BMT WBM

Port of Brisbane Maintenance Dredging - Sediment Quality Report 2013

Reference: R.B20259.004.01.SAPIR 2013.docx
Date: December 2013
Confidential

Port of Brisbane Maintenance Dredging - Sediment Quality Report 2013

Prepared for:	Port of Brisbane Pty Ltd
Prepared by:	BMT WBM Pty Ltd (Member of the BMT group of companies)

Offices

Brisbane
Denver
London
Mackay
Melbourne
Newcastle
Perth
Sydney
Vancouver

Document Control Sheet

BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane Qld 4000
Australia
PO Box 203, Spring Hill 4004

Tel: +61 7 3831 6744
Fax: + 61 7 3832 3627

ABN 54 010 830 421

www.bmtwbm.com.au

Document:	R.B20259.004.01.SAPIR 2013.docx
Title:	Port of Brisbane Maintenance Dredging - Sediment Quality Report 2013
Project Manager:	Darren Richardson
Author:	Markus Billerbeck
Client:	Port of Brisbane Pty Ltd
Client Contact:	Craig Wilson / Rachael Attard
Client Reference:	

Synopsis: **A report describing the sampling and analysis of sediment quality in the Port of Brisbane in accordance with the National Assessment Guidelines for Dredging (2009)**

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	13.12.13	DLR		MMB	
1	17.12.13	DLR		MMB	

DISTRIBUTION

Destination	Revision										
	0	1	2	3	4	5	6	7	8	9	10
Port of Brisbane Pty Ltd	PDF	PDF									
BMT WBM File	PDF	PDF									
BMT WBM Library	PDF	PDF									

Executive Summary

Port of Brisbane Pty Ltd (PBPL) is required to maintain a minimum depth of clearance below the keel of vessels calling at the port to allow for effective shipping access to the port and ensure ship safety. PBPL propose to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and Moreton Bay, primarily using the Trailer Suction Hopper Dredge (TSHD) 'Brisbane'. Maintenance dredging works extend from the Hamilton Reach of the Brisbane River to the North West Channel located in northern Moreton Bay.

The characterisation of the physical and chemical properties of proposed dredged sediment was required to be undertaken in accordance with the National Assessment Guidelines for Dredging (NAGD).

Sediments within the proposed dredging Zones 2 (Colmslie to Pinkenba) and Zone 3 (within Port reaches) were characterised by a high proportion of fines greater than 80% of the total sediment. Clay contributed on average 47.7% and 48.9% in the Zone 2 and Zone 3 sediments, respectively. Dredging Zone 4 (Entrance Channel) was characterised by coarser sediments with an average sand content of 38.4% and 9.1% coarse gravel. Silts contributed on average 24.5% and the proportion of clay was 28.0% in Zone 4. Similarly, the reference sites were characterised by a high proportion of fines including the Mud Island Dredge Material Disposal Area and the Moreton Bay reference sites.

With regards to the chemical sediment characteristics, the sediments in the proposed dredging zones were characterised as suitable for ocean disposal in accordance with the NAGD guidelines.

Concentrations of metals and metalloids were generally below their respective NAGD screening levels across the study area. Cadmium was not detected in any sample. With the exception of nickel, all 95% UCL concentrations were below their respective NAGD screening level for all dredge zones. Nickel concentrations exceeded the NAGD screening level of 21 mg/kg at most locations, in particular within the dredge Zones 2 and 3. The 95% UCL for nickel exceeded the NAGD screening level for each dredge zone with concentrations of 41.2 mg/kg, 36.2 mg/kg and 27.5 mg/kg for Zone 2, Zone 3 and Zone 4, respectively.

Phase III elutriate and bioavailability testing was undertaken to further investigate the elevated nickel concentrations and their potential impact on water quality and sediment biota. Elutriate test results were below the laboratory Limit of Reporting (LOR) and therefore below the ANZECC/ARMCANZ (2000) marine trigger limit of 7 µg/L (99% species protection) for all tested samples. The dilute acid extraction results were below the NAGD screening level of 21 mg/kg for all samples. These results indicate that impacts to water quality can be considered minimal during dredging and spoil disposal with regards to nickel. Furthermore, the bioavailable nickel fraction is unlikely to result in adverse impacts to sediment biota. As per NAGD, the sediments in the proposed dredge zones are characterised as suitable for ocean disposal with respect to nickel.

Most organic contaminants including organotins, Total Petroleum Hydrocarbons (TPHs), Polyaromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs) had either concentrations below the LOR or the 95% UCLs were below the respective NAGD screening levels. Furthermore, radionuclide activity was below the laboratory LOR at all investigated locations.

Whilst the 95% UCL for most organochlorine pesticides (OCPs) remained below the NAGD screening level for all dredge zones, the 95% UCL for DDE exceeded the NAGD screening level (2.2 µg/kg) across all

dredge areas with concentrations of 5.5 µg/kg, 5.1 µg/kg and 3.5 µg/kg for Zone 2, Zone 3 and Zone 4, respectively.

Phase III elutriate and porewater testing was undertaken to investigate the potential bioavailability of OCPs. Both elutriate and porewater testing resulted in concentrations below the laboratory LOR for all samples. It is noted that no trigger limits are given in ANZECC (2000) for DDE. However, based on the Phase III results the bioavailability of OCPs is considered very low and no adverse impacts on water quality and sediment biota are expected with respect to OCPs during dredging and spoil disposal. On the basis of the Phase II and Phase III testing for OCPs, the sediments in the proposed dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to OCPs.

Acid Sulfate Soil testing indicated that no management would be required for the sediments at all investigated locations within the proposed dredge zones. Whilst the sediments were characterised as potential acid sulfate soils (PASS), sufficient acid neutralising capacity (ANC) of the sediments was recorded. This means that the sediments have sufficient capacity for neutralising acids upon oxidation.

The evaluation of laboratory and field QA/QC procedures and assessments indicated that all sampling, sample handling and storage and laboratory analysis was undertaken to a high standard providing scientific confidence that the presented results are valid to allow an assessment of sediment quality against the NAGD guidelines.

Contents

List of Figures

List of Tables

Contents

1 Introduction

1.1 Background

Port of Brisbane Pty Ltd (PBPL) is required to maintain a minimum depth of clearance below the keel of vessels calling at the port to allow for effective shipping access to the port and ensure ship safety. Channel depths are declared by the Harbour Master (Maritime Safety Queensland) and displayed on various shipping charts. PBPL undertakes an annual maintenance dredging program to ensure these minimum depths are maintained.

PBPL propose to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and Moreton Bay, primarily using the Trailer Suction Hopper Dredge (TSHD) 'Brisbane'. Maintenance dredging works extend from the Hamilton Reach of the Brisbane River to the North West Channel located in northern Moreton Bay.

The characterisation of the physical and chemical properties of proposed dredged sediment was required to be undertaken in accordance with the National Assessment Guidelines for Dredging (Commonwealth of Australia 2009; henceforth NAGD).

The overall aim of this study is to assess the physical and chemical properties of sediments to be dredged from the Port of Brisbane, and on the basis of the approach set out in NAGD, assess the suitability of dredged material for unconfined ocean disposal. The specific objectives of the study were to:

- Describe and quantify the physical properties of sediments to be dredged;
- Quantify concentrations of potential contaminants in sediments to be dredged;
- Compare contaminant concentrations to screening levels set out in NAGD to determine whether there is a need for further assessment; and
- Assess the bioavailability of contaminants and potential toxicity effects based on comparisons of contaminant concentrations to guideline values.

1.2 Proposed Dredging

PBPL's area of responsibility in relation to maintenance and capital dredging within port limits can be broadly divided into two zones on the basis of the water body type, navigable depths and nature of dredged material:

- Moreton Bay zone (enclosed/open coastal waters); and
- Brisbane River zone including the Port of Brisbane (middle/lower estuary).

This SAP only considers assessment of sediments for the Brisbane River zone. The Brisbane River zone extends from Hamilton Reach to the Outer Bar Cutting. Annual maintenance dredging is required to remove sediments accumulated by natural siltation processes within the catchment and sediment loads from residential and commercial developments.

To ensure that declared depths of navigational channels are maintained at all times, PBPL undertakes 'insurance' dredging of up to -0.5 metres below the declared depth.

On average, PBPL dredges about 400,000 m^3 to 450,000 m^3 of material each year. Additional dredging needs to be undertaken following major flood events, i.e. in 2011 and 2013.

