 samples be undertaken for dredging volumes between 37,000 m³ and 43,000 m³. Based on this, 11 bed sediment sampling locations were selected, as shown in **Illustration 5.1**.

4.2 Sampling

Bed sediment samples were collected using lengths of 50 mm (internal diameter) PVC tube deployed from a 10 m 'Shark Cat' vessel to obtain 1 m long cores. Cores were then separated into 0.5 m sample intervals. Sampling intervals were limited to 0.5 m due to the tube diameter and the sample volume required for analysis.

Sediment cores were transferred from the PVC corer to individual core trays so that they could be photographed, logged and sampled for laboratory analysis.

Samples were collected using a clean, gloved hand to transfer sediment into a laboratory prepared jar. Samples were stored in an ice cooled esky during transport to the laboratory.

At each sample location, the GPS coordinates and water depth were noted as presented in **Table 4.1**.

Table 4.1 GPS coordinates and water depth at sample locations

Sample ID	*Latitude*	*Longitude*	*Depth from water surface to bed (mm)*
S1	-28.877641	153.522227	1940
S2	-28.877998	153.523804	3510
S3	-28.877275	153.520843	2680
S4	-28.876542	153.519577	2950
S5	-28.875706	153.518622	3740
S6 (S61)	-28.874259	153.518075	4020
S7	-28.872418	153.517807	4400
S8	-28.870205	153.518145	2640
S9	-28.869439	153.519636	2050
S10	-28.869176	153.521403	3800
S11 (S12)	-28.868123	153.522975	3410

4.3 Analysis

The bed sediment samples were analysed at the Southern Cross University Environmental Analysis Laboratory (EAL) for the parameters listed in **Table 4.2**.

Table 4.2 Sediment analysis parameters

EAL suite	*Analytes*
Contaminants	Includes Basic Texture; Copper, Lead, Cadmium, Zinc, Arsenic, Selenium, Iron, Manganese, Silver, Chromium, Nickel, Aluminium, Mercury, Boron, Cobalt, Beryllium; Pesticides (Organo-chlorines (OC), Organo-phosphates (OP), Polychlorinated Biphenyls (PCB)), Total Petroleum Hydrocarbons (TPH), BTEX, Polycyclic Aromatic Hydrocarbons (PAH), Cyanide and Organotins (monobutyltin, dibutyltin and tributyltin).
Acid Sulfate Analysis	SPOCAS Plus including Titratable Actual Acidity (TAA), Titratable Potential Acidity (TPA), Reduced Inorganic Sulfur (SCR). Retained Acidity (SNAS) and Acid Neutralising Capacity (ANC).
Physical Testing	Total Organic Carbon (TOC) and particle size analysis.

4.4 Results

4.4.1 Quality assurance and data usability assessment

The reliability (reproducibility) of the results was assessed by determining the relative percentage difference (RPD) between duplicate samples. RPDs were only calculated where results of both the sample and the duplicate were above laboratory reporting limits. The acceptable variance limit for soils is 50%.

The calculated RPDs were less than the acceptable threshold of 50%, with the exception of the reduced inorganic sulfur results for samples 12 and 13. RPD variation is considered to be attributed to the increased shell content within the samples. Shell content can have a varying effect on sulfur concentrations. Based on the calculated RPDs and the internal QA data reported by the laboratory, the reproducibility, accuracy and representativeness of the analytical results is considered suitable to meet the objectives of the assessment. Results provide sufficient confidence in the primary dataset for interpretative purposes.

4.4.2 Particle Size Distribution

Particle size analysis results are summarised in **Table 4.3** and **Table 4.4**, with the full results presented in **Appendix C**. The results indicate that particle size distribution varies across the sample locations.

Particle size results from the southern portion of the creek (samples S1 – S4) indicate the bed sediments are predominately made up of fine to medium sands, with traces of silt and clay. Layers of shell material in varying quantities were noted during site investigations, as detailed in **Table 4.3**. At the location of S2, the clay content was higher than in samples collected in the surrounding area. This is potentially due to a depression in the bed where the core was obtained.

Particle size results and bore logs (**Table 4.4**) from the northern portion of the creek indicate the bed sediments generally comprise an arrangement of silts and clays. The majority of areas were found to contain fine to medium grained sand in the surface of the core (0 – 0.3 m), with stiff silty clays being the primary constituent of the substrate. Shell content varied throughout the substrate, with deposits of high shell content observed between clay layers.

Overall, the clay content was observed to increase with depth across all sample locations and sand content was more prevalent in the southern portion of the creek.

Table 4.3 Typical bore log for samples collected in the southern portion of creek

Depth (m below bed)	*Description*
0 – 0.6	Fine to medium grained sand, brown/grey in colour. Shells, gravels < 5mm and blood worms present. Organic odour.
0.6 – 1.0	Silty clay with sand, medium plastic fines, dark grey in colour. Clay content increasing and sand decreasing with depth.

Table 4.4 Typical bore log for samples collected in the northern portion of creek

Depth (m below bed)	*Description*
0 – 0.3	Silty clay with sand, high plastic fines, very stiff, fine to medium grained sand, brown/grey in colour. Shells, and blood worms present. Organic odour.
0.3 – 1.0	Silty clay, high plastic fines, very stiff dark grey in colour. Clay content increasing with depth. Shells present throughout substrate in varying quantities.

4.4.3 Acid Sulfate Soils

Acid sulfate soils (ASS) are sediments or soils that contain iron sulfides which, when oxidised, form sulfuric acid. Actual ASS (AASS) are soils or sediments that are highly acidic (generally pH<4) due to the oxidation of sulfides in the material. Potential ASS (PASS) are soils or sediments containing sulfidic material that has not been oxidised. If oxidised, this material will have a high acid generating potential.

A total of 24 soil samples collected at 11 sites across the potential dredge area were analysed using the detailed laboratory chromium suite analysis to evaluate the risk associated with ASS. The measure of actual acidity and reducible inorganic sulfur determines the presence of AASS and PASS respectively. The results are detailed in **Appendix D**.

The results obtained from the chromium reducible sulfur and acid neutralising capacity analyses can be summarised by the following:

- No presence of AASS in any of the samples as there is no existing actual titratable acidity;
- All samples, with the exception of 3 individual samples, had a chromium reducible inorganic sulfur content greater than 0.03%, indicative of the presence of PASS;
- Significant acid neutralising capacity in most samples, resulting in negative net acidity; and
- Positive net acidity in 11 samples.

The three individual samples that returned a reducible inorganic content less than 0.03% were S3 0-0.5, S3 0.5-1.0 and S4 0.5-1.0. These samples generally contained a low silt and clay content, while samples that generated a higher reducible inorganic content value occurred in layers of increased silt/ clay content (prevalent in northern portion of Emigrant Creek). Of the 11 samples that indicated positive net acidity, one sample (S1 0.5-1.0) had a low acid neutralising capability, while the remaining samples had significant acid neutralising capability, but this was outweighed by the relatively high potential sulfidic acidity.

The NSW ASSMAC Acid Sulfate Soils Assessment Guidelines (1998) advise that an ASS Management Plan must be prepared for works disturbing more than 1000 tonnes of soil if the oxidisable sulfur content of the material is greater than 0.03%. Given the high sulfur content in the samples collected from the potential dredge area, an ASS management plan would need to be prepared.

4.4.4 Contamination

The results for the contamination analyses are presented in **Appendix E**.

As recommended by DEWHA (2009), the 95% upper confidence limit of the mean was used to determine compliance with guideline levels for contaminants. The 95% upper confidence level (UCL) was only calculated where more than one sample exceeded the guideline trigger value for a contaminant. **Table 4.5** presents the 95% UCL values for nickel, which is the only relevant contaminant, with 10 of the results exceeding the guideline trigger value set by DEWHA (2009) and ANZECC/ ARMCANZ (2000). The 95% UCL value of 19.9 mg/kg is less than the guideline trigger value (21 mg/kg). Therefore, nickel is not considered to be a contaminant of concern.

The remaining metals listed by DEWHA (2009), including silver, lead, cadmium, chromium, copper, zinc and mercury occurred in concentrations below their screening levels. Sample 9 exceeded the guideline trigger value for arsenic. However, due to the remaining samples having concentrations below the trigger value, calculation of a 95% UCL value was not deemed necessary. Other metals analysed such as manganese, selenium, iron, aluminium, beryllium, boron and cobalt are not included in DEWHA (2009) so no screening levels have been set.

All pesticide compounds listed by DEWHA (2009) and ANZECC/ARMCANZ (2000), including cyanide, were below the practical quantitation limit (PQL). Organotins, such as monobutyltin, dibutyltin and tributyltin, were also all below the PQL. Hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPHs) were below the relevant PQL set by DEWHA (2009) and ANZECC/ ARMCANZ (2000).

The Total Organic Carbon (TOC) results varied between 0.22% and 3.46%, with sample 9 having the highest content and sample 6 having the lowest content.

Table 4.5 Nickel results

Concentration (mg/kg)																					*95% UCL*
S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**	**S14**	**S15**	**S16**	**S17**	**S18**	**S19**	**S20**	**S21**	**S22**	**S23**	
11	12	20	22	7	5	7	6	18	35	29	33	5	25	32	35	16	32	17	16	30	40	19.9 mg/kg

Note: Samples S13 and S24 were not included as they form part of the quality assurance/ quality control components.

4.4.5 Material Classification

The material from the potential dredge area would require classification prior to reuse or disposal. There is a range of pre-classified wastes under the Protection of the Environment Operations Act 1997 (POEO Act), including virgin excavated natural material (VENM) and excavated natural material (ENM) for non-contaminated, non-ASS material.

Due to the majority of the material within the potential dredge area having oxidisable sulfide levels greater than 0.03%, the material does not meet the requirements of VENM or ENM and would therefore be classified as PASS.

Under the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation), waste material can be beneficially reused if it does not cause harm to the environment or human health. A Resource Recovery Order and Exemption could be applied for through the EPA if a fit for purpose reuse opportunity could be identified for the dredge material.

If it is not possible to obtain a Resource Recovery Order and Exemption, then the material would be classified in accordance with the EPA's Waste Classification Guidelines (2014). The material meets the CT1 classification for disposal as general solid waste.

5. Potential Dredge Scope

5.1 Extent of Dredging

Based on the stakeholder feedback and the bathymetric survey, three potential dredge zones have been identified, as depicted by the red polygons in **Illustration 5.1**. These zones currently have bed levels as high as 0.9 m below the Lowest Astronomical Tide (LAT) level. Where the bed level is -0.9 mLAT, the depth of water is approximately:

- 0.9 m during the lowest astronomical tide;
- 1.8 m at mean sea level;
- 2.9 m during the highest astronomical tide.

This is consistent with the stakeholder feedback that vessels with a relatively large draft (> 2 m) need to navigate Emigrant Creek during high tides.

A potential approach to dredging would be to create a channel that provided:

- 2.0 to 2.5 m depth of water during the lowest astronomical tide; and
- 20 to 30 m navigable width.

Such a channel would enable access for the majority of vessels all of the time and access for the larger vessels with a 2 to 3 m draft (e.g. large trawlers) most of the time.

The estimated dredge volumes associated with a range of dredge scope options are presented in **Table 5.1**. The volumes have been estimated by manipulating the bathymetric survey in the Autodesk Civil3D software and adopting a 1(v):4(h) side slope on the dredged channel.

Table 5.1 Volumes for dredge scope options

Option	*Dredge Depth (mLAT)*	*Channel Base Width (m)*	*Estimated Volume (m^3)*
1	- 2.0	20	11,500
2	- 2.0	30	16,900
3	- 2.5	20	24,500
4	- 2.5	30	35,700

5.2 Reuse or Disposal of Dredge Material

5.2.1 Reuse

As discussed in **Section 4.4.5**, a Resource Recovery Order and Exemption could be applied for through the EPA if a fit for purpose reuse opportunity could be identified for the dredge material. A potential reuse opportunity is to utilise the material for filling nearby land development sites. There are recent examples of the EPA granting a Resource Recovery Order and Exemption for the reuse of creek bed material with similar constraints (i.e. PASS) to fill approved land development sites. The application for an order and exemption for this purpose typically needs to specify the land development site and provide evidence that the proposed filling has appropriate approval (e.g. council development consent). The suitability of the dredge material for specific fill purposes would need to be determined based on the properties of the material.

Land development sites in relatively close proximity to Emigrant Creek are indicated by the yellow triangles on **Illustration 5.1**. There are many other land development sites in Ballina that require fill. The economic viability of reuse would be lower for sites that are located further from the creek.

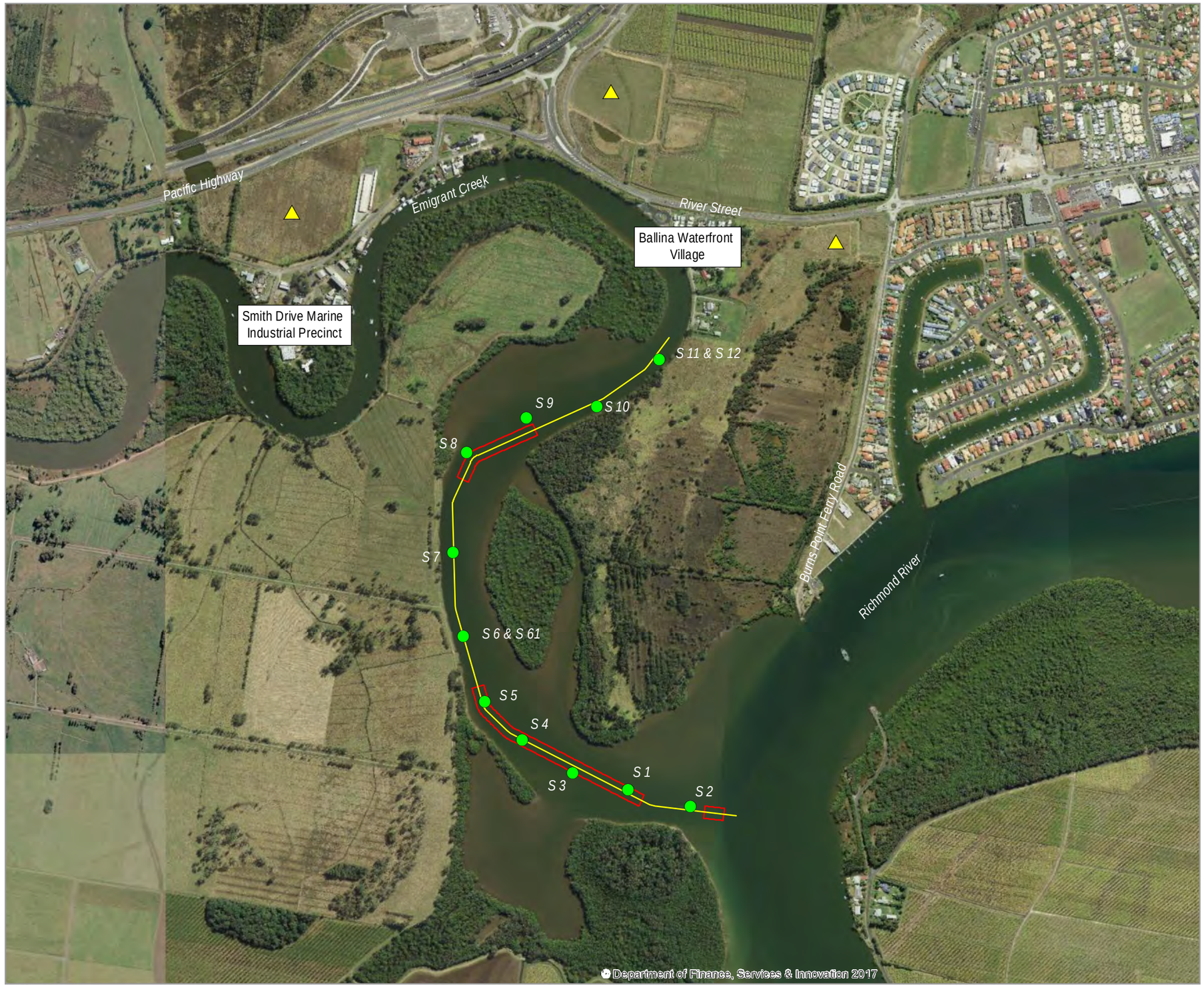
Prior to reuse, the dredge material would need to be dewatered and treated with lime to neutralise the acid sulfate. Dewatering can be undertaken by transferring the material into geofabric bags and allowing the water to drain out over a period of time. Alternatively, dewatering ponds can be utilised. Either option requires a significant area of land nearby the creek. Treatment with lime can be undertaken after dewatering or potentially in conjunction with dewatering by injecting a lime slurry as the dredge material is transferred into the geofabric bags.

5.2.2 Disposal

The dredge material could be disposed of at landfill. This would be a less sustainable option than reuse and is expected to be more costly. The material would require dewatering prior to disposal.

Information shown is for illustrative purposes only

Drawn by: AB Checked by: RE Reviewed by: DMT Date: 28/03/2018
Source of base data: DFS&I



LEGEND

- Approximate extent of proposed dredge area
- Approximate alignment of deepest section of channel
- Sediment sample location
- Potential reuse location for dredged material

0 200

North

GeoLINK environmental management and design

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Potential Dredge Areas and Bed Sediment Sample Locations

Illustration 5.1

References

NAGD Screening Levels- DEWHA (2009). National Assessment Guidelines for Dredging.

ANZECC/ARMCANZ ISQG- ANZECC/ARMCANZ (2000). Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The Guidelines.