The Brisbane River zone is divided into different dredging subareas based on existing contaminant data, comprising Zone 2, Zone 3 and Zone 4. It is noted that Zone 1 is not part of the annual dredging and samples from this zone have been used to collect reference samples upstream of the actual dredging areas.

The following average dredge volumes apply to the dredge subareas (Table 1-1):

Table 1-1 Approximate Maintenance Dredge Volumes

Dredging Subarea	Extents	Average Dredge Volume (m^3)
Zone 2	Colmslie to Pinkenba	150,000
Zone 3	Within port reaches	250,000
Zone 4	Moreton Bay entrance channel	30,000

The maintenance dredging program is structured to maximise efficiencies and utilisation of PBPL's largest dredger, the trailer suction hopper dredge *TSHD Brisbane*. The *TSHD Brisbane* typically carries out the majority of the port's maintenance dredging over a two month period between January and May (actual period varies depending on other commitments of the *TSHD Brisbane* and siltation patterns). The PBPL may also utilise smaller, more manoeuvrable dredging plant, such as grab dredgers and bed levellers, to maintain more confined areas within the Port Limits.

1.3 Offshore Disposal

The PBPL's policy with regard to dredged material is to maximise its beneficial reuse. In general, most of the material dredged by the PBPL from within Port Limits is used in reclamation works associated with development of the port. The reuse of this dredged material provides several benefits, including:

- Reduced pressure on sea disposal sites;
- The placement of any actual or potential acid sulphate material at depth beneath the water surface; and
- The containment of any contaminated material within a designated boundary, disconnected from the marine system and monitored to ensure the immobility of identified contaminants.

In 2009, the reclamation life of the Future Port Expansion (FPE) area was estimated to be approximately 30 years, based on the current level of port development at that time. Following extreme flood events in both 2011 and 2013 and the subsequent disposal of additional material in the FPE area, the estimated life of the FPE area was reduced by 20 years to 10 years. Given the importance of the FPE as an area to dispose of material unsuitable for ocean disposal, there has been a shift in thinking around the management of the FPE area.

The current proposed management of dredged material is to, where practical, dispose at sea all dredged material deemed suitable for ocean disposal. This proposed management initiative will

ensure the long term viability of the FPE area for the disposal of material deemed unsuitable for ocean disposal.

In the past, significant quantities of dredged material from the Brisbane River have been placed offshore at the Mud Island Dredge Material Placement Area (MIDMPA). In recent years only smaller volumes of dredged material from boat harbours in southern Moreton Bay were placed at the MIDMPA. However, it is proposed that the MIDMPA will be utilised for material found suitable for ocean disposal in future PBPL maintenance dredging campaigns.

2 Methodology

2.1 Compliance with SAP and Guidelines

All sampling and analysis of sediments was undertaken in accordance with the National Assessment Guidelines for Dredging (NAGD 2009). All sampling and analysis procedures followed the approach outlined in the SAP prepared by BMT WBM on 17 October 2013. A copy of the SAP is provided in Appendix A.

2.2 Timing of Sampling

All sampling was undertaken in a single campaign between 21 and 23 October 2013. Sampling was undertaken during daytime hours.

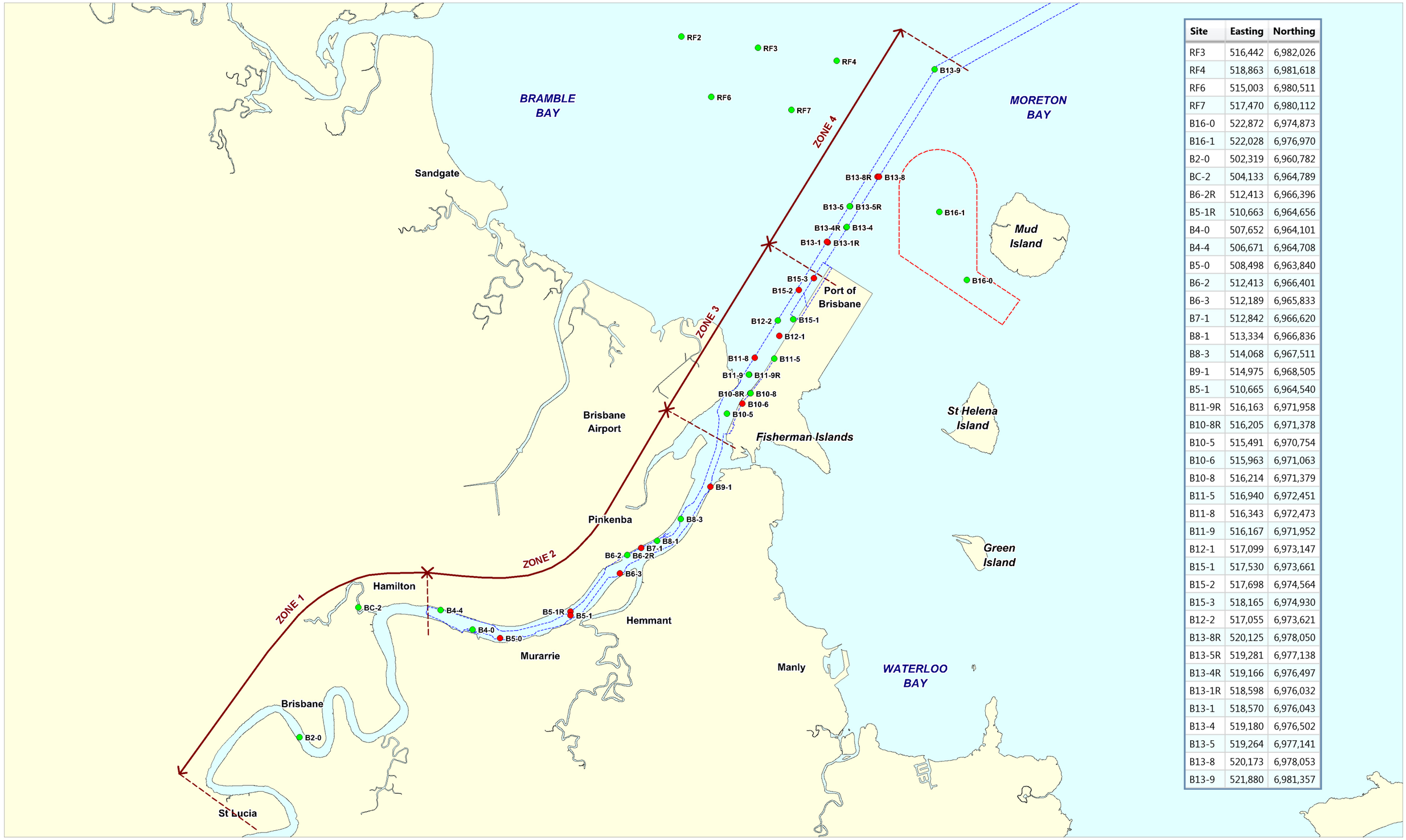
2.3 Sample Locations

2.3.1 Field Samples

35 locations were sampled with a Van Veen grab sampler in accordance with the SAP and NAGD requirements. This included 26 sample locations within the proposed dredging area (Zone 2, 3 and 4) and nine reference locations (Zone 1, MIDMPA and Moreton Bay reference sites).

A map showing the the actual sampling locations is provided in Figure 2-1.

As per the SAP, all samples were analysed for a basic suite with a detailed suite analysed at selected study locations (refer to Figure 2-1 and Section 2.6.).