Copyright and Usage

Appendix A

2017 Bathymetric Survey

Appendix B

2005 Bathymetric Survey

Information shown is for illustrative purposes only

Drawn by: AB Checked by: RE Reviewed by: DMT Date: 07/11/2017
Source of base data: LPI

LEGEND

Creek Bed Level (mAHD)

- -9.70 - -9.50
- -9.49 - -9.25
- -9.24 - -9.00
- -8.99 - -8.75
- -8.74 - -8.50
- -8.49 - -8.25
- -8.24 - -8.00
- -7.74 - -7.50
- -7.49 - -7.25
- -7.24 - -7.00
- -6.99 - -6.75
- -6.74 - -6.50
- -6.49 - -6.25
- -6.24 - -6.00
- -5.99 - -5.75
- -5.74 - -5.50
- -5.49 - -5.25
- -5.24 - -5.00
- -4.99 - -4.75
- -4.74 - -4.50
- -4.49 - -4.25
- -4.24 - -4.00
- -3.99 - -3.75
- -3.74 - -3.50
- -3.49 - -3.25
- -3.24 - -3.00
- -2.99 - -2.75
- -2.74 - -2.50
- -2.49 - -2.25
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- -1.74 - -1.50
- -1.49 - -1.25
- -1.24 - -1.00
- -0.99 - -0.75
- -0.74 - -0.50
- -0.49 - -0.25
- -0.24 - 0.00
- 0.01 - 0.25
- 0.26 - 0.50

North

0 150

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Bathymetric Survey Data Collected for Ballina Flood Study 2005

Appendix C

Bed Sediment Particle Size Analysis

GRAIN SIZE ANALYSIS (laser particle size techniques)

24 sediment samples supplied by Env Solutions Pty Ltd on the 21st December, 2017 - Lab Job No. G6135.
Analysis requested by Ollie Fick. **Your Project: Dredging**
(PO Box 248 BALLINA NSW 2478)

		USDA and ISSS Sand/Silt/Clay Classification					Wentworth (1922) Grain Size Classification					
SAMPLE ID	Lab Code	**SAND > 50 µm USDA** (< 2 mm fraction)	**SAND > 20 µm ISSS** (< 2 mm fraction)	**SILT 2–50 µm USDA** (< 2 mm fraction)	**SILT 2–20 µm ISSS** (< 2 mm fraction)	**CLAY < 2 µm** (< 2 mm fraction)	**Very Coarse Sand 1000–2000 µm** (< 2 mm fraction)	**Coarse Sand 500–1000 µm** (< 2 mm fraction)	**Medium Sand 250–500 µm** (< 2 mm fraction)	**Fine Sand 125–250 µm** (< 2 mm fraction)	**Very Fine Sand 63–125 µm** (< 2 mm fraction)	**Silt and Clay < 63 µm** (< 2 mm fraction)
S1 0.0-0.5	G6135/1	84.5	89.4	11.9	6.9	3.7	0.0	1.9	35.5	37.9	7.9	16.7
S1 0.5-1.0	G6135/2	74.6	82.4	19.6	11.8	5.8	0.0	0.9	30.8	35.5	6.2	26.6
S2 0.0-0.5	G6135/3	44.4	54.9	40.0	29.5	15.6	0.0	0.0	3.6	22.1	16.4	58.0
S2 0.5-1.0	G6135/4	76.9	81.3	16.4	12.0	6.7	0.0	0.0	10.6	45.3	20.4	23.7
S3 0.0-0.5	G6135/5	100.0	100.0	0.0	0.0	0.0	0.0	4.9	63.9	31.2	0.0	0.0
S3 0.5-1.0	G6135/6	92.7	94.7	5.1	3.1	2.2	0.0	2.8	59.5	30.3	0.0	7.4
S4 0.0-0.5	G6135/7	94.2	95.8	4.0	2.4	1.8	0.0	5.6	66.2	22.1	0.0	6.1
S4 0.5-1.0	G6135/8	94.0	95.5	4.4	2.9	1.6	0.0	4.2	68.6	21.0	0.0	6.2
S5 0.0-0.5	G6135/9	100.0	100.0	0.0	0.0	0.0	0.0	17.8	66.3	15.8	0.0	0.0
S5 0.5-1.0	G6135/10	10.5	22.3	71.3	59.4	18.2	0.0	0.8	3.7	1.7	2.4	91.4
S6 0.0-0.5	G6135/11	5.1	17.6	76.7	64.2	18.2	0.0	0.0	1.5	1.0	1.3	96.2
S6 0.5-1.0	G6135/12	10.3	26.6	71.1	54.7	18.7	0.0	0.5	4.2	1.7	1.7	91.9
S61 0.0-0.5	G6135/13	9.5	23.7	69.1	54.9	21.4	0.0	0.6	3.4	2.0	1.7	92.2
S7 0.0-0.5	G6135/14	86.9	89.3	8.7	6.3	4.4	0.0	8.5	67.7	10.0	0.1	13.7
S7 0.5-1.0	G6135/15	7.5	17.5	70.9	60.8	21.7	0.0	0.7	3.7	1.6	0.6	93.4
S8 0.0-0.5	G6135/16	46.6	57.5	41.6	30.7	11.8	0.0	4.9	20.0	13.9	5.8	55.4
S8 0.5-1.0	G6135/17	8.2	22.7	70.3	55.9	21.4	0.0	0.4	2.0	1.5	2.4	93.7
S9 0.0-0.5	G6135/18	81.7	86.6	13.0	8.1	5.2	0.0	4.5	37.3	30.9	7.6	19.8
S9 0.5-1.0	G6135/19	70.1	77.8	22.6	15.0	7.3	0.0	2.0	20.1	28.2	16.9	32.8
S10 0.0-0.5	G6135/20	58.3	67.4	31.3	22.2	10.4	0.0	7.5	31.8	13.8	3.3	43.7
S10 0.5-1.0	G6135/21	38.2	48.7	47.6	37.1	14.1	0.0	5.0	22.6	8.6	0.7	63.1
S11 0.0-0.5	G6135/22	19.4	31.2	61.7	49.9	18.9	0.0	1.5	7.9	4.8	3.5	82.3
S11 0.5-1.0	G6135/23	3.7	14.6	76.4	65.5	19.9	0.0	0.3	0.5	0.4	1.4	97.4
S12 0.5-1.0	G6135/24	4.4	20.8	74.2	57.7	21.4	0.0	0.0	0.0	0.1	2.2	97.7

Note:

1: Laser Particle Size using a Mastersizer Hydro 2000MU analyser.
Laser Method: Hydrogen peroxide digestion of organic matter prior to analysis.
Homogenisation using an IKA RW20 digital overhead stirrer in a bafffled beaker.
Sample aliquot pipetted into measurement beaker of calgon dispersant.
HydroMU 20.00 µm ultrasound applied for 2 min.

2: Average results reported of at least 3 measurements.

checked: .....
Graham Lancaster
Laboratory Manager

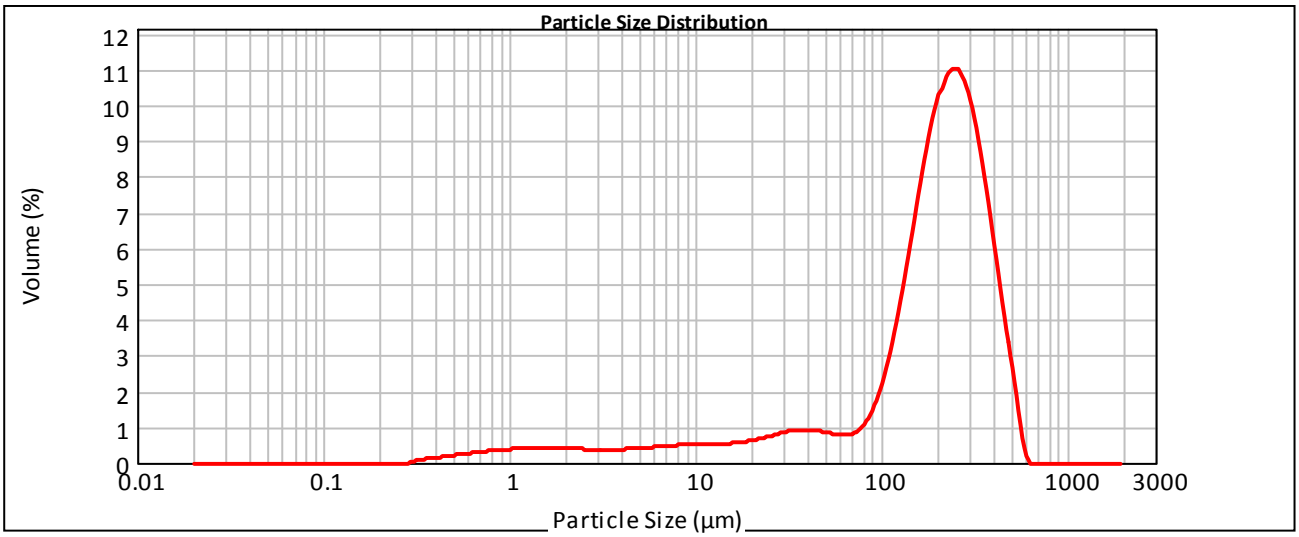
Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

EAL
Result Analysis Report

Sample Name:
G6135/1 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 14.84 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.017 %	**Result Emulation:** Off
Concentration: 0.0330 %Vol	**Span :** 1.770	**Uniformity:** 0.504	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 212.868 um	

d(0.1): 17.304 um **d(0.5):** 209.412 um **d(0.9):** 387.891 um



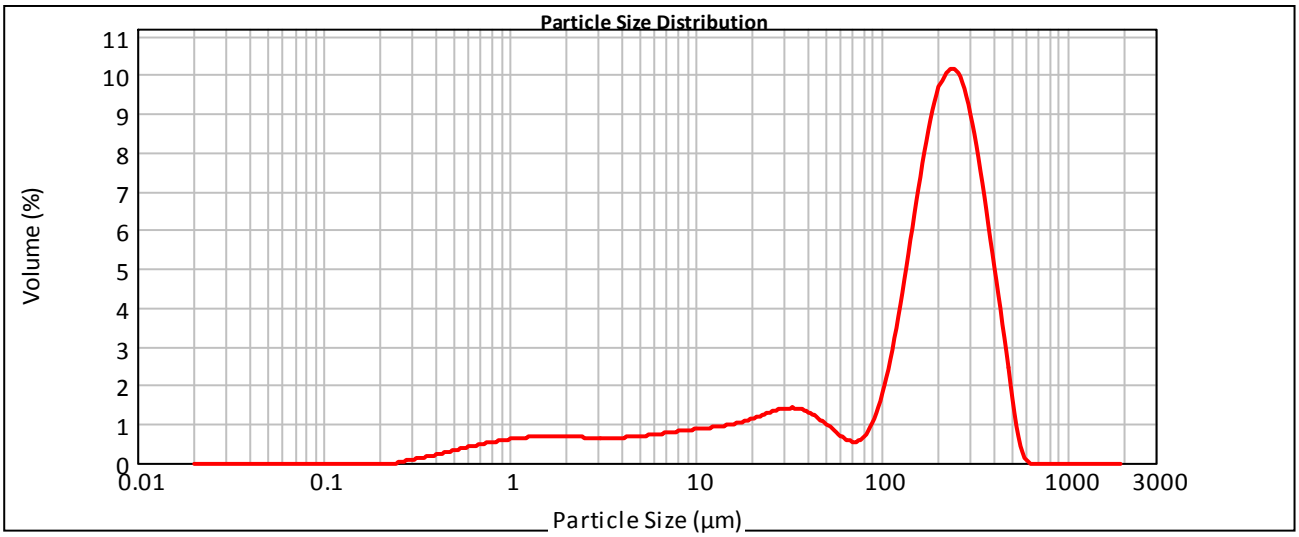
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.23	5.053	0.34	40.244	0.74	320.535	6.99
0.011	0.00	0.090	0.00	0.717	0.26	5.709	0.35	45.469	0.70	362.148	5.58
0.013	0.00	0.102	0.00	0.810	0.28	6.450	0.37	51.371	0.65	409.163	4.04
0.014	0.00	0.115	0.00	0.915	0.30	7.287	0.39	58.041	0.61	462.281	2.57
0.016	0.00	0.130	0.00	1.034	0.32	8.233	0.40	65.575	0.64	522.296	1.12
0.018	0.00	0.147	0.00	1.168	0.33	9.302	0.41	74.089	0.79	590.102	0.02
0.021	0.00	0.166	0.00	1.320	0.33	10.510	0.42	83.707	1.13	666.711	0.00
0.024	0.00	0.187	0.00	1.491	0.33	11.874	0.42	94.574	1.71	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.33	13.416	0.43	106.852	2.54	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.32	15.157	0.44	120.724	3.62	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.31	17.125	0.47	136.397	4.88	1086.372	0.00
0.038	0.00	0.305	0.07	2.429	0.30	19.348	0.51	154.104	6.19	1227.408	0.00
0.043	0.00	0.345	0.09	2.745	0.30	21.860	0.56	174.110	7.39	1386.753	0.00
0.049	0.00	0.389	0.12	3.101	0.30	24.698	0.61	196.714	8.30	1566.785	0.00
0.055	0.00	0.440	0.15	3.503	0.30	27.904	0.67	222.251	8.77	1770.189	0.00
0.062	0.00	0.497	0.18	3.958	0.31	31.527	0.72	251.105	8.70	2000.000	0.00
0.070	0.00	0.561	0.21	4.472	0.32	35.620	0.74	283.704	8.08		
0.080	0.00	0.634	0.21	5.053	0.32	40.244	0.74	320.535	8.08		

EAL
Result Analysis Report

Sample Name:
G6135/2 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 10.53 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.778 %	**Result Emulation:** Off
Concentration: 0.0146 %Vol	**Span :** 1.910	**Uniformity:** 0.585	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 185.767 um	

d(0.1): 5.261 um **d(0.5):** 188.058 um **d(0.9):** 364.448 um



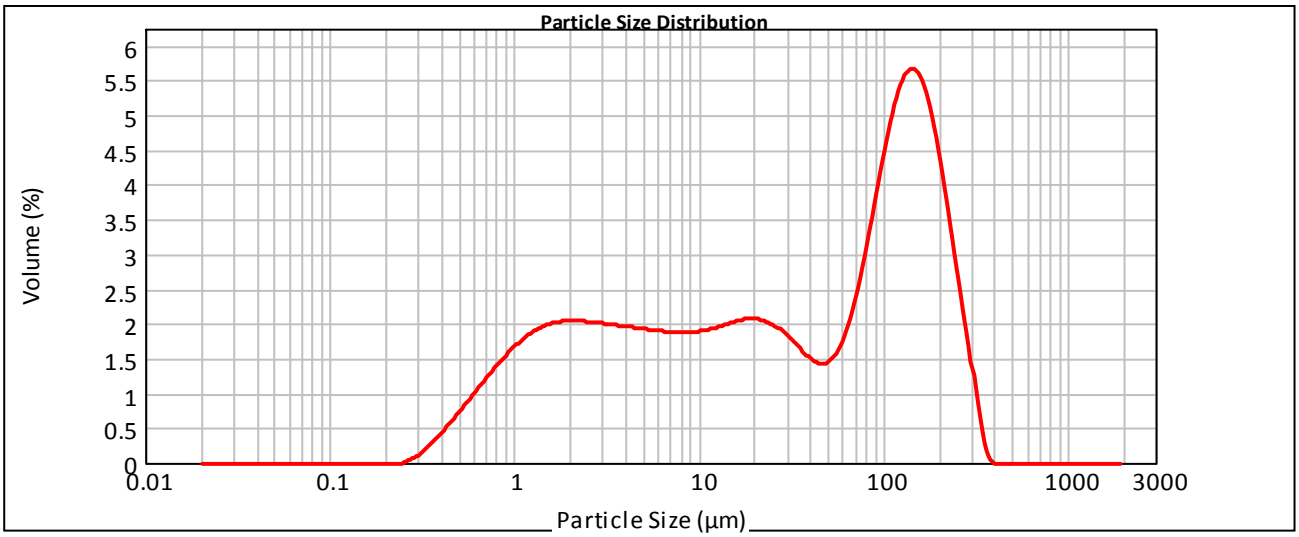
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.36	5.053	0.56	40.244	1.01	320.535	6.06
0.011	0.00	0.090	0.00	0.717	0.40	5.709	0.58	45.469	0.87	362.148	4.68
0.013	0.00	0.102	0.00	0.810	0.44	6.450	0.61	51.371	0.69	409.163	3.29
0.014	0.00	0.115	0.00	0.915	0.48	7.287	0.64	58.041	0.53	462.281	1.84
0.016	0.00	0.130	0.00	1.034	0.50	8.233	0.66	65.575	0.44	522.296	0.47
0.018	0.00	0.147	0.00	1.168	0.53	9.302	0.68	74.089	0.50	590.102	0.01
0.021	0.00	0.166	0.00	1.320	0.54	10.510	0.71	83.707	0.77	666.711	0.00
0.024	0.00	0.187	0.00	1.491	0.55	11.874	0.73	94.574	1.33	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.55	13.416	0.76	106.852	2.18	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.54	15.157	0.80	120.724	3.29	961.542	0.00
0.034	0.00	0.270	0.06	2.150	0.53	17.125	0.85	136.397	4.55	1086.372	0.00
0.038	0.00	0.305	0.09	2.429	0.52	19.348	0.91	154.104	5.85	1227.408	0.00
0.043	0.00	0.345	0.13	2.745	0.52	21.860	0.99	174.110	6.98	1386.753	0.00
0.049	0.00	0.389	0.18	3.101	0.51	24.698	1.06	196.714	7.78	1566.785	0.00
0.055	0.00	0.440	0.22	3.503	0.51	27.904	1.11	222.251	8.11	1770.189	0.00
0.062	0.00	0.497	0.27	3.958	0.52	31.527	1.13	251.105	7.90	2000.000	0.00
0.070	0.00	0.561	0.32	4.472	0.54	35.620	1.10	283.704	7.18		
0.080	0.00	0.634	0.32	5.053	0.54	40.244	1.10	320.535	7.18		

EAL
Result Analysis Report

Sample Name:
G6435/3 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.35 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.472 %	**Result Emulation:** Off
Concentration: 0.0064 %Vol	**Span :** 6.603	**Uniformity:** 2.2	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 71.516 um	

d(0.1): 1.306 um **d(0.5):** 29.145 um **d(0.9):** 193.753 um



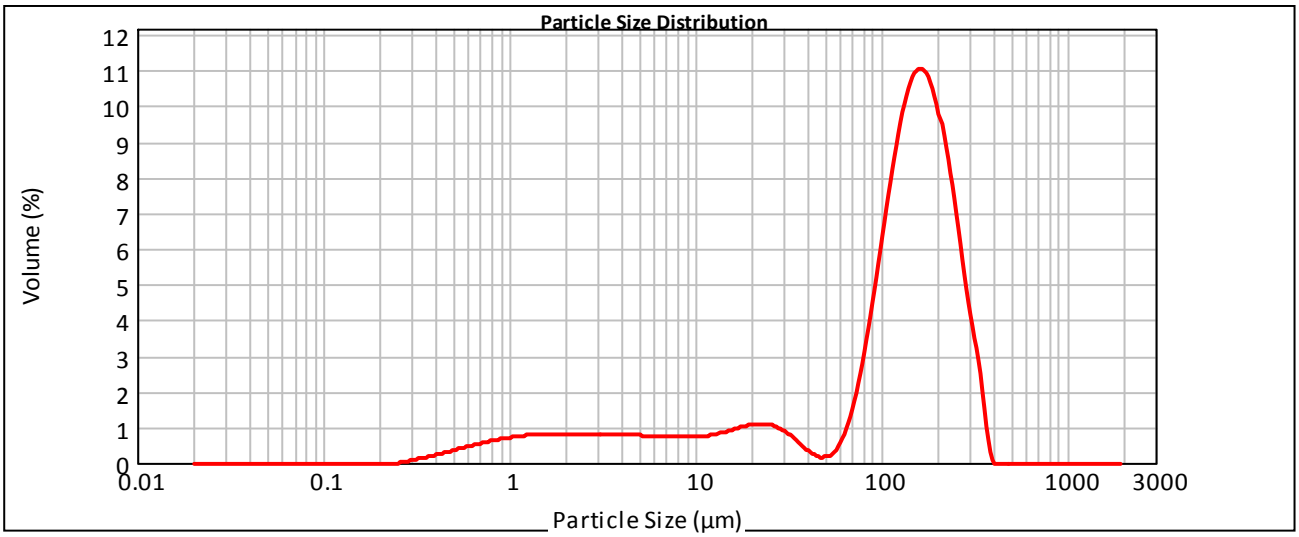
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.92	5.053	1.53	40.244	1.16	320.535	0.37
0.011	0.00	0.090	0.00	0.717	1.06	5.709	1.52	45.469	1.14	362.148	0.01
0.013	0.00	0.102	0.00	0.810	1.18	6.450	1.50	51.371	1.23	409.163	0.00
0.014	0.00	0.115	0.00	0.915	1.30	7.287	1.50	58.041	1.46	462.281	0.00
0.016	0.00	0.130	0.00	1.034	1.40	8.233	1.50	65.575	1.83	522.296	0.00
0.018	0.00	0.147	0.00	1.168	1.49	9.302	1.51	74.089	2.33	590.102	0.00
0.021	0.00	0.166	0.00	1.320	1.55	10.510	1.53	83.707	2.91	666.711	0.00
0.024	0.00	0.187	0.00	1.491	1.59	11.874	1.56	94.574	3.52	753.265	0.00
0.027	0.00	0.211	0.00	1.684	1.62	13.416	1.59	106.852	4.04	851.056	0.00
0.030	0.00	0.239	0.01	1.903	1.63	15.157	1.62	120.724	4.40	961.542	0.00
0.034	0.00	0.270	0.06	2.150	1.63	17.125	1.65	136.397	4.53	1086.372	0.00
0.038	0.00	0.305	0.15	2.429	1.62	19.348	1.65	154.104	4.39	1227.408	0.00
0.043	0.00	0.345	0.26	2.745	1.60	21.860	1.63	174.110	4.00	1386.753	0.00
0.049	0.00	0.389	0.37	3.101	1.59	24.698	1.57	196.714	3.39	1566.785	0.00
0.055	0.00	0.440	0.50	3.503	1.57	27.904	1.47	222.251	2.66	1770.189	0.00
0.062	0.00	0.497	0.64	3.958	1.56	31.527	1.36	251.105	1.92	2000.000	0.00
0.070	0.00	0.561	0.78	4.472	1.54	35.620	1.24	283.704	1.17		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6435/4 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.94 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.832 %	**Result Emulation:** Off
Concentration: 0.0149 %Vol	**Span :** 1.820	**Uniformity:** 0.533	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 134.922 um	

d(0.1): 3.752 um **d(0.5):** 137.185 um **d(0.9):** 253.417 um



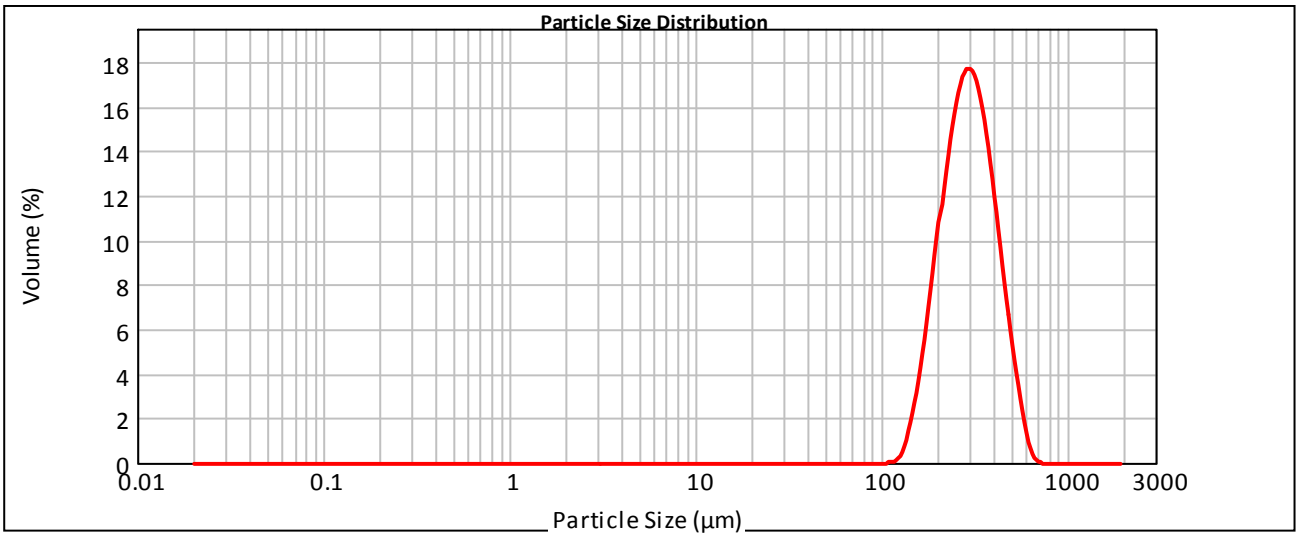
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.42	5.053	0.61	40.244	0.22	320.535	2.06
0.011	0.00	0.090	0.00	0.717	0.47	5.709	0.60	45.469	0.12	362.148	0.24
0.013	0.00	0.102	0.00	0.810	0.52	6.450	0.59	51.371	0.20	409.163	0.00
0.014	0.00	0.115	0.00	0.915	0.56	7.287	0.58	58.041	0.54	462.281	0.00
0.016	0.00	0.130	0.00	1.034	0.59	8.233	0.57	65.575	1.19	522.296	0.00
0.018	0.00	0.147	0.00	1.168	0.62	9.302	0.58	74.089	2.17	590.102	0.00
0.021	0.00	0.166	0.00	1.320	0.63	10.510	0.60	83.707	3.44	666.711	0.00
0.024	0.00	0.187	0.00	1.491	0.64	11.874	0.63	94.574	4.91	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.65	13.416	0.68	106.852	6.37	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.65	15.157	0.75	120.724	7.64	961.542	0.00
0.034	0.00	0.270	0.04	2.150	0.64	17.125	0.81	136.397	8.51	1086.372	0.00
0.038	0.00	0.305	0.09	2.429	0.64	19.348	0.86	154.104	8.83	1227.408	0.00
0.043	0.00	0.345	0.13	2.745	0.63	21.860	0.88	174.110	8.55	1386.753	0.00
0.049	0.00	0.389	0.19	3.101	0.63	24.698	0.84	196.714	7.68	1566.785	0.00
0.055	0.00	0.440	0.24	3.503	0.63	27.904	0.74	222.251	6.39	1770.189	0.00
0.062	0.00	0.497	0.30	3.958	0.62	31.527	0.58	251.105	4.83	2000.000	0.00
0.070	0.00	0.561	0.36	4.472	0.62	35.620	0.39	283.704	3.28		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/5 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 13.62 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.564 %	**Result Emulation:** Off
Concentration: 0.5831 %Vol	**Span :** 0.867	**Uniformity:** 0.268	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 310.511 um	

d(0.1): 193.555 um **d(0.5):** 295.406 um **d(0.9):** 449.781 um



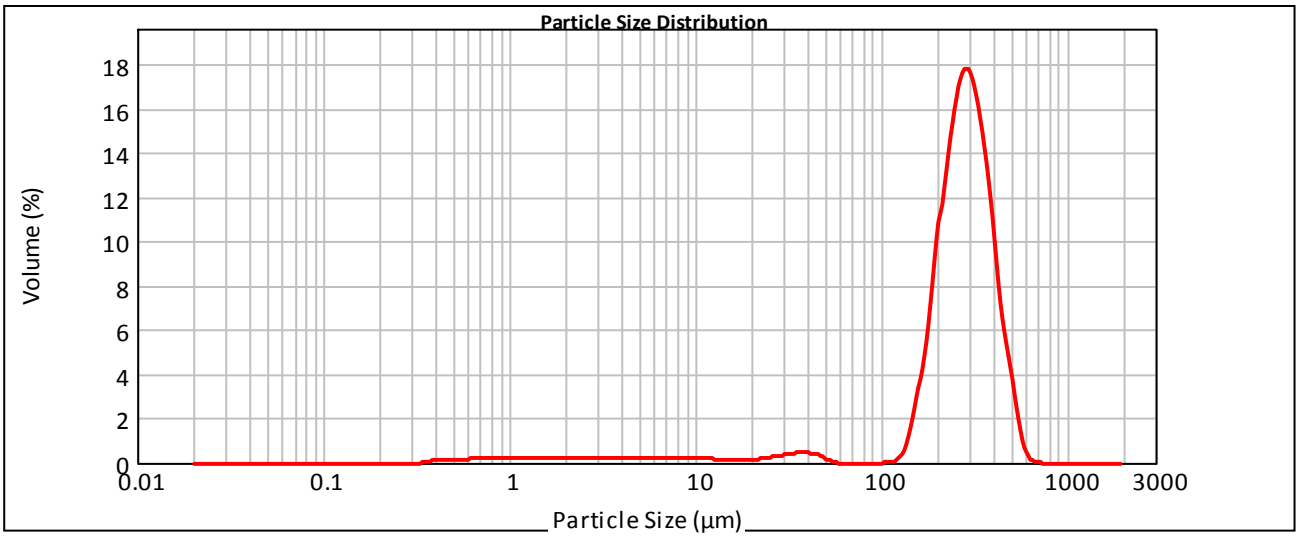
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.00	5.053	0.00	40.244	0.00	320.535	13.16
0.011	0.00	0.090	0.00	0.717	0.00	5.709	0.00	45.469	0.00	362.148	10.93
0.013	0.00	0.102	0.00	0.810	0.00	6.450	0.00	51.371	0.00	409.163	7.99
0.014	0.00	0.115	0.00	0.915	0.00	7.287	0.00	58.041	0.00	462.281	5.07
0.016	0.00	0.130	0.00	1.034	0.00	8.233	0.00	65.575	0.00	522.296	2.65
0.018	0.00	0.147	0.00	1.168	0.00	9.302	0.00	74.089	0.00	590.102	0.73
0.021	0.00	0.166	0.00	1.320	0.00	10.510	0.00	83.707	0.00	666.711	0.02
0.024	0.00	0.187	0.00	1.491	0.00	11.874	0.00	94.574	0.00	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.00	13.416	0.00	106.852	0.02	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.00	15.157	0.00	120.724	0.24	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.00	17.125	0.00	136.397	1.43	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.00	19.348	0.00	154.104	3.31	1227.408	0.00
0.043	0.00	0.345	0.00	2.745	0.00	21.860	0.00	174.110	5.95	1386.753	0.00
0.049	0.00	0.389	0.00	3.101	0.00	24.698	0.00	196.714	8.97	1566.785	0.00
0.055	0.00	0.440	0.00	3.503	0.00	27.904	0.00	222.251	11.74	1770.189	0.00
0.062	0.00	0.497	0.00	3.958	0.00	31.527	0.00	251.105	13.64	2000.000	
0.070	0.00	0.561	0.00	4.472	0.00	35.620	0.00	283.704	14.16		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/6 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.14 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.362 %	**Result Emulation:** Off
Concentration: 0.0452 %Vol	**Span :** 0.918	**Uniformity:** 0.313	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 279.283 um	

d(0.1): 162.786 um **d(0.5):** 278.668 um **d(0.9):** 418.607 um



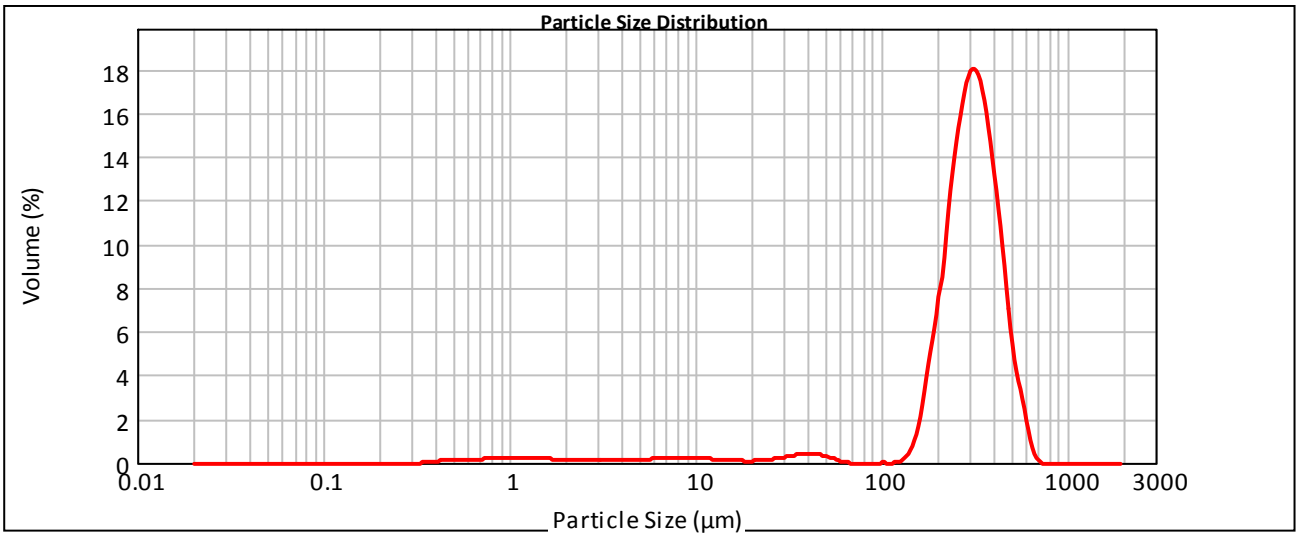
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.15	5.053	0.18	40.244	0.34	320.535	12.48
0.011	0.00	0.090	0.00	0.717	0.17	5.709	0.19	45.469	0.25	362.148	9.85
0.013	0.00	0.102	0.00	0.810	0.18	6.450	0.20	51.371	0.03	409.163	6.03
0.014	0.00	0.115	0.00	0.915	0.19	7.287	0.20	58.041	0.00	462.281	3.76
0.016	0.00	0.130	0.00	1.034	0.19	8.233	0.20	65.575	0.00	522.296	1.46
0.018	0.00	0.147	0.00	1.168	0.19	9.302	0.19	74.089	0.00	590.102	0.19
0.021	0.00	0.166	0.00	1.320	0.19	10.510	0.17	83.707	0.00	666.711	0.02
0.024	0.00	0.187	0.00	1.491	0.19	11.874	0.15	94.574	0.00	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.18	13.416	0.12	106.852	0.02	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.17	15.157	0.11	120.724	0.22	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.17	17.125	0.11	136.397	1.21	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.16	19.348	0.12	154.104	3.00	1227.408	0.00
0.043	0.00	0.345	0.05	2.745	0.16	21.860	0.16	174.110	5.43	1386.753	0.00
0.049	0.00	0.389	0.09	3.101	0.16	24.698	0.22	196.714	9.03	1566.785	0.00
0.055	0.00	0.440	0.10	3.503	0.16	27.904	0.28	222.251	11.90	1770.189	0.00
0.062	0.00	0.497	0.12	3.958	0.17	31.527	0.34	251.105	13.92	2000.000	0.00
0.070	0.00	0.561	0.14	4.472	0.17	35.620	0.37	283.704	14.12		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/7 rep - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 15.62 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.524 %	**Result Emulation:** Off
Concentration: 0.0724 %Vol	**Span :** 0.893	**Uniformity:** 0.298	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 308.538 um	

d(0.1): 185.634 um **d(0.5):** 305.519 um **d(0.9):** 458.414 um



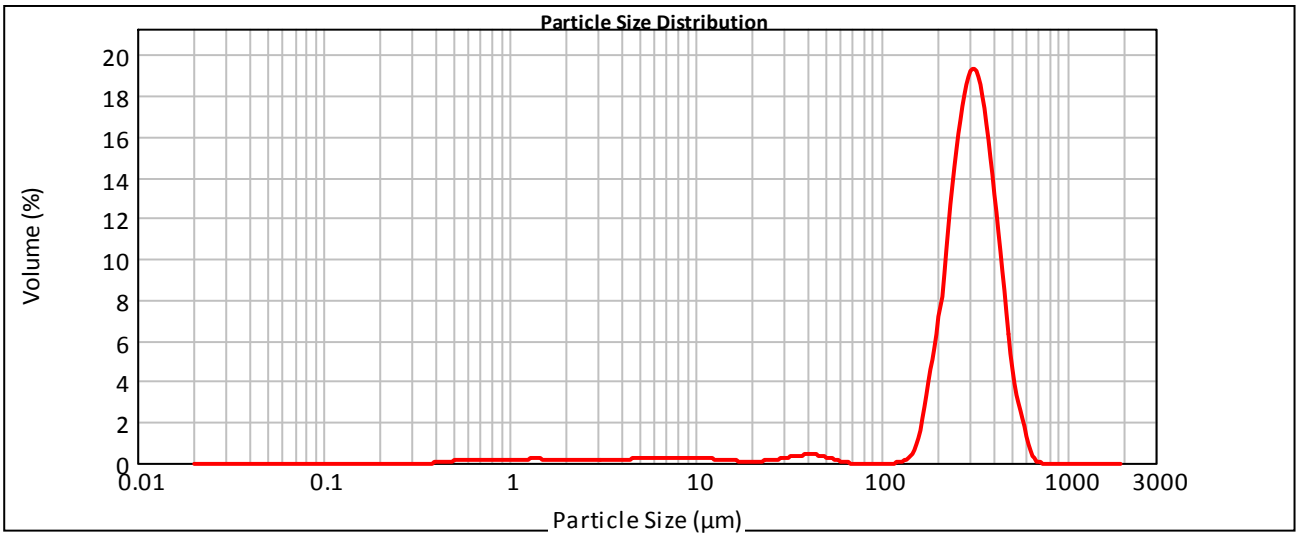
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.13	5.053	0.13	40.244	0.34	320.535	14.00
0.011	0.00	0.090	0.00	0.717	0.15	5.709	0.15	45.469	0.30	362.148	11.88
0.013	0.00	0.102	0.00	0.810	0.16	6.450	0.16	51.371	0.18	409.163	8.95
0.014	0.00	0.115	0.00	0.915	0.16	7.287	0.18	58.041	0.04	462.281	5.33
0.016	0.00	0.130	0.00	1.034	0.16	8.233	0.18	65.575	0.00	522.296	2.94
0.018	0.00	0.147	0.00	1.168	0.16	9.302	0.17	74.089	0.00	590.102	1.14
0.021	0.00	0.166	0.00	1.320	0.16	10.510	0.16	83.707	0.00	666.711	0.06
0.024	0.00	0.187	0.00	1.491	0.15	11.874	0.14	94.574	0.00	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.14	13.416	0.11	106.852	0.00	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.13	15.157	0.09	120.724	0.05	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.11	17.125	0.07	136.397	0.46	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.10	19.348	0.07	154.104	1.60	1227.408	0.00
0.043	0.00	0.345	0.03	2.745	0.10	21.860	0.09	174.110	3.95	1386.753	0.00
0.049	0.00	0.389	0.07	3.101	0.09	24.698	0.14	196.714	6.30	1566.785	0.00
0.055	0.00	0.440	0.09	3.503	0.10	27.904	0.20	222.251	10.17	1770.189	0.00
0.062	0.00	0.497	0.10	3.958	0.10	31.527	0.27	251.105	12.76	2000.000	
0.070	0.00	0.561	0.12	4.472	0.12	35.620	0.32	283.704	14.32		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/8 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 17.10 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.383 %	**Result Emulation:** Off
Concentration: 0.0901 %Vol	**Span :** 0.838	**Uniformity:** 0.282	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 305.155 um	

d(0.1): 190.027 um **d(0.5):** 304.462 um **d(0.9):** 445.207 um



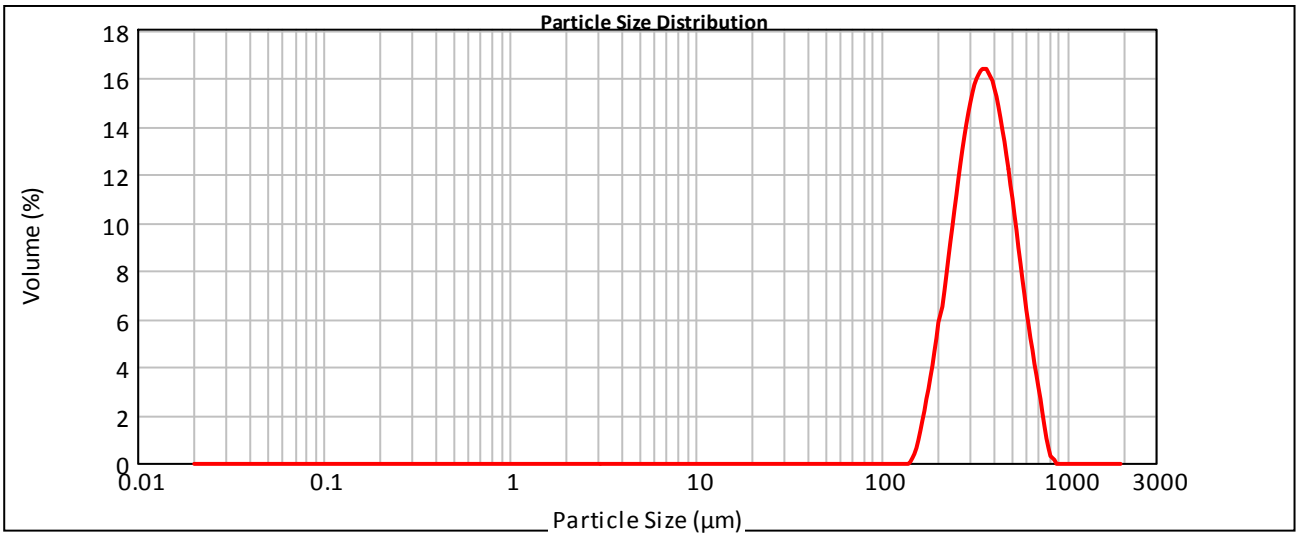
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.11	5.053	0.18	40.244	0.32	320.535	14.87
0.011	0.00	0.090	0.00	0.717	0.12	5.709	0.19	45.469	0.28	362.148	12.20
0.013	0.00	0.102	0.00	0.810	0.13	6.450	0.21	51.371	0.15	409.163	8.66
0.014	0.00	0.115	0.00	0.915	0.14	7.287	0.21	58.041	0.03	462.281	4.68
0.016	0.00	0.130	0.00	1.034	0.15	8.233	0.21	65.575	0.00	522.296	2.29
0.018	0.00	0.147	0.00	1.168	0.15	9.302	0.20	74.089	0.00	590.102	0.72
0.021	0.00	0.166	0.00	1.320	0.15	10.510	0.18	83.707	0.00	666.711	0.02
0.024	0.00	0.187	0.00	1.491	0.15	11.874	0.15	94.574	0.00	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.15	13.416	0.12	106.852	0.00	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.14	15.157	0.09	120.724	0.02	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.14	17.125	0.07	136.397	0.26	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.13	19.348	0.06	154.104	1.18	1227.408	0.00
0.043	0.00	0.345	0.00	2.745	0.13	21.860	0.08	174.110	3.50	1386.753	0.00
0.049	0.00	0.389	0.02	3.101	0.13	24.698	0.12	196.714	5.99	1566.785	0.00
0.055	0.00	0.440	0.07	3.503	0.14	27.904	0.18	222.251	10.44	1770.189	0.00
0.062	0.00	0.497	0.08	3.958	0.15	31.527	0.25	251.105	13.55	2000.000	
0.070	0.00	0.561	0.10	4.472	0.16	35.620	0.30	283.704	15.39		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/9 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 13.24 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 2.297 %	**Result Emulation:** Off
Concentration: 0.6818 %Vol	**Span :** 0.937	**Uniformity:** 0.288	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 379.462 um	