Site	Easting	Northing
RF3	516,442	6,982,026
RF4	518,863	6,981,618
RF6	515,003	6,980,511
RF7	517,470	6,980,112
B16-0	522,872	6,974,873
B16-1	522,028	6,976,970
B2-0	502,319	6,960,782
BC-2	504,133	6,964,789
B6-2R	512,413	6,966,396
B5-1R	510,663	6,964,656
B4-0	507,652	6,964,101
B4-4	506,671	6,964,708
B5-0	508,498	6,963,840
B6-2	512,413	6,966,401
B6-3	512,189	6,965,833
B7-1	512,842	6,966,620
B8-1	513,334	6,966,836
B8-3	514,068	6,967,511
B9-1	514,975	6,968,505
B5-1	510,665	6,964,540
B11-9R	516,163	6,971,958
B10-8R	516,205	6,971,378
B10-5	515,491	6,970,754
B10-6	515,963	6,971,063
B10-8	516,214	6,971,379
B11-5	516,940	6,972,451
B11-8	516,343	6,972,473
B11-9	516,167	6,971,952
B12-1	517,099	6,973,147
B15-1	517,530	6,973,661
B15-2	517,698	6,974,564
B15-3	518,165	6,974,930
B12-2	517,055	6,973,621
B13-8R	520,125	6,978,050
B13-5R	519,281	6,977,138
B13-4R	519,166	6,976,497
B13-1R	518,598	6,976,032
B13-1	518,570	6,976,043
B13-4	519,180	6,976,502
B13-5	519,264	6,977,141
B13-8	520,173	6,978,053
B13-9	521,880	6,981,357

LEGEND

- Basic Suite
- Basic Suite and Detailed Suite
- Dredge Area
- Dredge Material Placement Area

Title:

Actual Sediment Sampling Locations

Figure: **2-1**

Rev: **A**

N

0 2.5 5km

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B20259_I_BRH Port of Brisbane DLR\DRG\ECO_022_131212 Sediment Sampling Locations.wor

2.3.2 QA/QC Samples

In accordance with NAGD requirements and based on the number of sample locations, the following field and laboratory quality control samples were taken:

- Three field triplicate samples at 10% of locations to determine the small scale (measured in metres) spatial variability of the sediment physical and chemical characteristics, i.e. two additional grab samples at locations 5-1 (Zone 2), 11-9 (Zone 3) and 13-4 (Zone 4);
- Two triplicate split samples (primary sample from 5% of locations thoroughly mixed and split into three sample container sets) to assess laboratory variation, with one of the three samples sent to a second (reference) laboratory for analysis. Split samples were obtained at location 6-2 (Zone 2) and 10-6 (Zone 3);
- Three trip blank containers (one per sampling day) filled with inert material (e.g. chromatographic sand) to be analysed concurrent with the analysis of volatile organic substances such as BTEX and TPH C6-C9.

All samples were submitted to the primary and secondary laboratories in one batch so no inter-batch samples were required.

The Relative Standard Deviation (RSD) or Relative Percent Difference (RPD) was calculated for field triplicate and laboratory split samples. Assessment followed NAGD guidelines which recommend that the RSD or RPD of replicate samples agree within ±50 %. NAGD also notes that they may not always agree within this limit where sediments are very inhomogeneous or vary greatly in grain size.

2.4 Sample Collection

2.4.1 Grab Sampling

All sediment sampling was undertaken by experienced personnel. Sediment samples were collected using a stainless steel Van Veen grab sampler (0.14 m^2 gape).

Only samples obtained with properly closed grab jaws were processed to ensure that the fine sediment fractions were retained.

The grab sampler was thoroughly cleaned with De-con 90 solution prior to use and cleaned and rinsed with seawater between samples to prevent cross contamination between samples.

In order to overcome issues with potential high variability at sampling locations, a minimum of two grabs were collected at each sampling location and pooled as one sample. An adequate number of grabs was obtained and pooled for each sample location ensuring that sufficient sediment was collected for all analyses.

2.4.1.1 Sampling for Elutriate and Bioavailability Testing

Phase III testing was undertaken for parameters which have frequently exceeded the NAGD screening levels in the past. Based on the review of historical data in the SAP this included:

- Metals and metalloids;

- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

Phase III testing for metals/metalloids (and potential other metals/metalloids) was undertaken from the primary samples collected for the sediment quality assessment and based on the initial analysis results. Analysis was performed on the samples with the highest concentrations.

Bioavailability analysis for the organic contaminants (organotins and organochlorine pesticides) required porewater testing as per NAGD. Additional samples were collected for porewater testing at the locations which have historically shown the highest percentage of screening level exceedances. In order to meet required holding times, elutriate and bioavailability analysis for the organic contaminants was undertaken concurrent with the analysis of the primary samples.

As per the SAP, additional samples for porewater testing were obtained from five locations in Zone 2 and six locations in Zone 3.

2.4.2 Survey Vessel and Positioning

The BMT WBM vessel *Resolution II* was used for sampling the sediments. The vessel was thoroughly inspected and washed down prior to the beginning of sediment sampling each day.

Differential GPS was used on the survey vessel for position fixing and navigation to each sampling location.

The workspace on the vessel was washed down regularly with ambient seawater to clean all surfaces and minimize the potential for dust contamination of samples. All sample processing was undertaken away from any potential contamination sources such as engine exhausts, fuels, oils, greases, lead weights, zinc anodes, antifouling paint etc.

2.5 Sample Handling

Photographs of the grab samples were taken and grab samples were logged for its physical characteristics and variations in sediment type and texture (refer Appendix B). The grab samples from each location were carefully homogenized in a clean container prior to the filling of analytical laboratory-supplied clean sampling jars.

Nitrile gloves were worn by all field personnel handling the sediment, and gloves were disposed of after processing of each sample.

Sample bottles were labelled with a waterproof marker pen on the bottle label and lid. Sample bottles for organic analyses were filled with zero headspace to minimise volatilisation. A field trip blank sample container filled with clean chromatographic sand was placed with opened lid near the sample processing site while a sediment sample was completely processed.

All storage containers were chilled on ice immediately following sample collection. The samples were then transferred to BMT WBM office in sealed eskies at the end of each sampling day. Acid Sulfate Soil samples were frozen at the end of each sampling day to minimise potential oxidation of the sediment material.

At the end of the sampling campaign, all samples were submitted to the primary and secondary analytical laboratories.

All samples were submitted to the laboratories with Chain of Custody documentation (Appendices C and D).

2.6 Laboratory Analysis

2.6.1 Analytical Tests

Primary analysis of sediment samples was conducted by Advanced Analytical Australia (AAA). Certain analyses were subcontracted by AAA to other NATA accredited laboratories such as Particle Size Distribution (Golder Associates) and TOC (Sydney Analytical Laboratories). Australian Laboratory Services (ALS) was chosen as the secondary (reference) laboratory for inter-laboratory quality testing.

A total of 35 locations were analysed for a basic suite of parameters. Of these, 12 locations were also analysed for a detailed list of contaminants. Furthermore, elutriate and bioavailability (porewater and dilute acid extraction) testing was undertaken at selected locations as per the SAP.

Basic List of Parameters:

- Analysis included contaminants of (potential) concern and supplementary parameters:
  - Metals/Metalloids (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, Al, Fe);
  - Organotins (MBT, DBT, TBT);
  - Organochlorine Pesticides (including DDT, DDD, DDE, chlordane);
  - Particle size distribution;
  - Moisture content; and
  - Total Organic Carbon.

Detailed List of Parameters:

- Analysis included ‘low risk’ parameters that have been detected in the past but generally in concentrations below LOR or NAGD screening levels:
  - Polycyclic Aromatic Hydrocarbons (PAHs);
  - Total Petroleum Hydrocarbons (TPHs);
  - Polychlorinated Biphenyls (PCBs);
  - Acid Sulfate Soils;
  - Nutrients (TP, TN, NOx, TKN); and
  - Radionuclides.

Elutriate and Bioavailability Testing:

- Metals/Metalloids;

- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

2.6.2 Laboratory Quality Control

Both laboratories followed laboratory QC procedures in accordance with requirements outlined in Appendix F of NAGD. This included analysis of laboratory blanks, duplicates, certified surrogate materials and spiked samples.

Validation of all laboratory QC analyses was conducted in accordance with Appendix A of NAGD to confirm suitable data quality for undertaking a rigorous characterisation of the proposed dredge material.

2.6.2.1 Laboratory Blanks

The purpose of this assessment is to monitor potential laboratory contamination of samples due to potential cross-contamination of samples during laboratory preparation, extraction or analysis. Blank sample concentrations should be at or near the detection limit of the method used.

2.6.2.2 Laboratory Duplicates

This assessment refers to a randomly selected intra-laboratory split sample, which provides information regarding the method precision and sample heterogeneity. Results are presented as Relative Percent Difference (RPD) values of two sample concentrations for a specific contaminant.

NAGD recommends that duplicates should agree within a typical RPD of the method of ±35 %. This recommended RPD is typically not adopted by analytical laboratories as it does not account for the greater uncertainty for contaminant concentrations close to the method's detection limit.

The primary laboratory AAA uses the following approach to assess duplicate RPD's:

- Result <10 times LOR – no limit to RPD; and
- Result >10 times LOR – RPD between 0% and 50%.