d(0.1): 228.076 um **d(0.5):** 358.207 um **d(0.9):** 563.538 um



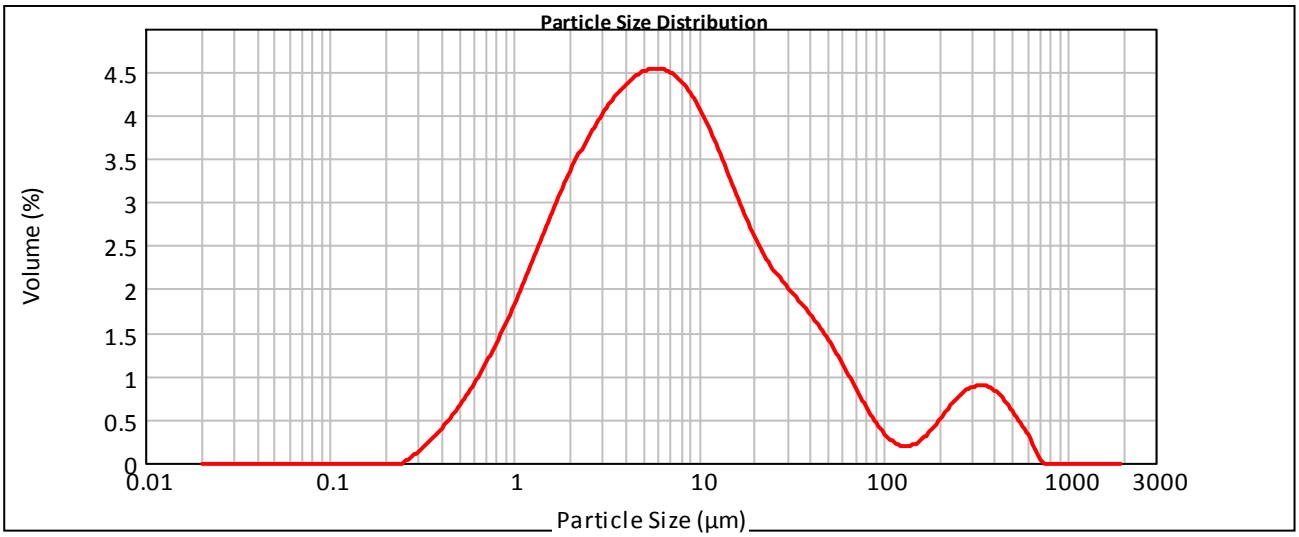
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.00	5.053	0.00	40.244	0.00	320.535	13.02
0.011	0.00	0.090	0.00	0.717	0.00	5.709	0.00	45.469	0.00	362.148	12.90
0.013	0.00	0.102	0.00	0.810	0.00	6.450	0.00	51.371	0.00	409.163	11.66
0.014	0.00	0.115	0.00	0.915	0.00	7.287	0.00	58.041	0.00	462.281	9.56
0.016	0.00	0.130	0.00	1.034	0.00	8.233	0.00	65.575	0.00	522.296	7.05
0.018	0.00	0.147	0.00	1.168	0.00	9.302	0.00	74.089	0.00	590.102	4.56
0.021	0.00	0.166	0.00	1.320	0.00	10.510	0.00	83.707	0.00	666.711	2.58
0.024	0.00	0.187	0.00	1.491	0.00	11.874	0.00	94.574	0.00	753.265	0.50
0.027	0.00	0.211	0.00	1.684	0.00	13.416	0.00	106.852	0.00	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.00	15.157	0.00	120.724	0.00	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.00	17.125	0.00	136.397	0.02	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.00	19.348	0.00	154.104	1.02	1227.408	0.00
0.043	0.00	0.345	0.00	2.745	0.00	21.860	0.00	174.110	2.69	1386.753	0.00
0.049	0.00	0.389	0.00	3.101	0.00	24.698	0.00	196.714	4.91	1566.785	0.00
0.055	0.00	0.440	0.00	3.503	0.00	27.904	0.00	222.251	7.52	1770.189	0.00
0.062	0.00	0.497	0.00	3.958	0.00	31.527	0.00	251.105	10.02	2000.000	
0.070	0.00	0.561	0.00	4.472	0.00	35.620	0.00	283.704	11.99		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/10 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.31 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.547 %	**Result Emulation:** Off
Concentration: 0.0054 %Vol	**Span :** 7.932	**Uniformity:** 4.52	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 32.224 um	

d(0.1): 1.284 um **d(0.5):** 6.478 um **d(0.9):** 52.670 um



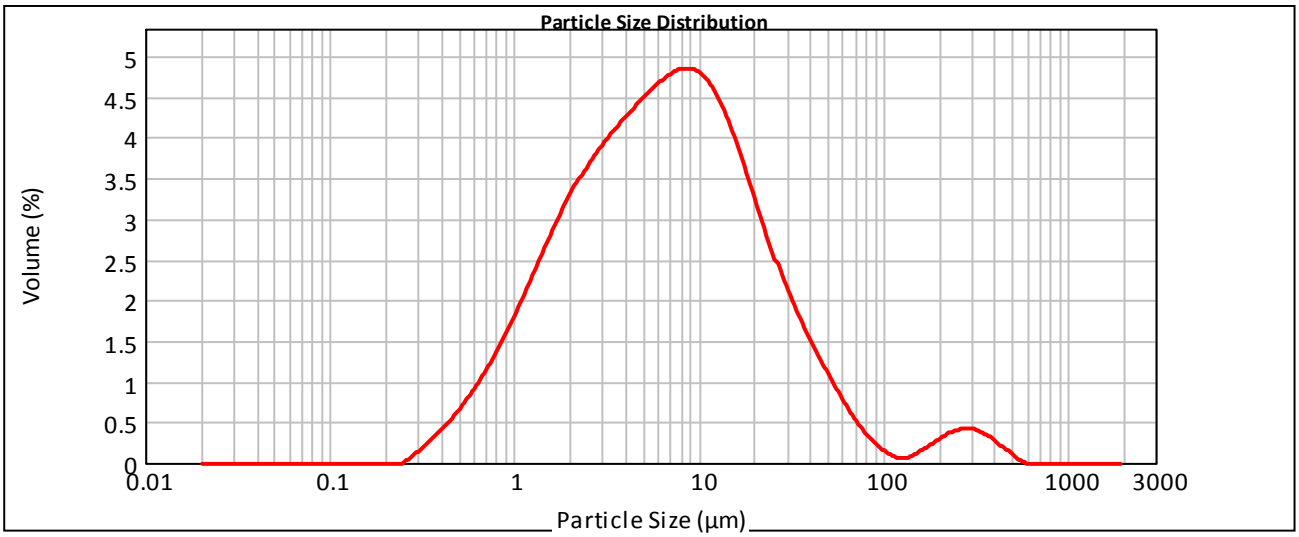
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.86	5.053	3.60	40.244	1.30	320.535	0.71
0.011	0.00	0.090	0.00	0.717	1.02	5.709	3.61	45.469	1.17	362.148	0.68
0.013	0.00	0.102	0.00	0.810	1.20	6.450	3.59	51.371	1.03	409.163	0.61
0.014	0.00	0.115	0.00	0.915	1.39	7.287	3.52	58.041	0.87	462.281	0.49
0.016	0.00	0.130	0.00	1.034	1.60	8.233	3.42	65.575	0.71	522.296	0.36
0.018	0.00	0.147	0.00	1.168	1.81	9.302	3.28	74.089	0.55	590.102	0.22
0.021	0.00	0.166	0.00	1.320	2.03	10.510	3.10	83.707	0.40	666.711	0.02
0.024	0.00	0.187	0.00	1.491	2.25	11.874	2.90	94.574	0.28	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.46	13.416	2.69	106.852	0.19	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.67	15.157	2.46	120.724	0.15	961.542	0.00
0.034	0.00	0.270	0.08	2.150	2.85	17.125	2.25	136.397	0.16	1086.372	0.00
0.038	0.00	0.305	0.15	2.429	3.02	19.348	2.06	154.104	0.21	1227.408	0.00
0.043	0.00	0.345	0.24	2.745	3.17	21.860	1.88	174.110	0.30	1386.753	0.00
0.049	0.00	0.389	0.34	3.101	3.30	24.698	1.74	196.714	0.42	1566.785	0.00
0.055	0.00	0.440	0.45	3.503	3.41	27.904	1.62	222.251	0.53	1770.189	0.00
0.062	0.00	0.497	0.57	3.958	3.50	31.527	1.51	251.105	0.63	2000.000	
0.070	0.00	0.561	0.71	4.472	3.57	35.620	1.41	283.704	0.69		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/11 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.54 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.351 %	**Result Emulation:** Off
Concentration: 0.0054 %Vol	**Span :** 4.538	**Uniformity:** 2.29	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 17.939 um	

d(0.1): 1.283 um **d(0.5):** 6.555 um **d(0.9):** 31.029 um



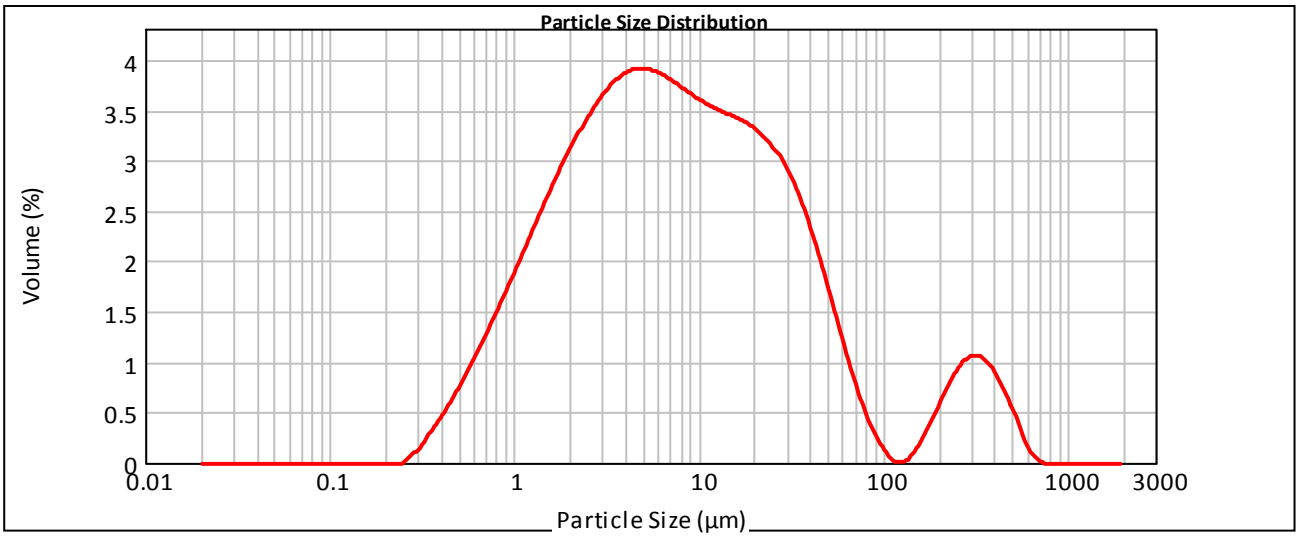
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.85	5.053	3.64	40.244	1.11	320.535	0.30
0.011	0.00	0.090	0.00	0.717	1.01	5.709	3.73	45.469	0.93	362.148	0.25
0.013	0.00	0.102	0.00	0.810	1.19	6.450	3.80	51.371	0.75	409.163	0.16
0.014	0.00	0.115	0.00	0.915	1.38	7.287	3.85	58.041	0.59	462.281	0.10
0.016	0.00	0.130	0.00	1.034	1.59	8.233	3.87	65.575	0.44	522.296	0.02
0.018	0.00	0.147	0.00	1.168	1.80	9.302	3.84	74.089	0.31	590.102	0.00
0.021	0.00	0.166	0.00	1.320	2.02	10.510	3.75	83.707	0.20	666.711	0.00
0.024	0.00	0.187	0.00	1.491	2.23	11.874	3.61	94.574	0.12	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.44	13.416	3.40	106.852	0.07	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.63	15.157	3.15	120.724	0.05	961.542	0.00
0.034	0.00	0.270	0.09	2.150	2.80	17.125	2.87	136.397	0.07	1086.372	0.00
0.038	0.00	0.305	0.16	2.429	2.96	19.348	2.57	154.104	0.13	1227.408	0.00
0.043	0.00	0.345	0.25	2.745	3.10	21.860	2.27	174.110	0.19	1386.753	0.00
0.049	0.00	0.389	0.35	3.101	3.22	24.698	1.99	196.714	0.25	1566.785	0.00
0.055	0.00	0.440	0.46	3.503	3.33	27.904	1.73	222.251	0.30	1770.189	0.00
0.062	0.00	0.497	0.58	3.958	3.44	31.527	1.50	251.105	0.33	2000.000	
0.070	0.00	0.561	0.71	4.472	3.54	35.620	1.30	283.704	0.33		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/12 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 10.07 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.263 %	**Result Emulation:** Off
Concentration: 0.0043 %Vol	**Span :** 6.865	**Uniformity:** 4.12	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 33.082 um	

d(0.1): 1.219 um **d(0.5):** 7.292 um **d(0.9):** 51.276 um



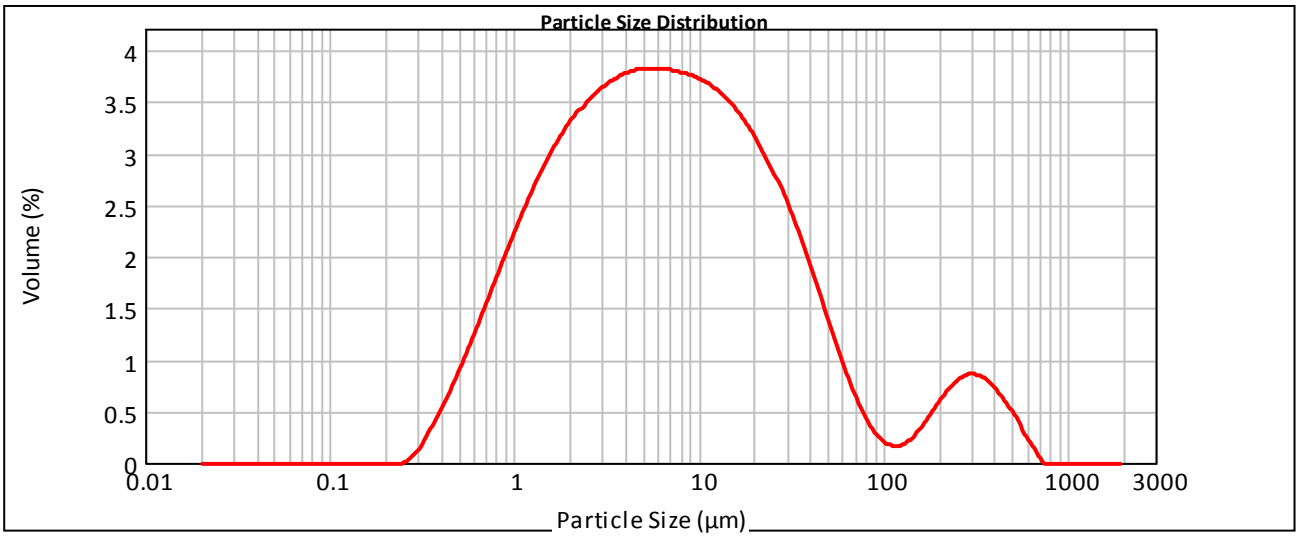
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.96	5.053	3.12	40.244	1.73	320.535	0.83
0.011	0.00	0.090	0.00	0.717	1.12	5.709	3.09	45.469	1.47	362.148	0.76
0.013	0.00	0.102	0.00	0.810	1.29	6.450	3.05	51.371	1.19	409.163	0.62
0.014	0.00	0.115	0.00	0.915	1.46	7.287	2.99	58.041	0.92	462.281	0.45
0.016	0.00	0.130	0.00	1.034	1.63	8.233	2.94	65.575	0.66	522.296	0.26
0.018	0.00	0.147	0.00	1.168	1.81	9.302	2.89	74.089	0.43	590.102	0.08
0.021	0.00	0.166	0.00	1.320	1.99	10.510	2.84	83.707	0.25	666.711	0.01
0.024	0.00	0.187	0.00	1.491	2.16	11.874	2.80	94.574	0.12	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.33	13.416	2.77	106.852	0.02	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.49	15.157	2.73	120.724	0.00	961.542	0.00
0.034	0.00	0.270	0.08	2.150	2.64	17.125	2.69	136.397	0.06	1086.372	0.00
0.038	0.00	0.305	0.17	2.429	2.77	19.348	2.64	154.104	0.19	1227.408	0.00
0.043	0.00	0.345	0.28	2.745	2.89	21.860	2.57	174.110	0.34	1386.753	0.00
0.049	0.00	0.389	0.39	3.101	2.99	24.698	2.47	196.714	0.50	1566.785	0.00
0.055	0.00	0.440	0.52	3.503	3.06	27.904	2.34	222.251	0.66	1770.189	0.00
0.062	0.00	0.497	0.66	3.958	3.10	31.527	2.18	251.105	0.78	2000.000	
0.070	0.00	0.561	0.81	4.472	3.12	35.620	1.97	283.704	0.84		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/13 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 9.56 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.613 %	**Result Emulation:** Off
Concentration: 0.0037 %Vol	**Span :** 7.046	**Uniformity:** 4.26	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 30.715 um	