The secondary laboratory ALS follows this approach:

- Result <10 times LOR – no limit to RPD;
- Result between 10 and 20 times LOR – RPD between 0% and 50%; and
- Result >20 times LOR – RPD between 0% and 20%.

Refer to Appendices C and D for the acceptance criteria of subcontracted laboratories.

2.6.2.3 Surrogate and Matrix Spikes

Laboratory Control Samples are either certified reference materials or a blank sample spiked with known concentrations of the analytes of interest. The purpose of this measurement is to monitor method accuracy.

Matrix spikes refer to an intra-laboratory split sample spiked with a representative set of target analytes of known concentration. Matrix spikes are assessed to monitor potential sample matrix effects on analyte recoveries.

Surrogate spikes are used for organic analytes. Surrogates are known additions to samples which mimic the compounds of interested are not normally expected to be present in the sample.

For both surrogate and matrix spikes, a calculation of the percent recovery of the spiked amount against the returned concentration is performed indicating analytical performance in terms of extraction efficiency.

NAGD states that recovery limits of 75% - 125% are generally acceptable. Analytical laboratories typically adopt specific surrogate and matrix spike recovery limits for the various contaminant compound groups. It is also noted that ideal recovery ranges may be waived in the event of sample matrix interference.

The primary laboratory AAA adopts the following acceptable surrogate and matrix spike recovery limits:

- Trace elements: 70-130%;
- Organic analyses: 50-150%;
- SVOC & speciated phenols: 10-140%; and
- Surrogates: 10-140%.

The secondary laboratory ALS adopts specific recovery limits for individual compounds.

2.7 Data Analysis

2.7.1 Sediment Contaminants

Concentrations of chemicals measured in sediment samples were compared to screening levels listed in Table 2 of NAGD to determine whether the material is suitable for unconfined placement at sea or if further analyses, such as elutriate, bioavailability or toxicity testing, are required.

Specifically, mean concentrations of chemical parameters at the upper 95% confidence level (95% UCL) were compared against NAGD guideline levels. This involved the following steps.

Data pre-treatment

Analytical values below detection limit were set to one-half of the laboratory Limit of Reporting (LOR) as per NAGD recommendation to facilitate 95% UCL calculation. Organic contaminant results were normalised to 1% Total Organic Carbon (TOC) where the measured value is within the range of 0.2-10%. If TOC values were outside of this range, the highest (10%) or lowest (0.2%) value was adopted as appropriate. Organic parameters with concentrations below detection limits were not normalised to 1% TOC but were included at half their LOR.

One assumption in the calculation of the 95% UCL is that the samples are statistically independent. Therefore, field triplicate samples and laboratory split samples were not included in the 95% UCL calculation.

Selection of appropriate 95% UCL Calculation Method

The methodology for calculating the 95% UCL followed the approach recommended in Appendix A of NAGD. A Shapiro-Wilk test was used to determine whether data followed a normal distribution. The ProUCL (Version 4.1.00) software package was used for these calculations (Singh et al. 2010).

Calculation of 95% UCL and Comparison to Screening Levels

ProUCL Version 4.1.00 was used to calculate the 95% UCL. For normally distributed data, the arithmetic mean and standard deviation were calculated, and the 95% UCL was calculated using the one-tailed Student's *t* UCL test. For data that followed a log-normal (or other) distribution, the geomean was calculated, and the 95% UCL was analysed using non-parametric Jack-Knife analysis as per NAGD recommendation.

In some cases where only one value of a dataset was recorded above LOR, calculation of the Jack-Knife UCL was not possible. In these cases, the maximum recorded value of the dataset was conservatively used instead for comparison against NAGD trigger levels.

Should 95% UCL values for all analysed parameters fall below NAGD screening levels, the sediment would be considered clean and suitable for unconfined disposal at sea. Further testing was undertaken for samples where the NAGD screening level was exceeded, as described below.

2.7.2 Elutriate and Bioavailability Testing

As outlined on Section 2.4.1.1, elutriate and bioavailability testing was undertaken as per NAGD for a range of contaminants which have regularly exceeded screening levels in the past.

Elutriate Testing:

The elutriate test is designed to simulate release of contaminants from sediment during dredged material disposal. Testing was carried out using the USEPA's standard seawater elutriate test which involves shaking the sediment samples with four times the volume of seawater at room temperature for 30 minutes. The sample was allowed to settle for one hour and the supernatant was centrifuged or filtered (0.45 µm) within sixty minutes, and analysed using analytical methods appropriate for determining ultra-trace levels in seawater.

Results were compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Bioavailability Testing:

The Dilute Acid Extraction (DAE) method was used to provide an estimate of the bioavailable fraction of metals/metalloids. The sediment samples were extracted using a weak acid and result compared against the respective NAGD screening levels.

For organic contaminants, analysis of pore water is the recommended bioavailability test as per NAGD. Porewater is assumed to represent the major route of exposure to sediment contaminants by benthic organisms. Porewater results were compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Should both elutriate and bioavailability tests result in values less than the respective guideline limits, the material would be considered clean and suitable for ocean disposal.

2.7.3 Acid Sulfate Soils

The results of the chromium-suite acid sulfate analysis were assessed against the Australian framework for Acid Sulfate Soil management in coastal systems (Ahern *et al.* 1998). The risk of acidification was determined by the acid-base accounting approach (Ahern *et al.* 2004). Net acidity was calculated from the results as a measure of the acid producing capacity of the sampled sediment upon complete oxidation.

The calculated net acidity was then compared to the QASSIT action criteria of 0.03% S or 18 mol H^+/tonne to assess the need for acid sulfate soil management if the dredged sediments were to be placed on land. The liming rate indicates the amount of lime that needs to be added to the soil to manage its acid generating capacity.

3 Results

Sediment logs of the sampled sediments are shown in Appendix B. Detailed laboratory results are provided in Appendices C and D for the primary and secondary laboratory, respectively.

3.1 Physical Sediment Characteristics

Figure 3-1 presents the results of Particle Size Distribution (PSD) in the proposed dredge area.

Sediments within the proposed dredging Zones 2 and 3 were characterised by a high proportion of fines greater than 80% of the total sediment. The average proportion of silts was 40.4% and 32.0% for Zone 2 and 3, respectively. Clay contributed on average 47.7% and 48.9% in the Zone 2 and Zone 3 sediments, respectively. Sands were represented between 11.1% and 18.0% on average for Zone 2 and 3.

Dredging Zone 4 was characterised by coarser sediments with an average sand content of 38.4% and 9.1% coarse gravel. Silts contributed on average 24.5% and the proportion of clay was 28.0% in Zone 4.

The MIDMPA sediments were comparable to the Zone 2 and Zone 3 sediments with respect to their particle size distribution. Fine sediments comprised 90.2% at the MIDMPA with silts and clays contributing 44.3% and 45.9%, respectively.

Similarly, the Moreton Bay reference sites were characterised by a high proportion of fines (89.9% on average) with silts and clays contributing on average 34.3% and 55.5%, respectively.

Sediments within Zone 1 had high proportions of sandy sediment comprising between 61.8% and 99.1% for the upstream reference location 2-0 and the Breakfast Creek site BC-2, respectively.

Results

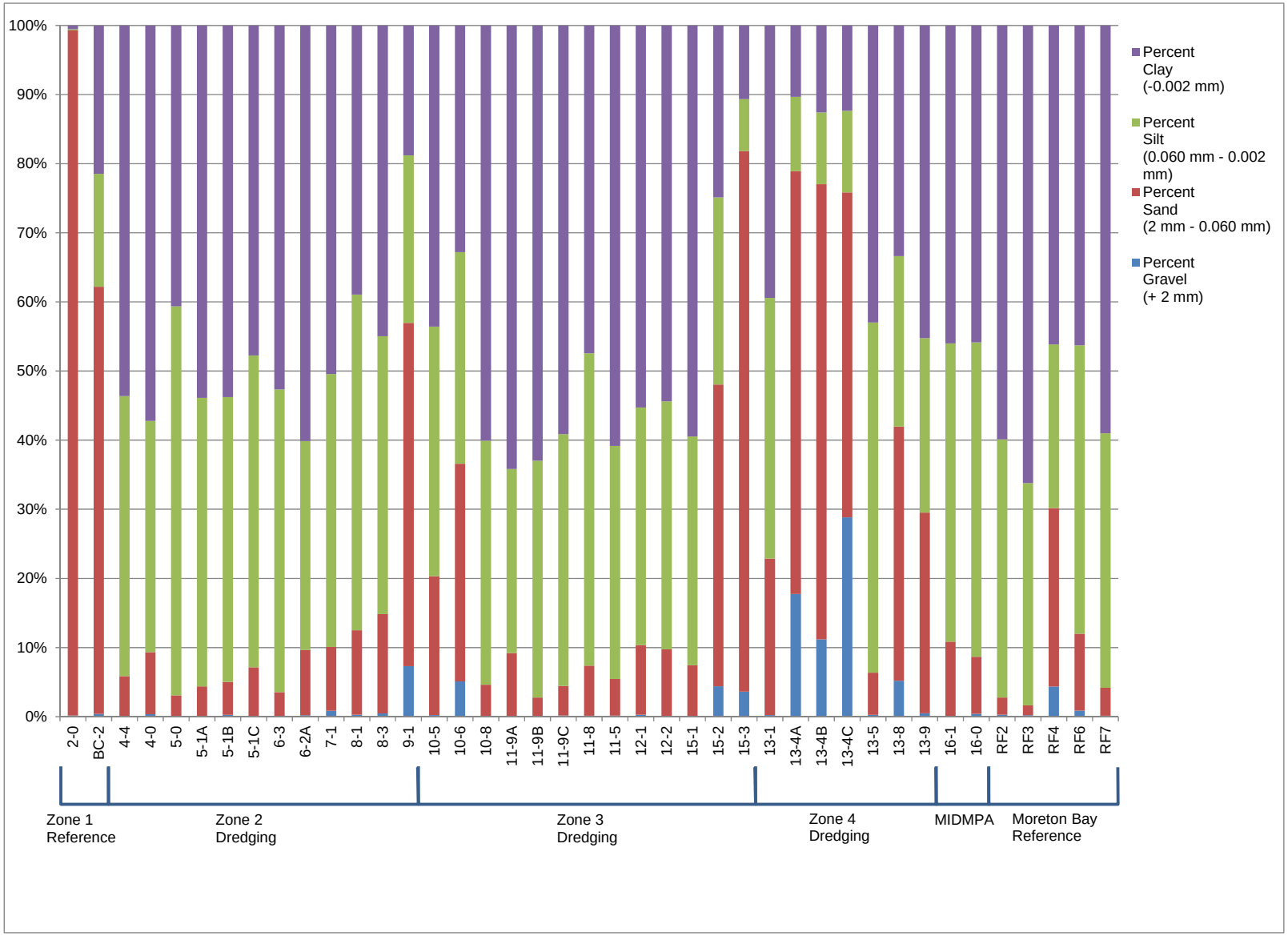


Figure 3-1 Particle Size Distribution Results

3.2 Chemical Sediment Characteristics

Table 3-1 presents the summary statistics and calculation of 95% UCLs for chemical parameters with concentrations above the laboratory LOR for the combined locations within the combined dredge Zones 2, 3 and 4.

Concentrations of chemical parameters for individual locations are presented in the following tables, including summary statistics and 95% UCL calculations for the individual dredge zones:

- Table 3-3: Zone 2 locations
- Table 3-4: Zone 3 locations
- Table 3-5: Zone 4 locations
- Table 3-6: Reference locations (Zone 1, MIDMPA and Moreton Bay reference sites)
- Table 3-7: Acid Sulfate Soil results (Chromium-Suite)

Table 3-1 Summary Statistics and 95% UCLs for Combined Locations in Zones 2, 3 and 4. Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

Sample		NAGD Screening Level	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
Moisture Content	%		X	55.4	10.6	60.31
Trace Elements						
Aluminium	mg/kg		X	24624.7	5912.3	27527
Arsenic	mg/kg	20	N	7.0	0.9	7.323
Cadmium	mg/kg	1.5	-	-	-	-
Chromium	mg/kg	80	X	42.6	8.1	46.31
Copper	mg/kg	65	N	28.3	8.0	30.92
Iron	mg/kg		X	41358.3	8002.8	44950
Lead	mg/kg	50	N	12.3	3.3	13.36
Mercury	mg/kg	0.15	N	0.08	0.03	0.0858
Nickel	mg/kg	21	X	30.9	8.9	35.49
Phosphorus	mg/kg		X	799.6	212.6	904.7
Silver	mg/kg	1	X	0.14	0.06	0.146
Zinc	mg/kg	200	N	89.6	19.9	96.28
Total Petroleum Hydrocarbons						
TPH C6-C9	mg/kg	550	-	-	-	-
TPH C10-14	mg/kg	550	-	-	-	-
TPH C15-28	mg/kg	550	-	-	-	-
TPH C29-36	mg/kg	550	X	38.7	9.9	44.17
Poly Aromatic Hydrocarbons						
Naphthalene	µg/kg		L	4.6	1.9	5.1
1-Methylnaphthalene	µg/kg		-	-	-	-
2-Methylnaphthalene	µg/kg		-	-	-	-
Acenaphthylene	µg/kg		-	-	-	-
Acenaphthene	µg/kg		-	-	-	-
Fluorene	µg/kg		-	-	-	-
Phenanthrene	µg/kg		N	12.4	4.5	14.3
Anthracene	µg/kg		N	4.8	1.3	4.9
Fluoranthene	µg/kg		N	43.0	16.4	49.8
Pyrene	µg/kg		N	44.8	21.8	53.8
Benz(a)anthracene	µg/kg		N	19.0	7.7	22.2
Chrysene	µg/kg		N	20.8	8.5	24.3
Benzo(b)&(k)fluoranthene	µg/kg		N	48.6	22.3	57.8
Benzo(a)pyrene	µg/kg		N	26.1	13.2	31.6
Indeno(1,2,3-cd)pyrene	µg/kg		N	22.3	9.6	26.3
Dibenz(a,h)anthracene	µg/kg		X	4.9	1.7	4.5
Benzo(g,h,i)perylene	µg/kg		N	20.6	8.5	24.1
Coronene	µg/kg		-	-	-	-

Sample		NAGD Screening Level	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
Benzo(e)pyrene	µg/kg		N	21.5	9.5	25.4
Perylene	µg/kg		X	62.6	27.5	80.5
Total PAHs (as above)	µg/kg	10000	N	357.3	141.5	415.4
Organochlorine Pesticides						
Aldrin	µg/kg		-	-	-	-
alpha-BHC	µg/kg		-	-	-	-
beta-BHC	µg/kg		-	-	-	-
gamma-BHC (Lindane)	µg/kg	0.32	-	-	-	-
delta-BHC	µg/kg		-	-	-	-
cis-Chlordane	µg/kg	0.5	-	-	-	-
trans-Chlordane	µg/kg	0.5	-	-	-	-
p,p'-DDD	µg/kg	2	X	2.2	0.2	1.2
p,p'-DDE	µg/kg	2.2	X	4.4	1.0	4.6
p,p'-DDT	µg/kg	1.6	-	-	-	-
Dieldrin	µg/kg	280	-	-	-	-
alpha-Endosulfan	µg/kg		-	-	-	-
beta-Endosulfan	µg/kg		-	-	-	-
Endosulfan Sulphate	µg/kg		-	-	-	-
Endrin	µg/kg	10	-	-	-	-
Endrin ketone	µg/kg		-	-	-	-
Endrin aldehyde	µg/kg		-	-	-	-
Heptachlor	µg/kg		-	-	-	-
Heptachlor epoxide	µg/kg		-	-	-	-
Hexachlorobenzene	µg/kg		-	-	-	-
Methoxychlor	µg/kg		-	-	-	-
Oxychlordane	µg/kg		-	-	-	-
Organotins						
Monobutyl tin	µgSn/kg		-	-	-	-
Dibutyl tin	µgSn/kg		X	0.7	0.3	0.6
Tributyl tin	µgSn/kg	9	X	0.7	0.7	0.684
Polychlorinated Biphenyls						
Mono-PCB congeners	µg/kg		-	-	-	-
Di-PCB congeners	µg/kg		-	-	-	-
Tri-PCB congeners	µg/kg		-	-	-	-
Tetra-PCB congeners	µg/kg		-	-	-	-
Penta-PCB congeners	µg/kg		-	-	-	-
Hexa-PCB congeners	µg/kg		-	-	-	-
Hepta-PCB congeners	µg/kg		-	-	-	-
Octa-PCB congeners	µg/kg		-	-	-	-
Nona-PCB congeners	µg/kg		-	-	-	-
Deca-PCB congeners	µg/kg		-	-	-	-
Total PCB congeners	µg/kg	23	-	-	-	-
Nutrients, TOC, Cyanide						
Total Nitrogen	mg/kg		X	1117.0	336.7	1304
Total Kjeldahl Nitrogen	mg/kg		X	1117.0	336.7	1304
Nitrate as N	mg/kg		-	-	-	-
Nitrite as N	mg/kg		-	-	-	-
Total Organic Carbon	%		X	1.3	0.4	1.556
Radionuclides						
Gross Alpha	mBq/g		-	-	-	-
Gross Beta	mBq/g		-	-	-	-

3.2.1 Trace Elements

Concentrations of metals and metalloids were generally below their respective NAGD screening levels across the study area. Cadmium was not detected in any sample.