d(0.1): 1.092 um **d(0.5):** 6.577 um **d(0.9):** 47.437 um



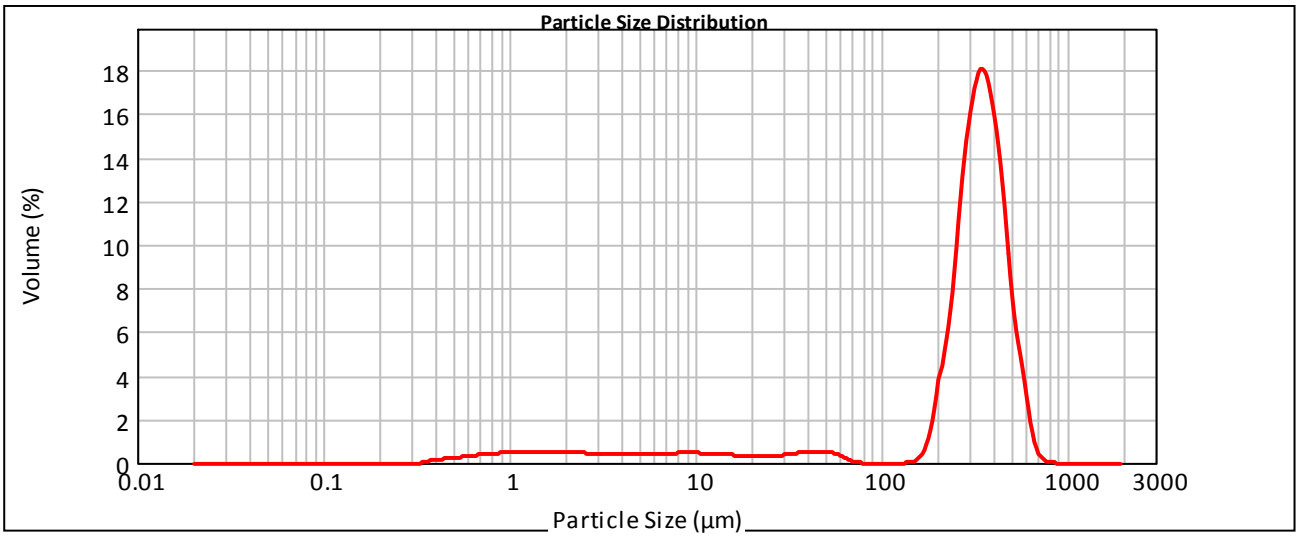
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.16	5.053	3.05	40.244	1.41	320.535	0.67
0.011	0.00	0.090	0.00	0.717	1.35	5.709	3.05	45.469	1.18	362.148	0.61
0.013	0.00	0.102	0.00	0.810	1.54	6.450	3.04	51.371	0.95	409.163	0.51
0.014	0.00	0.115	0.00	0.915	1.73	7.287	3.03	58.041	0.73	462.281	0.41
0.016	0.00	0.130	0.00	1.034	1.91	8.233	3.01	65.575	0.54	522.296	0.29
0.018	0.00	0.147	0.00	1.168	2.09	9.302	2.98	74.089	0.38	590.102	0.15
0.021	0.00	0.166	0.00	1.320	2.25	10.510	2.94	83.707	0.25	666.711	0.03
0.024	0.00	0.187	0.00	1.491	2.39	11.874	2.89	94.574	0.17	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.52	13.416	2.82	106.852	0.13	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.64	15.157	2.73	120.724	0.14	961.542	0.00
0.034	0.00	0.270	0.07	2.150	2.74	17.125	2.63	136.397	0.20	1086.372	0.00
0.038	0.00	0.305	0.17	2.429	2.82	19.348	2.51	154.104	0.28	1227.408	0.00
0.043	0.00	0.345	0.31	2.745	2.89	21.860	2.37	174.110	0.39	1386.753	0.00
0.049	0.00	0.389	0.45	3.101	2.95	24.698	2.21	196.714	0.50	1566.785	0.00
0.055	0.00	0.440	0.61	3.503	2.99	27.904	2.03	222.251	0.59	1770.189	0.00
0.062	0.00	0.497	0.79	3.958	3.02	31.527	1.84	251.105	0.66	2000.000	0.00
0.070	0.00	0.561	0.97	4.472	3.04	35.620	1.63	283.704	0.69		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/14 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.88 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.244 %	**Result Emulation:** Off
Concentration: 0.0246 %Vol	**Span :** 1.435	**Uniformity:** 0.349	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 314.492 um	

d(0.1): 14.761 um **d(0.5):** 329.618 um **d(0.9):** 487.690 um



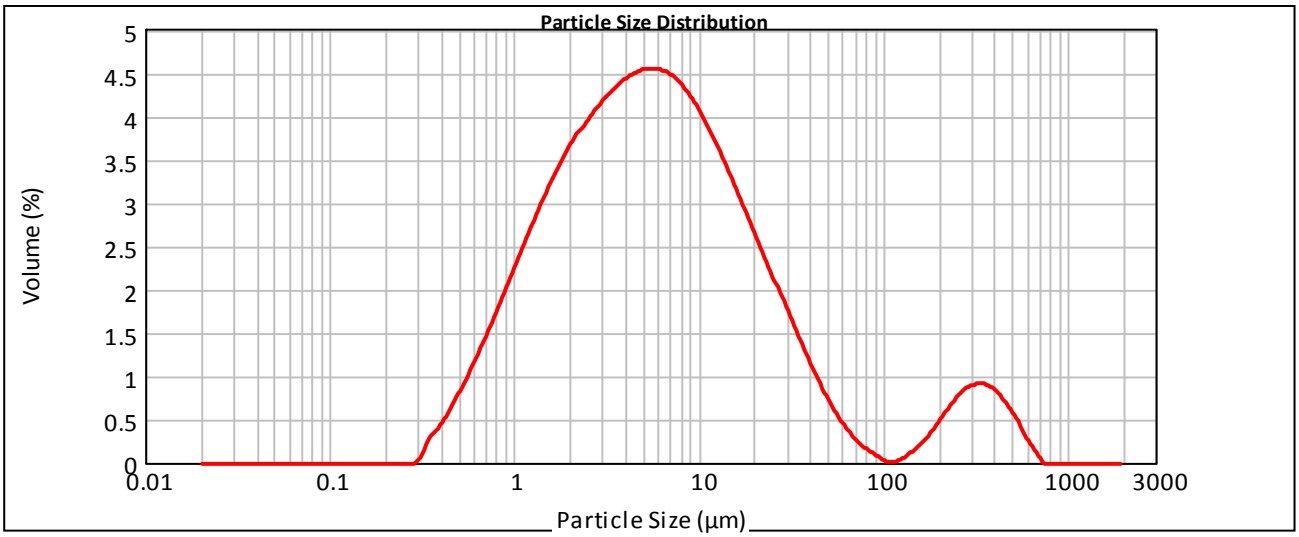
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.28	5.053	0.32	40.244	0.42	320.535	14.42
0.011	0.00	0.090	0.00	0.717	0.32	5.709	0.33	45.469	0.43	362.148	13.70
0.013	0.00	0.102	0.00	0.810	0.36	6.450	0.34	51.371	0.37	409.163	11.29
0.014	0.00	0.115	0.00	0.915	0.38	7.287	0.36	58.041	0.23	462.281	7.28
0.016	0.00	0.130	0.00	1.034	0.41	8.233	0.36	65.575	0.07	522.296	4.27
0.018	0.00	0.147	0.00	1.168	0.42	9.302	0.36	74.089	0.00	590.102	1.90
0.021	0.00	0.166	0.00	1.320	0.43	10.510	0.36	83.707	0.00	666.711	0.32
0.024	0.00	0.187	0.00	1.491	0.42	11.874	0.34	94.574	0.00	753.265	0.04
0.027	0.00	0.211	0.00	1.684	0.41	13.416	0.31	106.852	0.00	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.40	15.157	0.28	120.724	0.00	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.38	17.125	0.25	136.397	0.01	1086.372	0.00
0.038	0.00	0.305	0.00	2.429	0.36	19.348	0.23	154.104	0.23	1227.408	0.00
0.043	0.00	0.345	0.00	2.745	0.34	21.860	0.23	174.110	1.02	1386.753	0.00
0.049	0.00	0.389	0.06	3.101	0.33	24.698	0.24	196.714	3.32	1566.785	0.00
0.055	0.00	0.440	0.12	3.503	0.32	27.904	0.28	222.251	5.65	1770.189	0.00
0.062	0.00	0.497	0.16	3.958	0.31	31.527	0.33	251.105	9.88	2000.000	0.00
0.070	0.00	0.561	0.20	4.472	0.32	35.620	0.38	283.704	12.85		
0.080	0.00	0.634	0.24	5.053	0.32	40.244	0.42	320.535	14.42		

EAL
Result Analysis Report

Sample Name:
G6135/15 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.11 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.477 %	**Result Emulation:** Off
Concentration: 0.0047 %Vol	**Span :** 6.069	**Uniformity:** 4.79	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 29.169 um	

d(0.1): 1.127 um **d(0.5):** 5.560 um **d(0.9):** 34.866 um



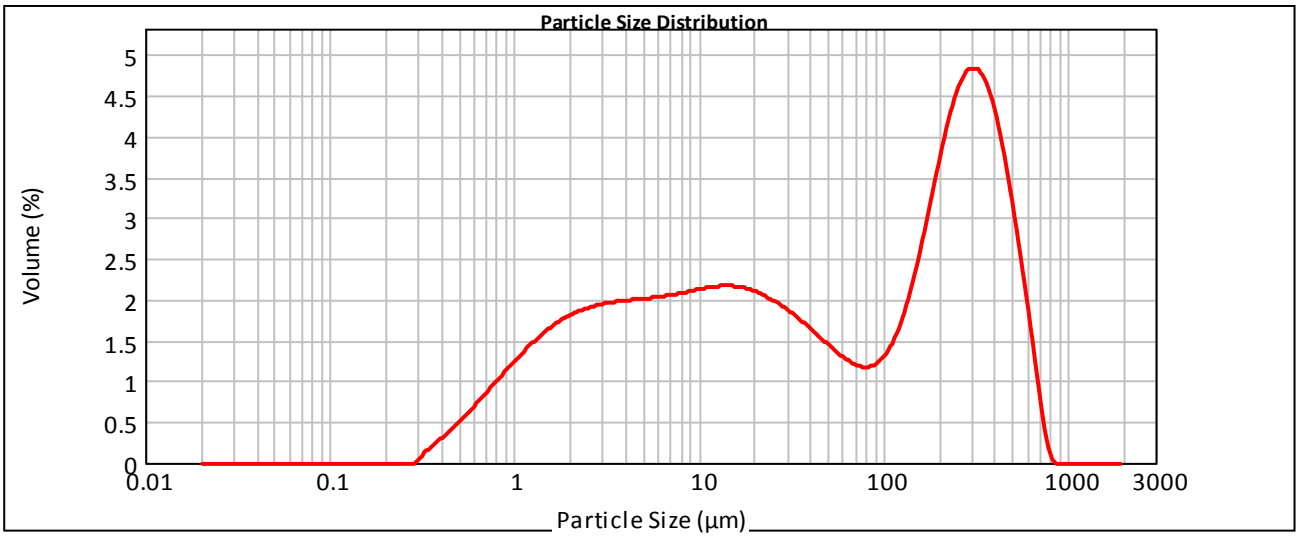
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.10	5.053	3.64	40.244	0.82	320.535	0.73
0.011	0.00	0.090	0.00	0.717	1.30	5.709	3.64	45.469	0.64	362.148	0.70
0.013	0.00	0.102	0.00	0.810	1.52	6.450	3.60	51.371	0.48	409.163	0.61
0.014	0.00	0.115	0.00	0.915	1.74	7.287	3.53	58.041	0.34	462.281	0.49
0.016	0.00	0.130	0.00	1.034	1.96	8.233	3.42	65.575	0.23	522.296	0.34
0.018	0.00	0.147	0.00	1.168	2.17	9.302	3.29	74.089	0.15	590.102	0.18
0.021	0.00	0.166	0.00	1.320	2.38	10.510	3.12	83.707	0.09	666.711	0.04
0.024	0.00	0.187	0.00	1.491	2.58	11.874	2.94	94.574	0.03	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.76	13.416	2.74	106.852	0.01	851.056	0.00
0.030	0.00	0.239	0.00	1.903	2.93	15.157	2.53	120.724	0.04	961.542	0.00
0.034	0.00	0.270	0.00	2.150	3.08	17.125	2.32	136.397	0.11	1086.372	0.00
0.038	0.00	0.305	0.13	2.429	3.21	19.348	2.10	154.104	0.19	1227.408	0.00
0.043	0.00	0.345	0.28	2.745	3.32	21.860	1.88	174.110	0.29	1386.753	0.00
0.049	0.00	0.389	0.40	3.101	3.42	24.698	1.66	196.714	0.42	1566.785	0.00
0.055	0.00	0.440	0.55	3.503	3.51	27.904	1.44	222.251	0.54	1770.189	0.00
0.062	0.00	0.497	0.72	3.958	3.57	31.527	1.22	251.105	0.65	2000.000	
0.070	0.00	0.561	0.90	4.472	3.62	35.620	1.01	283.704	0.72		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/16 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 10.60 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.757 %	**Result Emulation:** Off
Concentration: 0.0074 %Vol	**Span :** 11.221	**Uniformity:** 3.59	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 138.621 um	

d(0.1): 1.705 um **d(0.5):** 36.061 um **d(0.9):** 406.348 um



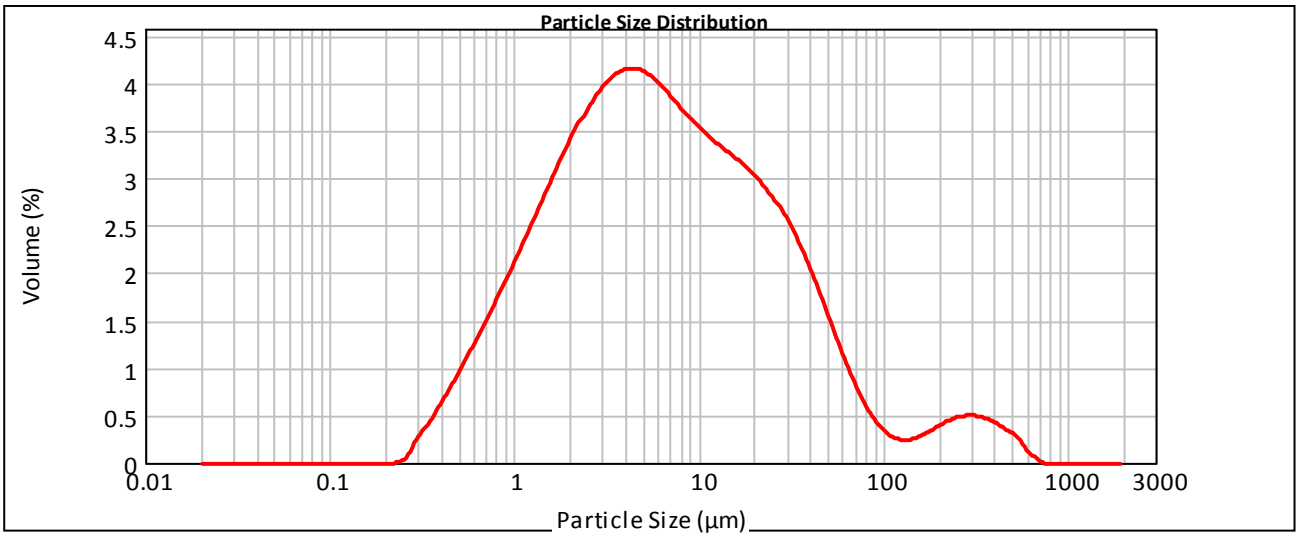
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.64	5.053	1.61	40.244	1.27	320.535	3.80
0.011	0.00	0.090	0.00	0.717	0.75	5.709	1.62	45.469	1.18	362.148	3.56
0.013	0.00	0.102	0.00	0.810	0.86	6.450	1.63	51.371	1.10	409.163	3.15
0.014	0.00	0.115	0.00	0.915	0.96	7.287	1.65	58.041	1.02	462.281	2.61
0.016	0.00	0.130	0.00	1.034	1.06	8.233	1.67	65.575	0.97	522.296	2.00
0.018	0.00	0.147	0.00	1.168	1.16	9.302	1.69	74.089	0.94	590.102	1.34
0.021	0.00	0.166	0.00	1.320	1.24	10.510	1.71	83.707	0.95	666.711	0.62
0.024	0.00	0.187	0.00	1.491	1.32	11.874	1.72	94.574	1.03	753.265	0.08
0.027	0.00	0.211	0.00	1.684	1.39	13.416	1.73	106.852	1.18	851.056	0.00
0.030	0.00	0.239	0.00	1.903	1.44	15.157	1.72	120.724	1.42	961.542	0.00
0.034	0.00	0.270	0.00	2.150	1.49	17.125	1.71	136.397	1.75	1086.372	0.00
0.038	0.00	0.305	0.11	2.429	1.52	19.348	1.67	154.104	2.15	1227.408	0.00
0.043	0.00	0.345	0.17	2.745	1.55	21.860	1.63	174.110	2.60	1386.753	0.00
0.049	0.00	0.389	0.26	3.101	1.57	24.698	1.57	196.714	3.05	1566.785	0.00
0.055	0.00	0.440	0.34	3.503	1.58	27.904	1.50	222.251	3.45	1770.189	0.00
0.062	0.00	0.497	0.44	3.958	1.59	31.527	1.43	251.105	3.73	2000.000	0.00
0.070	0.00	0.561	0.54	4.472	1.60	35.620	1.35	283.704	3.85		
0.080	0.00	0.634	0.54	5.053	1.60	40.244	1.35	320.535	3.85		

EAL
Result Analysis Report

Sample Name:
G6135/17 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.15 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.360 %	**Result Emulation:** Off
Concentration: 0.0042 %Vol	**Span :** 6.897	**Uniformity:** 3.53	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 23.984 um	

d(0.1): 1.073 um **d(0.5):** 6.050 um **d(0.9):** 42.803 um



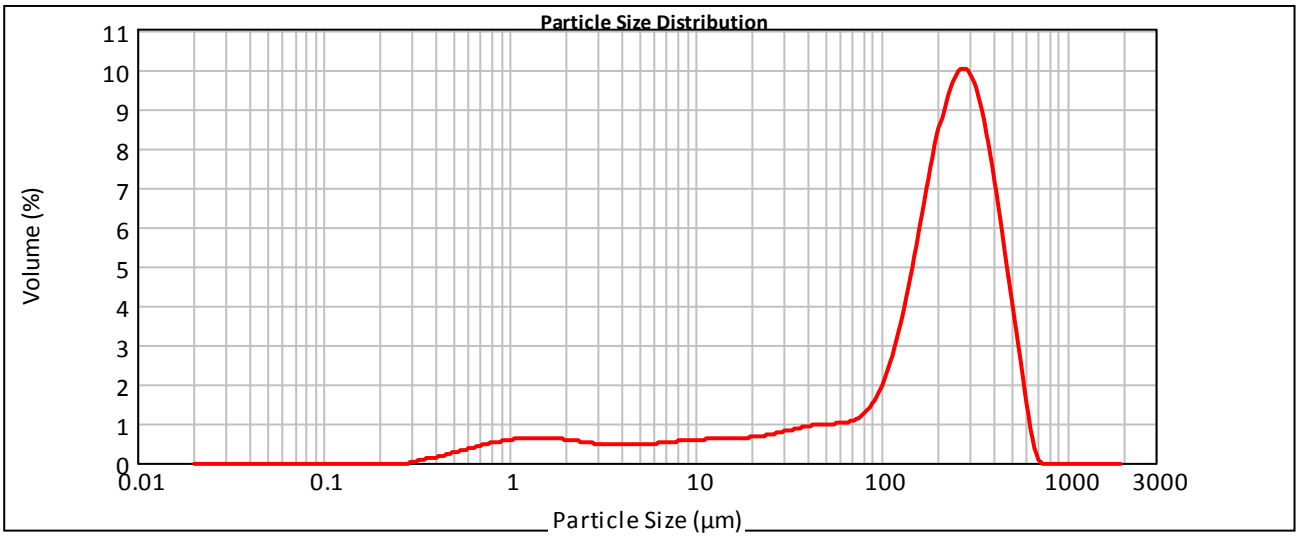
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.14	5.053	3.26	40.244	1.52	320.535	0.39
0.011	0.00	0.090	0.00	0.717	1.30	5.709	3.19	45.469	1.31	362.148	0.36
0.013	0.00	0.102	0.00	0.810	1.47	6.450	3.10	51.371	1.09	409.163	0.31
0.014	0.00	0.115	0.00	0.915	1.64	7.287	3.01	58.041	0.87	462.281	0.25
0.016	0.00	0.130	0.00	1.034	1.81	8.233	2.91	65.575	0.68	522.296	0.18
0.018	0.00	0.147	0.00	1.168	1.99	9.302	2.83	74.089	0.51	590.102	0.08
0.021	0.00	0.166	0.00	1.320	2.17	10.510	2.75	83.707	0.37	666.711	0.01
0.024	0.00	0.187	0.00	1.491	2.36	11.874	2.68	94.574	0.28	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.54	13.416	2.62	106.852	0.22	851.056	0.00
0.030	0.00	0.239	0.03	1.903	2.71	15.157	2.56	120.724	0.19	961.542	0.00
0.034	0.00	0.270	0.18	2.150	2.87	17.125	2.49	136.397	0.20	1086.372	0.00
0.038	0.00	0.305	0.29	2.429	3.02	19.348	2.41	154.104	0.23	1227.408	0.00
0.043	0.00	0.345	0.40	2.745	3.14	21.860	2.31	174.110	0.28	1386.753	0.00
0.049	0.00	0.389	0.54	3.101	3.23	24.698	2.20	196.714	0.32	1566.785	0.00
0.055	0.00	0.440	0.68	3.503	3.29	27.904	2.06	222.251	0.37	1770.189	0.00
0.062	0.00	0.497	0.83	3.958	3.31	31.527	1.90	251.105	0.39	2000.000	
0.070	0.00	0.561	0.98	4.472	3.30	35.620	1.72	283.704	0.40		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/18 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 10.85 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.914 %	**Result Emulation:** Off
Concentration: 0.0183 %Vol	**Span :** 1.915	**Uniformity:** 0.561	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 223.532 um	

d(0.1): 8.567 um **d(0.5):** 219.056 um **d(0.9):** 428.128 um



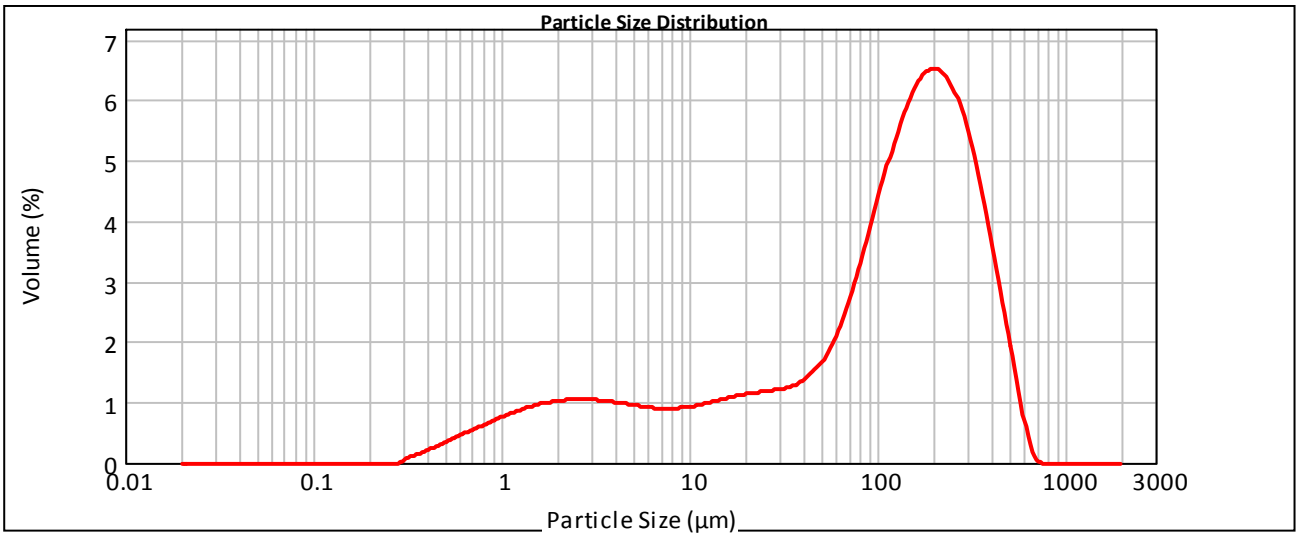
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.33	5.053	0.38	40.244	0.75	320.535	7.30
0.011	0.00	0.090	0.00	0.717	0.38	5.709	0.39	45.469	0.78	362.148	6.31
0.013	0.00	0.102	0.00	0.810	0.42	6.450	0.41	51.371	0.79	409.163	5.04
0.014	0.00	0.115	0.00	0.915	0.46	7.287	0.43	58.041	0.81	462.281	3.67
0.016	0.00	0.130	0.00	1.034	0.49	8.233	0.45	65.575	0.85	522.296	2.32
0.018	0.00	0.147	0.00	1.168	0.51	9.302	0.46	74.089	0.96	590.102	0.94
0.021	0.00	0.166	0.00	1.320	0.51	10.510	0.48	83.707	1.17	666.711	0.06
0.024	0.00	0.187	0.00	1.491	0.51	11.874	0.48	94.574	1.53	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.50	13.416	0.49	106.852	2.08	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.47	15.157	0.50	120.724	2.83	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.45	17.125	0.51	136.397	3.76	1086.372	0.00
0.038	0.00	0.305	0.04	2.429	0.42	19.348	0.53	154.104	4.82	1227.408	0.00
0.043	0.00	0.345	0.09	2.745	0.39	21.860	0.55	174.110	5.91	1386.753	0.00
0.049	0.00	0.389	0.12	3.101	0.38	24.698	0.59	196.714	6.90	1566.785	0.00
0.055	0.00	0.440	0.18	3.503	0.36	27.904	0.63	222.251	7.64	1770.189	0.00
0.062	0.00	0.497	0.23	3.958	0.36	31.527	0.68	251.105	7.99	2000.000	0.00
0.070	0.00	0.561	0.28	4.472	0.37	35.620	0.72	283.704	7.88		
0.080	0.00	0.634	0.28	5.053	0.37	40.244	0.72	320.535	7.88		

EAL
Result Analysis Report

Sample Name:
G6135/19 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.06 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.750 %	**Result Emulation:** Off
Concentration: 0.0127 %Vol	**Span :** 2.742	**Uniformity:** 0.861	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 152.326 um	

d(0.1): 2.980 um **d(0.5):** 126.096 um **d(0.9):** 348.704 um



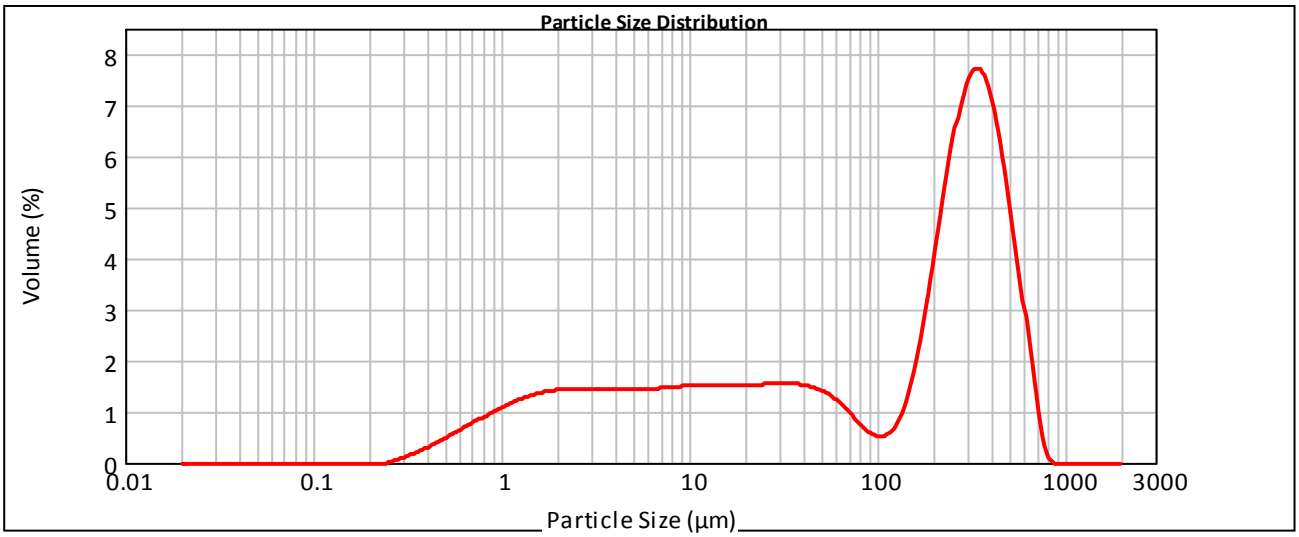
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.42	5.053	0.75	40.244	1.13	320.535	3.83
0.011	0.00	0.090	0.00	0.717	0.48	5.709	0.73	45.469	1.27	362.148	3.18
0.013	0.00	0.102	0.00	0.810	0.54	6.450	0.72	51.371	1.47	409.163	2.48
0.014	0.00	0.115	0.00	0.915	0.59	7.287	0.72	58.041	1.75	462.281	1.78
0.016	0.00	0.130	0.00	1.034	0.65	8.233	0.72	65.575	2.10	522.296	1.08
0.018	0.00	0.147	0.00	1.168	0.69	9.302	0.74	74.089	2.52	590.102	0.34
0.021	0.00	0.166	0.00	1.320	0.74	10.510	0.76	83.707	2.99	666.711	0.01
0.024	0.00	0.187	0.00	1.491	0.77	11.874	0.79	94.574	3.48	753.265	0.00
0.027	0.00	0.211	0.00	1.684	0.80	13.416	0.83	106.852	3.96	851.056	0.00
0.030	0.00	0.239	0.00	1.903	0.82	15.157	0.86	120.724	4.39	961.542	0.00
0.034	0.00	0.270	0.00	2.150	0.83	17.125	0.89	136.397	4.76	1086.372	0.00
0.038	0.00	0.305	0.08	2.429	0.84	19.348	0.91	154.104	5.03	1227.408	0.00
0.043	0.00	0.345	0.13	2.745	0.84	21.860	0.93	174.110	5.18	1386.753	0.00
0.049	0.00	0.389	0.18	3.101	0.83	24.698	0.95	196.714	5.20	1566.785	0.00
0.055	0.00	0.440	0.23	3.503	0.81	27.904	0.97	222.251	5.08	1770.189	0.00
0.062	0.00	0.497	0.29	3.958	0.79	31.527	1.00	251.105	4.80	2000.000	
0.070	0.00	0.561	0.35	4.472	0.77	35.620	1.05	283.704	4.38		
0.080		0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/20 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.33 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.802 %	**Result Emulation:** Off
Concentration: 0.0101 %Vol	**Span :** 2.704	**Uniformity:** 0.97	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 193.686 um	

d(0.1): 1.918 um **d(0.5):** 171.950 um **d(0.9):** 466.840 um



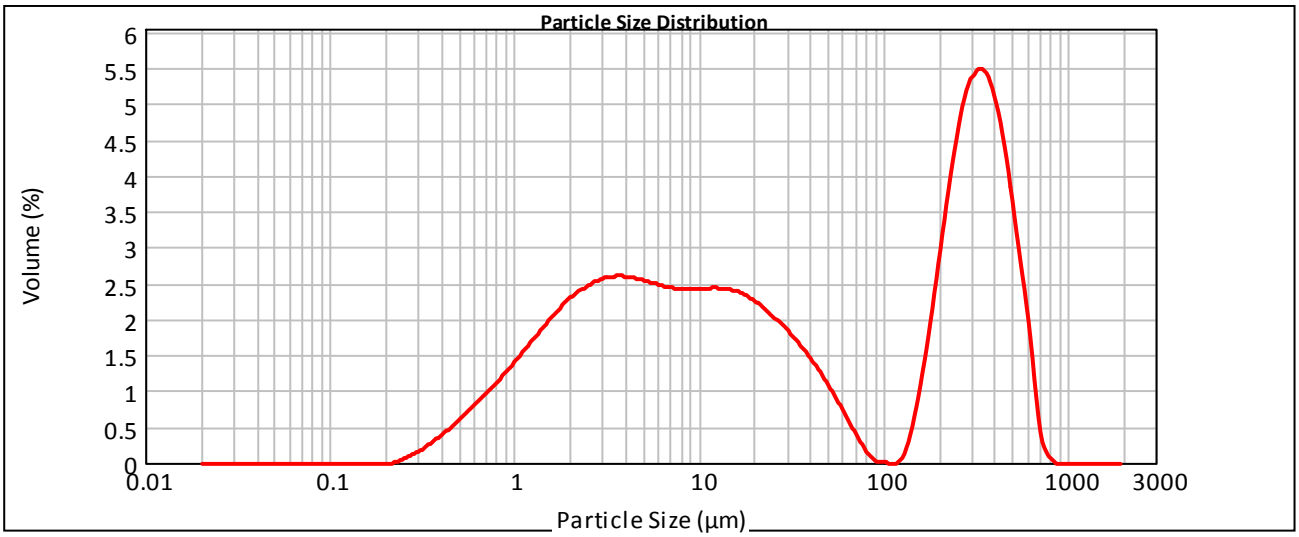
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.59	5.053	1.14	40.244	1.20	320.535	6.16
0.011	0.00	0.090	0.00	0.717	0.68	5.709	1.15	45.469	1.15	362.148	5.90
0.013	0.00	0.102	0.00	0.810	0.77	6.450	1.16	51.371	1.07	409.163	5.24
0.014	0.00	0.115	0.00	0.915	0.85	7.287	1.17	58.041	0.95	462.281	4.27
0.016	0.00	0.130	0.00	1.034	0.92	8.233	1.19	65.575	0.80	522.296	3.15
0.018	0.00	0.147	0.00	1.168	0.99	9.302	1.20	74.089	0.64	590.102	2.04
0.021	0.00	0.166	0.00	1.320	1.04	10.510	1.21	83.707	0.50	666.711	0.83
0.024	0.00	0.187	0.00	1.491	1.09	11.874	1.22	94.574	0.41	753.265	0.08
0.027	0.00	0.211	0.00	1.684	1.12	13.416	1.22	106.852	0.45	851.056	0.00
0.030	0.00	0.239	0.01	1.903	1.14	15.157	1.22	120.724	0.65	961.542	0.00
0.034	0.00	0.270	0.06	2.150	1.15	17.125	1.22	136.397	1.07	1086.372	0.00
0.038	0.00	0.305	0.12	2.429	1.15	19.348	1.22	154.104	1.72	1227.408	0.00
0.043	0.00	0.345	0.19	2.745	1.15	21.860	1.22	174.110	2.58	1386.753	0.00
0.049	0.00	0.389	0.26	3.101	1.15	24.698	1.23	196.714	3.57	1566.785	0.00
0.055	0.00	0.440	0.34	3.503	1.14	27.904	1.23	222.251	4.56	1770.189	0.00
0.062	0.00	0.497	0.42	3.958	1.14	31.527	1.23	251.105	5.41	2000.000	0.00
0.070	0.00	0.561	0.51	4.472	1.14	35.620	1.23	283.704	5.98		
0.080	0.00	0.634	0.51	5.053	1.14	40.244	1.23	320.535	5.98		

EAL
Result Analysis Report

Sample Name:
G6135/21 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.42 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 1.205 %	**Result Emulation:** Off
Concentration: 0.0066 %Vol	**Span :** 22.657	**Uniformity:** 7.02	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 134.682 um	

d(0.1): 1.481 um **d(0.5):** 18.398 um **d(0.9):** 418.333 um



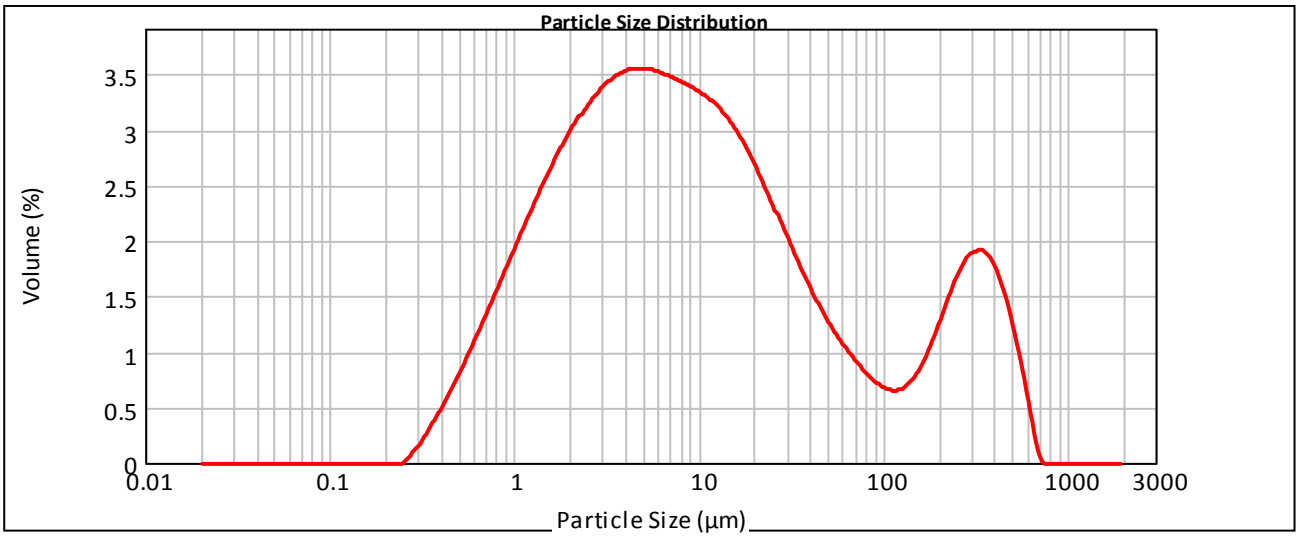
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	0.73	5.053	2.01	40.244	1.08	320.535	4.39
0.011	0.00	0.090	0.00	0.717	0.84	5.709	1.98	45.469	0.92	362.148	4.19
0.013	0.00	0.102	0.00	0.810	0.96	6.450	1.95	51.371	0.74	409.163	3.72
0.014	0.00	0.115	0.00	0.915	1.08	7.287	1.94	58.041	0.55	462.281	3.02
0.016	0.00	0.130	0.00	1.034	1.21	8.233	1.93	65.575	0.35	522.296	2.20
0.018	0.00	0.147	0.00	1.168	1.34	9.302	1.93	74.089	0.17	590.102	1.39
0.021	0.00	0.166	0.00	1.320	1.47	10.510	1.94	83.707	0.03	666.711	0.33
0.024	0.00	0.187	0.00	1.491	1.60	11.874	1.94	94.574	0.00	753.265	0.05
0.027	0.00	0.211	0.01	1.684	1.72	13.416	1.93	106.852	0.00	851.056	0.00
0.030	0.00	0.239	0.05	1.903	1.83	15.157	1.91	120.724	0.05	961.542	0.00
0.034	0.00	0.270	0.10	2.150	1.92	17.125	1.86	136.397	0.41	1086.372	0.00
0.038	0.00	0.305	0.17	2.429	1.99	19.348	1.79	154.104	0.96	1227.408	0.00
0.043	0.00	0.345	0.25	2.745	2.04	21.860	1.70	174.110	1.66	1386.753	0.00
0.049	0.00	0.389	0.33	3.101	2.07	24.698	1.60	196.714	2.46	1566.785	0.00
0.055	0.00	0.440	0.42	3.503	2.08	27.904	1.49	222.251	3.23	1770.189	0.00
0.062	0.00	0.497	0.52	3.958	2.07	31.527	1.36	251.105	3.87	2000.000	0.00
0.070	0.00	0.561	0.62	4.472	2.04	35.620	1.23	283.704	4.28		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/22 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 11.95 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.669 %	**Result Emulation:** Off
Concentration: 0.0052 %Vol	**Span :** 29.133	**Uniformity:** 6.72	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 57.303 um	