However, nickel concentrations exceeded the NAGD screening level of 21 mg/kg at most locations, in particular within the dredge Zones 2 and 3. The geometric mean across all locations within the dredge Zones 2, 3 and 4 was 30.9 mg/kg and the 95% UCL was 35.5 mg/kg exceeding the NAGD screening level for nickel. The 95% UCL for nickel also exceeded the NAGD screening level for the individual dredge zones with concentrations of 41.2 mg/kg, 36.2 mg/kg and 27.5 mg/kg for Zone 2, Zone 3 and Zone 4, respectively.

Mercury was detected at most study locations with concentrations generally well below the NAGD screening level of 0.15 mg/kg. Mercury was detected at the screening level at location 13-5 in Zone 4. However, the 95% UCL for mercury remained below the NAGD screening level for all dredge zones with concentrations of 0.10 mg/kg, 0.08 mg/kg and 0.12 mg/kg for or Zone 2, Zone 3 and Zone 4, respectively. The combined 95% UCL for mercury at all dredge zones was 0.09 mg/kg.

The trace metal concentrations at the reference locations followed a similar trend, i.e. most metals and metalloids were below the NAGD screening level with exceedances noted for nickel at the MIDMPA and the Moreton Bay reference locations. Furthermore, mercury was recorded at the screening level of 0.15 mg/kg at reference location RF4.

3.2.1.1 Elutriate and Bioavailability Testing

Phase III elutriate and bioavailability testing was undertaken to further investigate the elevated nickel concentrations and their potential impact on water quality and sediment biota (Table 3-2).

Samples with the highest recorded nickel concentrations were selected for all dredge zones. A total of 18 samples were analysed including four duplicate measurements as per NAGD.

Elutriate test results were below the LOR and therefore below the ANZECC/ARMCANZ (2000) marine trigger limit of 7 µg/L (99% species protection) for all tested samples. The dilute acid extraction results were below the NAGD screening level of 21 mg/kg for all samples.

These results indicate that impacts to water quality can be considered minimal during dredging and spoil disposal with regards to nickel. Furthermore, the bioavailable nickel fraction is unlikely to result in adverse impacts to sediment biota.

On the basis of the Phase II and Phase III testing for metals and metalloids, the sediments in dredge Zone 2, 3 and 4 are considered suitable for ocean disposal as per the NAGD guidelines for all investigated metals and metalloids.

Table 3-2 Nickel Elutriate and Bioavailability Testing Results

Dredge Zone	Sample	Elutriate Analysis (µg/L)	ANZECC guideline value (µg/L)	Bioavailability Dissolved Acid Extraction (mg/kg)	NAGD Screening Level (mg/kg)
Zone 2	4-4	<3	7 µg/L (99% species protection)	10	21 mg/kg
	6-3	<3		13	
	6-2	<3		17	
	6-2 (duplicate)	<3		17	
	7-1	<3		16	
	8-1	<3		16	
Zone 3	10-5	<3		13	
	10-8	<3		12	
	10-8 (duplicate)	<3		12	
	11-9	<3		12	
	11-5	<3		12	
	11-5 (duplicate)	<3		12	
	12-2	<3		13	
	15-1	<3		11	
Zone 4	13-1	<3		8.7	
	13-5	<3		12	
	13-5 (duplicate)	<3		12	
	13-8	<3		6.4	

3.2.2 Total Petroleum Hydrocarbons (TPHs)

Concentrations of TPHs were below the LOR for the C6-C9, C10-C14 and C15-C28 fractions at all study locations. A few low level detections of TPHs C29-C36 were noted at individual locations in all dredge zones with a maximum normalised concentration of 51 mg/kg which is well below the NAGD screening level of 550 mg/kg.

Therefore, the sediments in dredge Zones 2, 3 and 4 are suitable for ocean disposal as per the NAGD guidelines with respect to TPHs.

A similar pattern was observed at the reference locations with only one individual detection noted at the MIDMPA (31 mg/kg).

3.2.3 Poly Aromatic Hydrocarbons (PAHs)

Relatively low level detections of PAHs were noted at all investigated study locations within all dredge zones. The 95% UCL for total PAHs was well below the NAGD screening level of 10,000 µg/kg for all dredge zones with 377 µg/kg, 587 µg/kg for Zone 2 and Zone 3 and a maximum normalised concentration of 440 µg/kg for Zone 4. The 95% UCL for total PAHs across all dredge zones was 415 µg/kg.

One the basis of these results the sediments in dredge Zones 2, 3 and 4 are suitable for ocean disposal as per the NAGD guidelines with respect to PAHs.

PAHs were not assessed at the reference locations.

3.2.4 Organochlorine Pesticides (OCPs)

The concentrations for most OCPs were below the laboratory LOR at all study locations. The only exceptions within the dredge zones were DDD and DDE. Whilst only individual detections of DDD above the NAGD screening level of 2 µg/kg were noted at location 7-1 in Zone 2 and location 13-5 in Zone 4, normalised concentrations of DDE exceeded the NAGD screening level of 2.2 µg/kg at most locations within all dredge zones.

Whilst the 95% UCL for DDD remained below the NAGD screening level for all dredge zones, the 95% UCL for DDE exceeded the NAGD screening level across all dredge areas with concentrations of 5.5 µg/kg, 5.1 µg/kg and 3.5 µg/kg for Zone 2, Zone 3 and Zone 4, respectively. Accordingly, the 95% UCL for DDE across all dredge zones exceeded the NAGD screening level with a concentration of 4.6 µg/kg.

Similarly, concentrations of DDE exceeded the NAGD screening level at most reference locations with concentrations ranging between 2.0 µg/kg and 7.5 µg/kg. Furthermore, cis-chlordane (1.5 µg/kg) and trans-chlordane (6.2 µg/kg) was detected at levels exceeding the NAGD screening level of 0.5 µg/kg at the Breakfast Creek reference location BC2. Chlordane was not detected within the dredge zones or any other location.

3.2.4.1 Elutriate and Bioavailability Testing

Phase III elutriate and bioavailability (porewater) testing was undertaken to investigate the potential bioavailability of OCPs. As outlined in Section 2.4.1.1, five additional samples (plus one duplicate) were analysed from Zone 2 and six samples (plus two duplicates) from Zone 3 based on historical data.

Both elutriate and porewater testing resulted in concentrations below the laboratory LOR for all samples. It is noted that neither marine nor freshwater trigger limits are given in ANZECC (2000) for DDD and DDE.

Based on the above results the bioavailability of OCPs is considered very low and no adverse impacts on water quality and sediment biota are expected with respect to OCPs during dredging and spoil disposal.

On the basis of the Phase II and Phase III testing for OCPs, the sediments in dredge Zone 2, 3 and 4 are considered suitable for ocean disposal as per the NAGD guidelines with respect to OCPs.

3.2.5 Organotins

Concentrations of organotins were either below the LOR or detected at low concentrations well below the NAGD screening level of 9 µgSn/kg across all dredge zones. The 95% UCL for TBT was 1.1 µgSn/kg, 0.5 µgSn/kg and 0.4 µgSn/kg for Zone 2, Zone 3 and Zone 4, respectively. Across the combined dredge zones, the 95% UCL for TBT was 0.68 µgSn/kg.

Based on these results the sediments in all dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to organotins.

At the reference locations, organotin concentrations were mostly below the LOR with only a few low level detections noted well below the NAGD screening level.

3.2.6 Polychlorinated Biphenyls (PCBs)

Concentrations of PCBs were below the laboratory LOR at all investigated locations. Therefore, the sediments in the dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to PCBs.

No assessment of PCBs was undertaken at the reference locations.

3.2.7 Radionuclides

Measurements of gross alpha and gross beta activity was below the laboratory LOR at all investigated locations. Therefore, the sediments in the dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to radionuclides.

No assessment of radionuclides was undertaken at the reference locations.

3.2.8 Nutrients and Carbon Content

Total Nitrogen and Total Kjeldahl Nitrogen concentrations ranged between 270 mg/kg and 1540 mg/kg across the dredge zones. Total Phosphorus concentrations ranged between 320 mg/kg and 1100 mg/kg.

Nitrate and Nitrite concentrations were below the LOR in all samples.

Total Organic Carbon content ranged between 0.4% and 1.9% across the dredge zones.

Similar levels of nutrients and Total Organic Carbon were noted across the reference locations.

No screening levels exist in NAGD for nutrients and carbon content in sediments. However, nutrient and carbon levels were considered to be consistent with other harbour areas in Moreton Bay (e.g. WBM 2005a, b).

3.2.9 Acid Sulfate Soils

Acid Sulfate Soil testing indicated that no management would be required for the sediments at all investigated locations within dredge Zones 2, 3 and 4.

Actual acidity (TAA) was below the LOR at all locations indicating that the sediments are not actual acid sulfate soils.

Chromium reducible sulfur was above the LOR at all locations indicating that the sediments are potential acid sulfate soils (PASS). However, the acid neutralising capacity (ANC) was in excess of the chromium reducible sulfur at all locations. This means that the sediments have sufficient capacity for neutralising acids upon oxidation.

In case of ocean disposal of the dredged material, oxidation of the dredge material is considered unlikely as the sediments will stay saturated with seawater. Under normal operating conditions of the dredging vessel (PASS exposure timeframe of less than 24 hours) it is considered that the risk of oxidation is low. Therefore, sea disposal is unlikely to require any treatment of the dredged material.

Results

Table 3-3 Summary Statistics and 95% UCLs for Zone 2. Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

Analytical Parameter	Unit	NAGD Screening Level	4-4	4-0	5-0	5-1A	6-3	6-2A	7-1	8-1	8-3	9-1	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
Moisture Content	%		63	59.7	59	61.4	64	62.4	61.2	56	60.4	46	X	59.1	5.2	62.32
Trace Elements																
Aluminium	mg/kg		29000	28000	28000	32000	30000	31000	29000	26000	27000	18000	X	27506.5	3881.6	30050
Arsenic	mg/kg	20	7.7	6.9	7	7.2	6.8	5.9	6.3	5.7	7.2	5.6	N	6.6	0.7	7.044
Cadmium	mg/kg	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Chromium	mg/kg	80	53	50	50	52	50	52	50	47	46	39	X	48.7	4.1	51.27
Copper	mg/kg	65	41	35	36	36	35	39	34	31	31	24	N	34.2	4.7	36.94
Iron	mg/kg		47000	48000	48000	49000	49000	52000	49000	46000	45000	36000	X	46703.0	4280.4	49381
Lead	mg/kg	50	15	14	13	19	12	11	12	10	13	7.5	N	12.7	3.1	14.43
Mercury	mg/kg	0.15	0.1	0.09	<0.01	0.12	0.07	0.07	0.08	0.07	0.11	0.05	N	0.08	0.02	0.10
Nickel	mg/kg	21	41	38	37	36	40	47	42	40	35	32	N	38.80	4.18	41.23
Phosphorus	mg/kg		1100	980	990	940	990	1200	1000	1000	910	750	N	986.0	116.8	1054
Silver	mg/kg	1	0.18	0.16	0.13	0.37	0.15	0.13	0.14	0.11	0.13	<0.1	L	0.16	0.08	0.203
Zinc	mg/kg	200	120	110	100	110	100	120	100	89	95	73	N	101.7	14.3	110
Total Petroleum Hydrocarbons																
TPH C6-C9	mg/kg	550	<20	<10	<10	<20	<20	<20	<20	<10	<20	<10	-	-	-	-
TPH C10-14	mg/kg	550	<20	<10	<10	<20	<20	<20	<20	<10	<20	<10	-	-	-	-
TPH C15-28	mg/kg	550	<100	<50	<50	<100	<100	<100	<100	<50	<100	<50	-	-	-	-
TPH C29-36	mg/kg	550	<100	32	<50	<100	<100	<100	<100	<50	<100	<50	X	32.4	-	47.8
Poly Aromatic Hydrocarbons																
Naphthalene	µg/kg				<5	3.8	3.3		3.2			<5	N	3.4	0.3	3.6
1-Methylnaphthalene	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
2-Methylnaphthalene	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Acenaphthylene	µg/kg				<15	<15	<15		<15			<5	-	-	-	-
Acenaphthene	µg/kg				<5	<5	<5		2.6			<5	-	2.6	-	-
Fluorene	µg/kg				<5	<5	<5		2.6			<5	-	2.6	-	-
Phenanthrene	µg/kg				16.0	13.1	10.6		7.4			6.0	N	10.6	4.1	14.5
Anthracene	µg/kg				5.3	4.4	3.3		3.2			<5	N	4.0	1.0	4.8
Fluoranthene	µg/kg				51.3	48.1	36.7		30.5			18.0	N	36.9	13.5	49.8
Pyrene	µg/kg				49.3	51.9	33.9		28.4			20.0	N	36.7	13.6	49.7
Benz(a)anthracene	µg/kg				22.7	21.9	15.0		11.6			8.0	N	15.8	6.4	21.9
Chrysene	µg/kg				24.7	25.6	16.1		12.6			9.0	N	17.6	7.3	24.6
Benzo(b)&(k)fluoranthene	µg/kg				52.0	54.4	33.9		30.0			22.0	N	38.5	14.1	51.9
Benzo(a)pyrene	µg/kg				28.0	28.8	17.2		16.3			10.0	N	20.1	8.1	27.8
Indeno(1,2,3-cd)pyrene	µg/kg				24.7	24.4	15.6		14.2			10.0	N	17.8	6.5	24.0
Dibenz(a,h)anthracene	µg/kg				4.0	3.8	<5		<5			<5	X	3.9	0.2	3.8
Benzo(g,h,i)perylene	µg/kg				20.7	22.5	13.3		12.1			10.0	N	15.7	5.5	21.0
Coronene	µg/kg				<10	<10	<10		<10			<10	-	-	-	-
Benzo(e)pyrene	µg/kg				22.7	25.0	15.6		13.7			10.0	N	17.4	6.3	23.4
Perylene	µg/kg				64.0	53.1	53.9		50.0			53.0	N	54.8	5.4	59.9
Total PAHs (as above)	µg/kg	10000			386.7	381.3	266.7		236.8			180.0	N	290.3	91.0	377.1
Organochlorine Pesticides																
Aldrin	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
alpha-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
beta-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-

Results

Analytical Parameter	Unit	NAGD Screening Level	4-4	4-0	5-0	5-1A	6-3	6-2A	7-1	8-1	8-3	9-1	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
gamma-BHC (Lindane)	µg/kg	0.32	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
delta-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
cis-Chlordane	µg/kg	0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
trans-Chlordane	µg/kg	0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
p,p'-DDD	µg/kg	2	<2	<2	<2	<2	<2	<2	2.1	<2	<2	<1	X	2.1	-	1.3
p,p'-DDE	µg/kg	2.2	4.4	4.7	4.0	6.3	4.4	7.1	4.7	4.7	4.7	4.0	X	4.8	1.0	5.5
p,p'-DDT	µg/kg	1.6	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Dieldrin	µg/kg	280	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
alpha-Endosulfan	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
beta-Endosulfan	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endosulfan Sulphate	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Endrin	µg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endrin ketone	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endrin aldehyde	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Heptachlor	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Heptachlor epoxide	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Hexachlorobenzene	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Methoxychlor	µg/kg		<20	<20	<20	<20	<20	<20	<20	<20	<20	<10	-	-	-	-
Oxychlordane	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Organotins																
Monobutyl tin	µgSn/kg		<1.0	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<0.5	-	-	-	-
Dibutyl tin	µgSn/kg		<1.0	0.6	0.5	1.2	<1.0	<1.0	<1.0	<0.5	<1.0	<0.5	X	0.7	0.3	0.7
Tributyl tin	µgSn/kg	9	1.0	2.1	1.6	<1.0	<1.0	<1.0	<1.0	0.4	0.6	<0.5	L	0.94	0.70	1.1
Polychlorinated Biphenyls																
Mono-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Di-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Tri-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Tetra-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Penta-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Hexa-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Hepta-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Octa-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Nona-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Deca-PCB congeners	µg/kg				<5	<5	<5		<5			<5	-	-	-	-
Total PCB congeners	µg/kg	23			<5	<5	<5		<5			<5	-	-	-	-
Nutrients, TOC, Cyanide																
Total Nitrogen	mg/kg		1540	1340	1260	1300	1520	1480	1520	1400	1350	880	X	1344.0	195.5	1472
Total Kjeldahl Nitrogen	mg/kg		1540	1340	1260	1300	1520	1480	1520	1400	1350	880	X	1344.0	195.5	1472
Nitrate as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Nitrite as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Total Organic Carbon	%		1.8	1.7	1.5	1.6	1.8	1.7	1.9	1.7	1.7	1	X	1.6	0.3	1.785
Radionuclides																
Gross Alpha	mBq/g	35000			<60	<60	<60		<60			<60	-	-	-	-
Gross Beta	mBq/g	35000			<135	<135	<135		<135			<135	-	-	-	-