d(0.1): 1.186 um **d(0.5):** 8.058 um **d(0.9):** 235.926 um



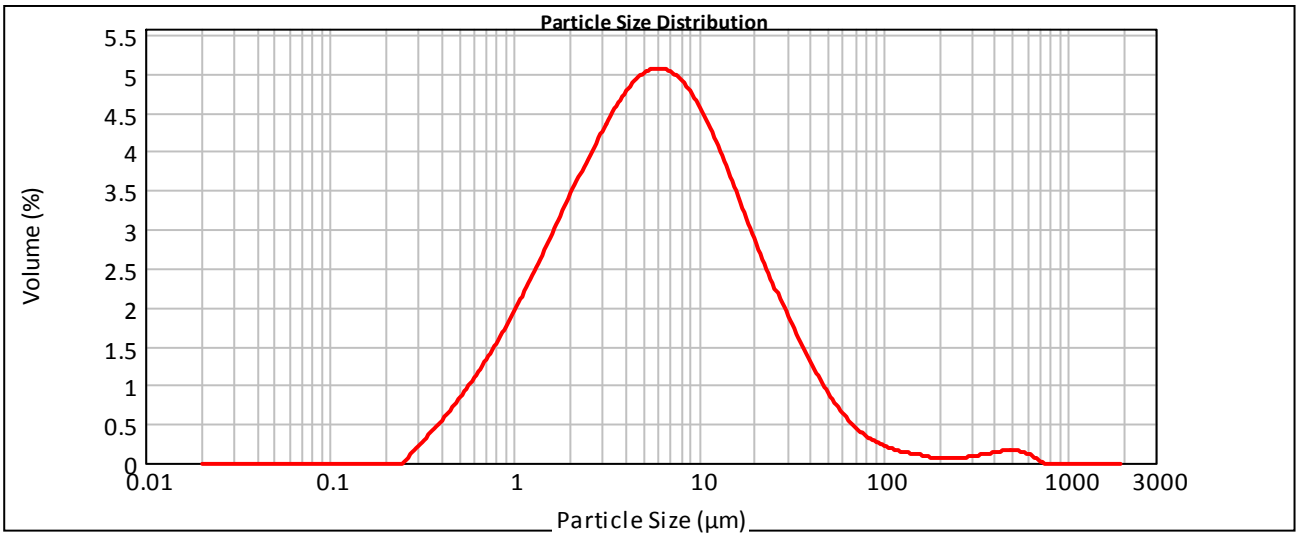
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.01	5.053	2.83	40.244	1.18	320.535	1.53
0.011	0.00	0.090	0.00	0.717	1.17	5.709	2.81	45.469	1.05	362.148	1.46
0.013	0.00	0.102	0.00	0.810	1.33	6.450	2.78	51.371	0.94	409.163	1.29
0.014	0.00	0.115	0.00	0.915	1.49	7.287	2.75	58.041	0.84	462.281	1.04
0.016	0.00	0.130	0.00	1.034	1.65	8.233	2.71	65.575	0.74	522.296	0.72
0.018	0.00	0.147	0.00	1.168	1.81	9.302	2.68	74.089	0.66	590.102	0.36
0.021	0.00	0.166	0.00	1.320	1.97	10.510	2.63	83.707	0.59	666.711	0.03
0.024	0.00	0.187	0.00	1.491	2.11	11.874	2.57	94.574	0.54	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.25	13.416	2.49	106.852	0.52	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.38	15.157	2.39	120.724	0.54	961.542	0.00
0.034	0.00	0.270	0.10	2.150	2.50	17.125	2.27	136.397	0.60	1086.372	0.00
0.038	0.00	0.305	0.19	2.429	2.60	19.348	2.13	154.104	0.71	1227.408	0.00
0.043	0.00	0.345	0.31	2.745	2.69	21.860	1.97	174.110	0.86	1386.753	0.00
0.049	0.00	0.389	0.42	3.101	2.75	24.698	1.81	196.714	1.05	1566.785	0.00
0.055	0.00	0.440	0.56	3.503	2.80	27.904	1.64	222.251	1.24	1770.189	0.00
0.062	0.00	0.497	0.70	3.958	2.83	31.527	1.48	251.105	1.40	2000.000	0.00
0.070	0.00	0.561	0.85	4.472	2.84	35.620	1.32	283.704	1.51		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/23 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.55 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.344 %	**Result Emulation:** Off
Concentration: 0.0049 %Vol	**Span :** 4.431	**Uniformity:** 2.05	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 14.336 um	

d(0.1): 1.167 um **d(0.5):** 5.689 um **d(0.9):** 26.374 um



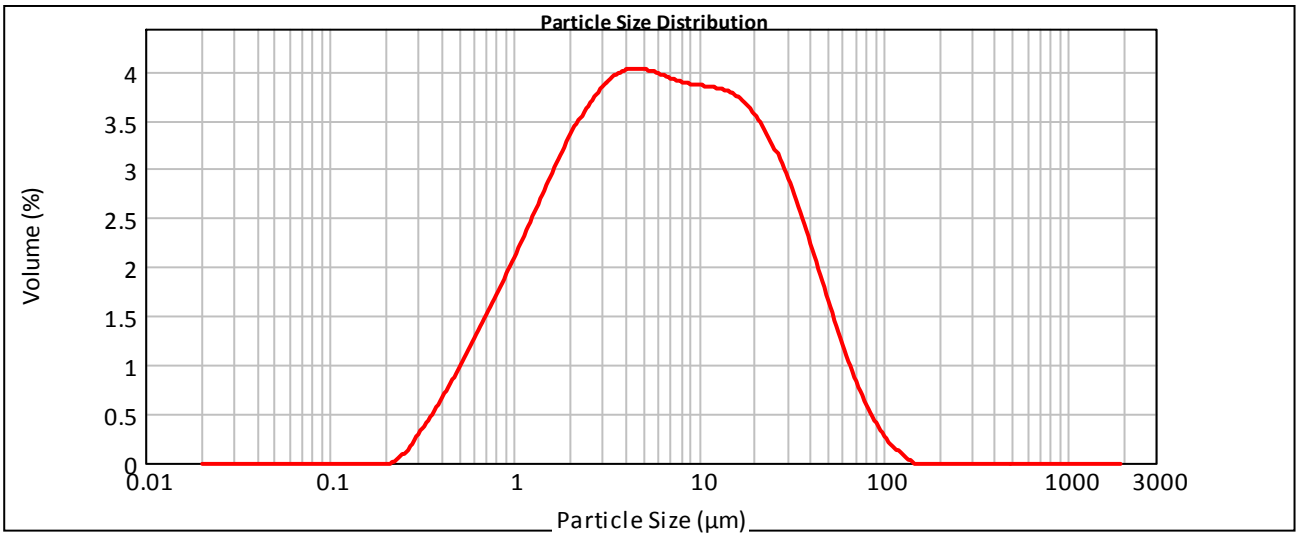
Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.00	5.053	4.02	40.244	0.94	320.535	0.08
0.011	0.00	0.090	0.00	0.717	1.16	5.709	4.04	45.469	0.77	362.148	0.10
0.013	0.00	0.102	0.00	0.810	1.32	6.450	4.02	51.371	0.61	409.163	0.12
0.014	0.00	0.115	0.00	0.915	1.50	7.287	3.95	58.041	0.48	462.281	0.13
0.016	0.00	0.130	0.00	1.034	1.69	8.233	3.84	65.575	0.38	522.296	0.12
0.018	0.00	0.147	0.00	1.168	1.89	9.302	3.69	74.089	0.29	590.102	0.08
0.021	0.00	0.166	0.00	1.320	2.09	10.510	3.50	83.707	0.23	666.711	0.02
0.024	0.00	0.187	0.00	1.491	2.30	11.874	3.28	94.574	0.18	753.265	0.00
0.027	0.00	0.211	0.00	1.684	2.52	13.416	3.03	106.852	0.14	851.056	0.00
0.030	0.00	0.239	0.01	1.903	2.74	15.157	2.78	120.724	0.11	961.542	0.00
0.034	0.00	0.270	0.15	2.150	2.95	17.125	2.52	136.397	0.09	1086.372	0.00
0.038	0.00	0.305	0.23	2.429	3.16	19.348	2.26	154.104	0.08	1227.408	0.00
0.043	0.00	0.345	0.35	2.745	3.36	21.860	2.01	174.110	0.05	1386.753	0.00
0.049	0.00	0.389	0.46	3.101	3.55	24.698	1.77	196.714	0.05	1566.785	0.00
0.055	0.00	0.440	0.58	3.503	3.71	27.904	1.54	222.251	0.04	1770.189	0.00
0.062	0.00	0.497	0.71	3.958	3.85	31.527	1.33	251.105	0.05	2000.000	0.00
0.070	0.00	0.561	0.85	4.472	3.95	35.620	1.13	283.704	0.07		
0.080	0.00	0.634		5.053		40.244		320.535			

EAL
Result Analysis Report

Sample Name:
G6135/24 - Average

Particle Name: Soil	**Accessory Name:** Hydro 2000MU (A)	**Analysis model:** General purpose	**Sensitivity:** Normal
Particle RI: 1.540	**Absorption:** 1	**Size range:** 0.020 to 2000.000 um	**Obscuration:** 12.65 %
Dispersant Name: Sodium Metaphosphate	**Dispersant RI:** 1.482	**Weighted Residual:** 0.253 %	**Result Emulation:** Off
Concentration: 0.0047 %Vol	**Span :** 5.239	**Uniformity:** 1.64	**Result units:** Volume
		Vol. Weighted Mean D[4,3]: 12.873 um	

d(0.1): 1.063 um **d(0.5):** 6.225 um **d(0.9):** 33.675 um



Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %	Size (µm)	Volume In %
0.010	0.00	0.080	0.00	0.634	1.14	5.053	3.20	40.244	1.66	320.535	0.00
0.011	0.00	0.090	0.00	0.717	1.30	5.709	3.17	45.469	1.40	362.148	0.00
0.013	0.00	0.102	0.00	0.810	1.46	6.450	3.14	51.371	1.15	409.163	0.00
0.014	0.00	0.115	0.00	0.915	1.63	7.287	3.11	58.041	0.92	462.281	0.00
0.016	0.00	0.130	0.00	1.034	1.80	8.233	3.09	65.575	0.70	522.296	0.00
0.018	0.00	0.147	0.00	1.168	1.97	9.302	3.08	74.089	0.52	590.102	0.00
0.021	0.00	0.166	0.00	1.320	2.15	10.510	3.07	83.707	0.36	666.711	0.00
0.024	0.00	0.187	0.00	1.491	2.33	11.874	3.05	94.574	0.24	753.265	0.00
0.027	0.00	0.211	0.02	1.684	2.50	13.416	3.03	106.852	0.13	851.056	0.00
0.030	0.00	0.239	0.08	1.903	2.66	15.157	2.99	120.724	0.08	961.542	0.00
0.034	0.00	0.270	0.19	2.150	2.81	17.125	2.92	136.397	0.00	1086.372	0.00
0.038	0.00	0.305	0.30	2.429	2.94	19.348	2.83	154.104	0.00	1227.408	0.00
0.043	0.00	0.345	0.42	2.745	3.05	21.860	2.70	174.110	0.00	1386.753	0.00
0.049	0.00	0.389	0.55	3.101	3.13	24.698	2.54	196.714	0.00	1566.785	0.00
0.055	0.00	0.440	0.69	3.503	3.18	27.904	2.35	222.251	0.00	1770.189	0.00
0.062	0.00	0.497	0.84	3.958	3.21	31.527	2.14	251.105	0.00	2000.000	0.00
0.070	0.00	0.561	0.99	4.472	3.21	35.620	1.90	283.704	0.00		
0.080	0.00	0.634		5.053		40.244		320.535	0.00		

Appendix D

Bed Sediment Acid Sulfate Soil Analysis

RESULTS OF ACID SULFATE SOIL ANALYSIS

24 samples supplied by Env Solutions Pty Ltd on 20th December, 2017 - Lab. Job No. G6133

Analysis requested by Ollie Fick. **Your Project: Dredging**

PO Box 248 BALLINA NSW 2478

Required if pH_{KCl} <4.5 — required if pH_{KCl} > 6.5

Sample Site	EAL lab code	TEXTURE	MOISTURE CONTENT		REDUCED INORGANIC SULFUR (% chromium reducible S)		RETAINED ACIDITY $\%S_{NAS}$ ($\%S_{KCl}$ - $\%S_{KCl}$)	RETAINED ACIDITY S_{NAS}	ACID NEUTRALISING CAPACITY (ANC_{BT})		TITRATABLE ACTUAL ACIDITY (TAA)	(To pH 6.5)	TITRATABLE POTENTIAL ACIDITY (TPA)		(To pH 6.5)	TITRATABLE SULFIDIC ACIDITY (TSA)	NET ACIDITY (Sulfur Trail) mol H+/t	NET ACIDITY (Acid Trail) mol H+/t	LIME CALCULATION (Scr Sulfur Trail) kg $CaCO_3$/t DW	LIME CALCULATION (Acid Trail) kg $CaCO_3$/t DW
		(note 7)	(% moisture of total wet weight)	(g moisture / g of oven dry soil)	(%Scr)	mol H+/t	(HCL digest)	(mol H+/t)	(% $CaCO_3$)	(mol H+/t)	pH_{kcl}	(mol H+/t)	pH_{ox}	pH_{TPA}	(mol H+/t)	(mol H+/t)	(based on %Scrs)	(based on TPA)	(includes 1.5 safety Factor when liming rate is +ve)	
Method No.					*22B*	*a- 22B*	*23R*	*a-23R*	*19A2*	*a-19A2*	*23A*	*23F*	*23B*		*23G*	*23H*	*note 5*	*note 5*	*note 6*	*note 6*
S1 0.0-0.5	*G6133/1*	Medium	32.2	0.47	0.114	71	..	..	0.58	116	7.24	0	4.42	5.02	9	9	-7	9	0	1
S1 0.5-1.0	*G6133/2*	Fine	28.0	0.39	0.285	178	..	..	0.82	164	7.45	0	3.25	3.35	69	69	69	69	5	5
S2 0.0-0.5	*G6133/3*	Fine	42.8	0.75	0.718	448	..	..	2.22	444	8.44	0	3.69	3.64	115	115	151	115	11	9
S2 0.5-1.0	*G6133/4*	Fine	44.5	0.80	0.412	257	..	..	2.20	439	8.58	0	5.26	5.30	16	16	-36	16	-3	1
S3 0.0-0.5	*G6133/5*	Coarse	21.2	0.27	0.005	3	..	..	0.33	66	7.74	0	6.79	6.92	0	0	-41	0	-3	0
S3 0.5-1.0	*G6133/6*	Coarse	22.4	0.29	0.017	11	..	..	0.54	108	7.96	0	6.79	7.24	0	0	-62	0	-5	0
S4 0.0-0.5	*G6133/7*	Coarse	25.8	0.35	0.043	27	..	..	0.40	80	7.54	0	6.08	6.60	0	0	-26	0	-2	0
S4 0.5-1.0	*G6133/8*	Coarse	19.5	0.24	0.009	6	..	..	0.32	63	7.53	0	6.31	6.88	0	0	-36	0	-3	0
S5 0.0-0.5	*G6133/9*	Coarse	19.7	0.25	0.125	78	..	..	0.95	190	9.19	0	7.99	7.76	0	0	-49	0	-4	0
S5 0.5-1.0	*G6133/10*	Fine	37.6	0.60	1.181	737	..	..	4.00	800	8.52	0	3.38	3.50	142	142	203	142	15	11
S6 0.0-0.5	*G6133/11*	Fine	36.2	0.57	0.576	359	..	..	3.73	745	8.73	0	6.44	5.94	6	6	-137	6	-10	0
S6 0.5-1.0	*G6133/12*	Fine	42.5	0.74	1.601	998	..	..	3.60	718	8.42	0	2.51	2.59	495	495	519	495	39	37
S61 0.0-0.5	*G6133/13*	Fine	43.2	0.76	1.642	1024	..	..	6.49	1297	8.52	0	3.30	3.31	173	173	160	173	12	13
S7 0.0-0.5	*G6133/14*	Fine	29.6	0.42	0.497	310	..	..	3.06	612	8.92	0	7.00	6.32	2	2	-98	2	-7	0
S7 0.5-1.0	*G6133/15*	Fine	46.1	0.86	2.480	1547	..	..	3.90	780	8.42	0	2.17	2.14	934	934	1027	934	77	70
S8 0.0-0.5	*G6133/16*	Fine	41.9	0.72	1.268	791	..	..	3.86	771	8.51	0	3.38	3.27	151	151	277	151	21	11
S8 0.5-1.0	*G6133/17*	Fine	44.2	0.79	1.818	1134	..	..	3.39	677	8.36	0	2.45	2.30	634	634	682	634	51	48
S9 0.0-0.5	*G6133/18*	Fine	27.7	0.38	0.368	230	..	..	4.75	950	8.92	0	8.45	8.32	0	0	-404	0	-30	0
S9 0.5-1.0	*G6133/19*	Fine	42.5	0.74	1.302	812	..	..	6.11	1220	8.46	0	6.73	6.36	4	4	-1	4	0	0
S10 0.0-0.5	*G6133/20*	Fine	28.0	0.39	0.402	251	..	..	2.60	520	8.72	0	7.07	6.90	0	0	-96	0	-7	0
S10 0.5-1.0	*G6133/21*	Fine	35.1	0.54	1.521	949	..	..	3.10	619	8.51	0	2.51	2.38	432	432	536	432	40	32
S11 0.0-0.5	*G6133/22*	Fine	33.8	0.51	1.720	1073	..	..	7.81	1560	8.60	0	6.04	5.81	10	10	33	10	2	1
S11 0.5-1.0	*G6133/23*	Fine	40.2	0.67	1.774	1107	..	..	3.68	734	8.36	0	2.35	2.27	609	609	617	609	46	46
S12 0.5-1.0	*G6133/24*	Fine	34.3	0.52	1.519	947	..	..	9.54	1906	8.57	0	6.55	6.21	4	4	-323	4	-24	0

NOTE:

1 - All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)

2 - Samples analysed by SPOCAS method 23 (ie Suspension Peroxide Oxidation Combined Acidity & sulfate) and 'Chromium Reducible Sulfur' technique (Scr - Method 22B)

3 - Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). ***Acid Sulfate Soils Laboratory Methods Guidelines.*** QLD DNRME.

4 - Bulk Density is required for liming rate calculations per soil volume. Lab. Bulk Density is no longer applicable - field bulk density rings can be used and dried/ weighed in the laboratory.

5 - **ABA Equation: Net Acidity = Potential Sulfidic Acidity (ie. Scrs or Sox) + Actual Acidity + Retained Acidity - measured ANC/FF (with FF currently defaulted to 1.5)**

6 - The neutralising requirement, lime calculation, includes a 1.5 safety margin for acid neutralisation (an increased safety factor may be required in some cases)

7 - For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays

8 - .. denotes not requested or required

9 - SCREENING, CRS, TAA and ANC are NATA accredited but other SPOCAS segments are currently not NATA accredited

10- Results at or below detection limits are replaced with '0' for calculation purposes.

11 - Projects that disturb >1000 tonnes of soil, the ≥0.03% S classification guideline would apply (refer to acid sulfate management guidelines).

NATA Accreditation No. 14960. Accredited for compliance with ISO/IEC 17025.

(Classification of potential acid sulfate material if: coarse Scr≥0.03%S or 19mole H+/t; medium Scr≥0.06%S or 37mole H+/t; fine Scr≥0.1%S or 62mole H+/t) - as per QUASSIT Laboratory Methods Guidelines

checked: .....

Graham Lancaster (Nata signatory)

Laboratory Manager

Environmental Analysis Laboratory, Southern Cross University,
Tel. 02 6620 3678, website: scu.edu.au/eal

Appendix E

Bed Sediment Contamination Analysis

RESULTS OF SEDIMENT ANALYSIS

24 soil samples supplied by Env Solutions Pty Ltd on 21st December, 2017 - Lab Job No. G6135
Analysis requested by Ollie Fick. **Your Job: Dredging**
PO Box 248 BALLINA NSW 2478

ANALYTE	METHOD REFERENCE	Sample 1 S1 0.0-0.5	Sample 2 S1 0.5-1.0	Sample 3 S2 0.0-0.5	Sample 4 S2 0.5-1.0	Sample 5 S3 0.0-0.5	Sample 6 S3 0.5-1.0	Sample 7 S4 0.0-0.5	Sample 8 S4 0.5-1.0
	Job No.	*G6135/1*	*G6135/2*	*G6135/3*	*G6135/4*	*G6135/5*	*G6135/6*	*G6135/7*	*G6135/8*
MOISTURE %	c	32	29	48	34	21	22	26	23
TEXTURE		Silt	Silt	Silt	Silt	Sand	Sand	Sand	Sand
Total Organic Carbon (%C)	*HCL treatment- LECO Analyser*	0.81	1.14	1.57	2.11	0.33	0.22	0.39	0.34
SILVER (mg/kg DW)	*a*	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1
ARSENIC (mg/kg DW)	*a*	4	5	6	9	7	6	6	5
LEAD (mg/kg DW)	*a*	3	3	6	6	2	1	2	2
CADMIUM (mg/kg DW)	*a*	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1
CHROMIUM (mg/kg DW)	*a*	11	13	26	26	7	5	7	6
COPPER (mg/kg DW)	*a*	6	6	12	13	3	1	3	2
MANGANESE (mg/kg DW)	*a*	86	85	174	182	110	100	76	82
NICKEL (mg/kg DW)	*a*	11	12	20	22	7	5	7	6
SELENIUM (mg/kg DW)	*a*	0.4	0.4	0.6	0.8	0.3	0.1	0.3	0.1
ZINC (mg/kg DW)	*a*	46	47	81	85	38	31	35	31
MERCURY (mg/kg DW)	*a*	0.02	0.03	0.07	0.06	0.01	0.01	0.01	0.01
IRON (% DW)	*a*	1.91	2.13	3.52	3.65	1.92	1.61	1.77	1.57
ALUMINIUM (% DW)	*a*	0.63	0.70	1.52	1.58	0.38	0.26	0.45	0.33
BERYLLIUM (mg/kg DW)	*a*	0.4	0.4	0.8	0.8	0.3	0.3	0.4	0.3
BORON (mg/kg DW)	*a*	10	10	17	24	7	5	8	6
COBALT (mg/kg DW)	*a*	15	16	22	25	15	13	12	12
PESTICIDE ANALYSIS SCREEN									
DDT+DDE+DDD (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin + Dieldrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organochlorine Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organophosphate Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB's (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HYDROCARBON ANALYSIS RESULTS									
BTEX	*c*								
Benzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total m+p-Xylenes (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (ortho.meta & para)	*c*	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total BTEX (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
Total Recoverable Hydrocarbons	*c*								
C6-C10 (Volatile) Fraction (mg/kg)	*c*	<10	<10	<10	<10	<10	<10	<10	<10
C10-C14 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
C15-C28 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Sum of C6-C36 (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C10-C16 less Naphthalene (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C16-C34 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C34-C40 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Polyaromatic Hydrocarbons (PAH)									
Naphthalene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)&(k)flouranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene (BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h) anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)peryiene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sum of reported PAHs (mg/kg)	*c*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Carcinogenic PAHs (as BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (half)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Cyanide (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBT									
Monobutyltin (µg/kg)	*c*	<10	<5	<5	<5	<2	<2	<2	<2
Dibutyltin (µg/kg)	*c*	<0.5	<1	<1	<1	<1	<0.5	<0.5	<0.5
Tributyltin (µg/kg)	*c*	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Contaminants (Physical - rubber, plastic, bitumen, paper, cloth, paint wood) (%)	*** As per RTA T276*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

METHODS REFERENCE

a. ^{13}Nitric/HCl digest - APHA 3125 ICPMS
b. ^{13}Nitric/HCl digest - APHA 3120 ICPOES
c. Analysis sub-contracted - Envirolab report no. 182701

NOTES

DW = Dry Weight. na = no guidelines available; n.d. denotes not detected

Organochlorine pesticide (OC's) screen:

(HCB, alpha-BHC, gamma-BHC, Heptachlor, delta-BHC, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, Endosulfan 1, pp-DDE, Dieldrin, Endrin, pp-DDD, Endosulfan 2, pp-DDT, Endrin Aldehyde, Endosulfan Sulphate, Methoxychlor)

Organophosphorus pesticide (OP's) screen:

(Azinphos-methyl (Guthion), Bromophos-ethyl, Chlorpyriphos, Chlorpyriphos-methyl, Diazinon, Dichlorvos, Dimethoate, Ethion, Fenitrothion, Malathion, Parathion, Ronnel)

PCB's = Polychloriniated Biphenyls: (Arochlor 1016, 1232, 1242, 1248, 1254, 1260)

checked:.....

RESULTS OF SEDIMENT ANALYSIS

24 soil samples supplied by Env Solutions Pty Ltd on 21st December, 2017 - Lab Job No. G6135
Analysis requested by Ollie Fick. **Your Job: Dredging**
PO Box 248 BALLINA NSW 2478

ANALYTE	METHOD REFERENCE	Sample 9 S5 0.0-0.5	Sample 10 S5 0.5-1.0	Sample 11 S6 0.0-0.5	Sample 12 S6 0.5-1.0	Sample 13 S61 0.0-0.5	Sample 14 S7 0.0-0.5	Sample 15 S7 0.5-1.0	Sample 16 S8 0.0-0.5
	Job No.	*G6135/9*	*G6135/10*	*G6135/11*	*G6135/12*	*G6135/13*	*G6135/14*	*G6135/15*	*G6135/16*
MOISTURE %	c	20	35	43	47	44	22	42	37
TEXTURE		Sand	Clay	Clay	Clay	Clay	Sand	Silt	Silt
Total Organic Carbon (%C)	*HCL treatment- LECO Analyser*	3.46	1.11	1.01	1.08	1.22	0.32	1.05	1.14
SILVER (mg/kg DW)	*a*	0.1	0.1	<0.1	0.1	0.1	<0.1	<0.1	0.1
ARSENIC (mg/kg DW)	*a*	25	9	8	9	8	5	7	7
LEAD (mg/kg DW)	*a*	2	7	6	7	7	1	5	7
CADMIUM (mg/kg DW)	*a*	0.1	0.1	0.1	0.1	0.1	<0.1	0.1	0.1
CHROMIUM (mg/kg DW)	*a*	11	45	34	40	40	5	27	39
COPPER (mg/kg DW)	*a*	6	18	14	17	18	2	14	17
MANGANESE (mg/kg DW)	*a*	138	333	351	564	432	76	402	331
NICKEL (mg/kg DW)	*a*	18	35	29	33	34	5	25	32
SELENIUM (mg/kg DW)	*a*	0.5	0.7	0.7	0.7	0.7	0.0	0.6	0.6
ZINC (mg/kg DW)	*a*	35	90	73	85	86	29	61	84
MERCURY (mg/kg DW)	*a*	0.05	0.12	0.08	0.05	0.06	0.01	0.04	0.08
IRON (% DW)	*a*	3.35	5.49	4.64	5.24	5.48	1.54	4.22	4.89
ALUMINIUM (% DW)	*a*	0.53	2.47	2.08	2.42	2.70	0.27	1.79	2.20
BERYLLIUM (mg/kg DW)	*a*	0.3	1.1	0.8	1.1	1.2	0.2	0.8	0.9
BORON (mg/kg DW)	*a*	30	21	19	20	25	6	17	19
COBALT (mg/kg DW)	*a*	33	31	27	30	28	11	22	29
PESTICIDE ANALYSIS SCREEN									
DDT+DDE+DDD (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin + Dieldrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organochlorine Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organophosphate Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB's (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HYDROCARBON ANALYSIS RESULTS									
BTEX	*c*								
Benzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total m+p-Xylenes (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (ortho,meta & para)	*c*	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total BTEX (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
Total Recoverable Hydrocarbons	*c*								
C6-C10 (Volatile) Fraction (mg/kg)	*c*	<10	<10	<10	<10	<10	<10	<10	<10
C10-C14 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
C15-C28 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Sum of C6-C36 (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C10-C16 less Naphthalene (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C16-C34 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C34-C40 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Polyaromatic Hydrocarbons (PAH)									
Naphthalene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)&(k)flouranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene (BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h) anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)peryiene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sum of reported PAHs (mg/kg)	*c*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Carcinogenic PAHs (as BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (half)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Cyanide (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBT									
Monobutyltin (µg/kg)	*c*	<2	<2	<1	<0.5	<0.5	<0.5	<0.5	<0.5
Dibutyltin (µg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tributyltin (µg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Contaminants (Physical - rubber, plastic, bitumen, paper, cloth, paint wood) (%)	*** As per RTA T276*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

METHODS REFERENCE

a. $^{1:3}$Nitric/HCl digest - APHA 3125 ICPMS
b. $^{1:3}$Nitric/HCl digest - APHA 3120 ICPOES
c. Analysis sub-contracted - Envirolab report no. 182701

NOTES

DW = Dry Weight. na = no guidelines available; n.d. denotes not detected

Organochlorine pesticide (OC's) screen:

(HCB, alpha-BHC, gamma-BHC, Heptachlor, delta-BHC, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, Endosulfan 1, pp-DDE, Dieldrin, Endrin, pp-DDD, Endosulfan 2, pp-DDT, Endrin Aldehyde, Endosulfan Sulphate, Methoxychlor)

Organophosphorus pesticide (OP's) screen:

(Azinphos-methyl (Guthion), Bromophos-ethyl, Chlorpyriphos, Chlorpyriphos-methyl, Diazinon, Dichlorvos, Dimethoate, Ethion, Fenitrothion, Malathion, Parathion, Ronnel)

PCB's = Polychloriniated Biphenyls: (Arochlor 1016, 1232, 1242, 1248, 1254, 1260)

checked:.....

RESULTS OF SEDIMENT ANALYSIS

24 soil samples supplied by Env Solutions Pty Ltd on 21st December, 2017 - Lab Job No. G6135
Analysis requested by Ollie Fick. **Your Job: Dredging**
PO Box 248 BALLINA NSW 2478

ANALYTE	METHOD REFERENCE	Sample 17 S8 0.5-1.0	Sample 18 S9 0.0-0.5	Sample 19 S9 0.5-1.0	Sample 20 S10 0.0-0.5	Sample 21 S10 0.5-1.0	Sample 22 S11 0.0-0.5	Sample 23 S11 0.5-1.0	Sample 24 S12 0.5-1.0
Job No.		*G6135/17*	*G6135/18*	*G6135/19*	*G6135/20*	*G6135/21*	*G6135/22*	*G6135/23*	*G6135/24*
MOISTURE %	c	44	30	34	33	29	42	38	41
TEXTURE		Silt	Silt	Clay	Silt	Silt	Clay	Clay	Clay
Total Organic Carbon (%C)	*HCL treatment- LECO Analyser*	1.20	1.05	1.28	1.02	0.75	1.13	1.37	1.31
SILVER (mg/kg DW)	*a*	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ARSENIC (mg/kg DW)	*a*	8	5	9	5	4	9	7	8
LEAD (mg/kg DW)	*a*	7	3	7	5	3	6	8	8
CADMIUM (mg/kg DW)	*a*	0.1	0.1	0.1	<0.1	0.1	0.1	0.1	0.1
CHROMIUM (mg/kg DW)	*a*	43	20	38	19	20	34	46	47
COPPER (mg/kg DW)	*a*	17	8	16	10	9	16	21	20
MANGANESE (mg/kg DW)	*a*	345	120	653	124	112	305	376	343
NICKEL (mg/kg DW)	*a*	35	16	32	17	16	30	40	40
SELENIUM (mg/kg DW)	*a*	1.0	0.3	1.0	0.3	0.2	0.7	0.7	1.0
ZINC (mg/kg DW)	*a*	88	56	81	59	42	73	95	97
MERCURY (mg/kg DW)	*a*	0.04	0.02	0.06	0.04	0.03	0.05	0.04	0.06
IRON (% DW)	*a*	5.29	2.91	5.26	2.86	2.32	4.86	5.69	5.70
ALUMINIUM (% DW)	*a*	2.63	1.06	2.39	1.13	1.08	2.17	2.90	2.87
BERYLLIUM (mg/kg DW)	*a*	1.2	0.5	1.0	0.7	0.5	0.9	1.3	1.1
BORON (mg/kg DW)	*a*	21	13	20	11	10	18	19	18
COBALT (mg/kg DW)	*a*	30	17	28	17	14	25	31	31
PESTICIDE ANALYSIS SCREEN									
DDT+DDE+DDD (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin + Dieldrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organochlorine Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Organophosphate Pesticides (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB's (mg/kg)	*c*	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HYDROCARBON ANALYSIS RESULTS									
BTEX	*c*								
Benzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total m+p-Xylenes (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (ortho,meta & para)	*c*	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total BTEX (mg/kg)	*c*	<1	<1	<1	<1	<1	<1	<1	<1
Total Recoverable Hydrocarbons	*c*								
C6-C10 (Volatile) Fraction (mg/kg)	*c*	<10	<10	<10	<10	<10	<10	<10	<10
C10-C14 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
C15-C28 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Sum of C6-C36 (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C10-C16 less Naphthalene (mg/kg)	*c*	<50	<50	<50	<50	<50	<50	<50	<50
>C16-C34 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
>C34-C40 Fraction (mg/kg)	*c*	<100	<100	<100	<100	<100	<100	<100	<100
Polyaromatic Hydrocarbons (PAH)									
Naphthalene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)&(k)flouranthene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene (BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h) anthracene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)peryiene (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sum of reported PAHs (mg/kg)	*c*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Carcinogenic PAHs (as BaP TEQ) (mg/kg)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (half)	*c*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Cyanide (mg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TBT									
Monobutyltin (µg/kg)	*c*	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibutyltin (µg/kg)	*c*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tributyltin (µg/kg)	*c*	<0.5	<4	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0
Contaminants (Physical - rubber, plastic, bitumen, paper, cloth, paint wood) (%)	*** As per RTA T276*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

METHODS REFERENCE

a. ^{13}Nitric/HCl digest - APHA 3125 ICPMS
b. ^{13}Nitric/HCl digest - APHA 3120 ICPOES
c. Analysis sub-contracted - Envirolab report no. 182701

NOTES

DW = Dry Weight. na = no guidelines available; n.d. denotes not detected

Organochlorine pesticide (OC's) screen:

(HCB, alpha-BHC, gamma-BHC, Heptachlor, delta-BHC, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, Endosulfan 1, pp-DDE, Dieldrin, Endrin, pp-DDD, Endosulfan 2, pp-DDT, Endrin Aldehyde, Endosulfan Sulphate, Methoxychlor)

Organophosphorus pesticide (OP's) screen:

(Azinphos-methyl (Guthion), Bromophos-ethyl, Chlorpyriphos, Chlorpyriphos-methyl, Diazinon, Dichlorvos, Dimethoate, Ethion, Fenitrothion, Malathion, Parathion, Ronnel)

PCB's = Polychloriniated Biphenyls: (Arochlor 1016, 1232, 1242, 1248, 1254, 1260)

checked:.....

RESULTS OF SEDIMENT ANALYSIS

24 soil samples supplied by Env Solutions Pty Ltd on 21st December, 2017 - Lab Job No. G6135
Analysis requested by Ollie Fick. **Your Job: Dredging**
PO Box 248 BALLINA NSW 2478

ANALYTE	METHOD REFERENCE
	Job No.
MOISTURE %	c
TEXTURE	
Total Organic Carbon (%C)	*HCL treatment- LECO Analyser*
SILVER (mg/kg DW)	*a*
ARSENIC (mg/kg DW)	*a*
LEAD (mg/kg DW)	*a*
CADMIUM (mg/kg DW)	*a*
CHROMIUM (mg/kg DW)	*a*
COPPER (mg/kg DW)	*a*
MANGANESE (mg/kg DW)	*a*
NICKEL (mg/kg DW)	*a*
SELENIUM (mg/kg DW)	*a*
ZINC (mg/kg DW)	*a*
MERCURY (mg/kg DW)	*a*
IRON (% DW)	*a*
ALUMINIUM (% DW)	*a*
BERYLLIUM (mg/kg DW)	*a*
BORON (mg/kg DW)	*a*
COBALT (mg/kg DW)	*a*
PESTICIDE ANALYSIS SCREEN	
DDT+DDE+DDD (mg/kg)	*c*
Aldrin + Dieldrin (mg/kg)	*c*
Chlordane (mg/kg)	*c*
Endosulfan (mg/kg)	*c*
Endrin (mg/kg)	*c*
Heptachlor (mg/kg)	*c*
HCB (mg/kg)	*c*
Methoxychlor (mg/kg)	*c*
Other Organochlorine Pesticides (mg/kg)	*c*
Chlorpyrifos (mg/kg)	*c*
Other Organophosphate Pesticides (mg/kg)	*c*
PCB's (mg/kg)	*c*
HYDROCARBON ANALYSIS RESULTS	
BTEX	*c*
Benzene (mg/kg)	*c*
Toluene (mg/kg)	*c*
Ethylbenzene (mg/kg)	*c*
Total m+p-Xylenes (mg/kg)	*c*
o-Xylene (mg/kg)	*c*
Xylenes (ortho.meta & para)	*c*
Total BTEX (mg/kg)	*c*
Total Recoverable Hydrocarbons	*c*
C6-C10 (Volatile) Fraction (mg/kg)	*c*
C10-C14 Fraction (mg/kg)	*c*
C15-C28 Fraction (mg/kg)	*c*
C29-C36 Fraction (mg/kg)	*c*
Sum of C6-C36 (mg/kg)	*c*
>C10-C16 Fraction (mg/kg)	*c*
>C10-C16 less Naphthalene (mg/kg)	*c*
>C16-C34 Fraction (mg/kg)	*c*
>C34-C40 Fraction (mg/kg)	*c*
Polyaromatic Hydrocarbons (PAH)	
Naphthalene (mg/kg)	*c*
Acenaphthylene (mg/kg)	*c*
Acenaphthene (mg/kg)	*c*
Fluorene (mg/kg)	*c*
Phenanthrene (mg/kg)	*c*
Anthracene (mg/kg)	*c*
Fluoranthene (mg/kg)	*c*
Pyrene (mg/kg)	*c*
Benzo(a)anthracene (mg/kg)	*c*
Chrysene (mg/kg)	*c*
Benzo(b)&(k)flouranthene (mg/kg)	*c*
Benzo(a)pyrene (BaP TEQ) (mg/kg)	*c*
Indeno(1,2,3-c,d)pyrene (mg/kg)	*c*
Dibenzo(a,h) anthracene (mg/kg)	*c*
Benzo(g,h,i)perylene (mg/kg)	*c*
Sum of reported PAHs (mg/kg)	*c*
Carcinogenic PAHs (as BaP TEQ) (mg/kg)	*c*
Benzo(a)pyrene TEQ calc (zero)	*c*
Benzo(a)pyrene TEQ calc (half)	*c*
Total Cyanide (mg/kg)	*c*
TBT	
Monobutyltin (µg/kg)	*c*
Dibutyltin (µg/kg)	*c*
Tributyltin (µg/kg)	*c*
Contaminants (Physical - rubber, plastic, bitumen, paper, cloth, paint wood) (%)	*** As per RTA T276*

METHODS REFERENCE

a. $^{1:3}$Nitric/HCl digest - APHA 3125 ICPMS
b. $^{1:3}$Nitric/HCl digest - APHA 3120 ICPOES
c. Analysis sub-contracted - Envirolab report no. 182701

NOTES

DW = Dry Weight. na = no guidelines available; n.d. denotes not detected

Organochlorine pesticide (OC's) screen:

(HCB, alpha-BHC, gamma-BHC, Heptachlor, delta-BHC, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, Endosulfan 1, pp-DDE, Dieldrin, Endrin, pp-DDD, Endosulfan 2, pp-DDT, Endrin Aldehyde, Endosulfan Sulphate, Methoxychlor)

Organophosphorus pesticide (OP's) screen:

(Azinphos-methyl (Guthion), Bromophos-ethyl, Chlorpyriphos, Chlorpyriphos-methyl, Diazinon, Dichlorvos, Dimethoate, Ethion, Fenitrothion, Malathion, Parathion, Ronnel)

PCB's = Polychloriniated Biphenyls: (Arochlor 1016, 1232, 1242, 1248, 1254, 1260)

checked:.....