Results

Table 3-4 Summary Statistics and 95% UCLs for Zone 3. Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

Analytical Parameter	Unit	NAGD Screening Level	10-5	10-6	10-8	11-9A	11-8	11-5	12-1	12-2	15-1	15-2	15-3	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
Moisture Content	%		58.7	51.8	65	65.5	60.9	64.7	61.9	64.1	64.3	50.5	24.2	X	55.7	12.2	64.08
Trace Elements																	
Aluminium	mg/kg		26000	23000	31000	31000	27000	32000	28000	29000	28000	20000	9200	X	24688.6	6564.6	29424
Arsenic	mg/kg	20	6.6	7.3	7.8	7.5	7.7	7.7	5.6	6.1	7.6	7.1	6.3	N	7.1	0.8	7.441
Cadmium	mg/kg	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Chromium	mg/kg	80	44	41	49	49	45	48	43	44	45	36	21	X	41.3	8.0	46.64
Copper	mg/kg	65	28	25	32	31	29	30	27	28	27	23	5.7	X	24.1	7.2	29.91
Iron	mg/kg		43000	39000	49000	49000	44000	48000	43000	45000	45000	34000	21000	X	40850.8	8195.3	46297
Lead	mg/kg	50	11	10	12	13	13	12	10	11	11	13	4.3	X	10.6	2.5	12.28
Mercury	mg/kg	0.15	0.08	0.06	0.07	0.07	0.1	0.11	0.07	0.07	0.06	0.08	0.02	N	0.07	0.02	0.0845
Nickel	mg/kg	21	34	25	38	38	34	38	35	36	35	25	12	X	30.5	8.0	36.22
Phosphorus	mg/kg		850	640	940	940	910	920	860	920	850	710	320	X	776.1	187.7	908.1
Silver	mg/kg	1	0.11	0.11	0.13	0.13	0.14	0.13	0.1	0.1	0.11	0.11	<0.1	X	0.12	0.01	0.124
Zinc	mg/kg	200	86	81	98	96	93	94	82	85	84	75	32	X	79.5	18.2	92.28
Total Petroleum Hydrocarbons																	
TPH C6-C9	mg/kg	550	<10	<10	<20	<20	<20	<20	<20	<20	<20	<10	<10	-	-	-	-
TPH C10-14	mg/kg	550	<10	<10	<20	<20	<20	<20	<20	<20	<20	<10	<10	-	-	-	-
TPH C15-28	mg/kg	550	<50	<50	<100	<100	<100	<100	<100	<100	<100	<50	<50	-	-	-	-
TPH C29-36	mg/kg	550	<50	51	<100	<100	<100	<100	<100	<100	<100	<50	<50	X	50.8	-	49.67
Poly Aromatic Hydrocarbons																	
Naphthalene	µg/kg			5.8			5.3		3.8			9.0	<5	N	6.0	2.2	7.6
1-Methylnaphthalene	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
2-Methylnaphthalene	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Acenaphthylene	µg/kg			<15			<15		<5			<15	<5	-	-	-	-
Acenaphthene	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Fluorene	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Phenanthrene	µg/kg			13.3			20.0		6.9			17.0	<5	N	14.3	5.7	18.8
Anthracene	µg/kg			4.2			5.9		<5			7.0	<5	N	5.7	1.4	6.3
Fluoranthene	µg/kg			46.7			64.7		21.3			61.0	<5	N	48.4	19.7	64.7
Pyrene	µg/kg			42.5			64.7		19.4			94.0	<5	N	55.1	31.8	79.2
Benz(a)anthracene	µg/kg			20.0			29.4		8.8			30.0	<5	N	22.0	10.0	29.9
Chrysene	µg/kg			21.7			30.6		10.0			35.0	<5	N	24.3	11.0	33.0
Benzo(b)&(k)fluoranthene	µg/kg			49.2			64.7		23.8			100.0	<10	N	59.4	31.9	83.6
Benzo(a)pyrene	µg/kg			26.7			40.6		11.9			55.0	<5	N	33.5	18.5	47.5
Indeno(1,2,3-cd)pyrene	µg/kg			20.8			30.6		11.3			43.0	<5	N	26.4	13.6	36.8
Dibenz(a,h)anthracene	µg/kg			<5			5.3		<5			8.0	<5	N	6.6	1.9	6.5
Benzo(g,h,i)perylene	µg/kg			21.7			28.8		10.0			36.0	<5	N	24.1	11.1	32.8
Coronene	µg/kg			<10			<10		<10			<10	<10	-	-	-	-
Benzo(e)pyrene	µg/kg			23.3			29.4		10.6			43.0	<5	N	26.6	13.5	36.9
Perylene	µg/kg			141.7			58.8		45.6			99.0	59.3	N	80.9	39.4	118.5
Total PAHs (as above)	µg/kg	10000		441.7			482.4		181.3			640.0	<100	N	436.3	190.3	586.7
Organochlorine Pesticides																	
Aldrin	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
alpha-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-

Results

Analytical Parameter	Unit	NAGD Screening Level	10-5	10-6	10-8	11-9A	11-8	11-5	12-1	12-2	15-1	15-2	15-3	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
beta-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
gamma-BHC (Lindane)	µg/kg	0.32	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
delta-BHC	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
cis-Chlordane	µg/kg	0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
trans-Chlordane	µg/kg	0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
p,p'-DDD	µg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
p,p'-DDE	µg/kg	2.2	5.3	3.3	5.3	4.4	4.1	4.7	5.0	5.0	4.7	5.0	<1	X	4.6	0.6	5.1
p,p'-DDT	µg/kg	1.6	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Dieldrin	µg/kg	280	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
alpha-Endosulfan	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
beta-Endosulfan	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endosulfan Sulphate	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Endrin	µg/kg	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endrin ketone	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Endrin aldehyde	µg/kg		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<5	-	-	-	-
Heptachlor	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Heptachlor epoxide	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Hexachlorobenzene	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Methoxychlor	µg/kg		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<10	-	-	-	-
Oxychlordane	µg/kg		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	-	-	-	-
Organotins																	
Monobutyl tin	µgSn/kg		<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	-	-	-	-
Dibutyl tin	µgSn/kg		<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.8	<0.5	X	0.8	-	0.5
Tributyl tin	µgSn/kg	9	0.3	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	X	0.3	-	0.5
Polychlorinated Biphenyls																	
Mono-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Di-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Tri-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Tetra-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Penta-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Hexa-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Hepta-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Octa-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Nona-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Deca-PCB congeners	µg/kg			<5			<5		<5			<5	<5	-	-	-	-
Total PCB congeners	µg/kg	23		<5			<5		<5			<5	<5	-	-	-	-
Nutrients, TOC, Cyanide																	
Total Nitrogen	mg/kg		1230	890	1420	1420	1390	1390	1340	1270	1360	730	270	X	1062.4	371.5	1358
Total Kjeldahl Nitrogen	mg/kg		1230	890	1420	1420	1390	1390	1340	1270	1360	730	270	X	1062.4	371.5	1358
Nitrate as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Nitrite as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Total Organic Carbon	%		1.5	1.2	1.5	1.6	1.7	1.5	1.6	1.4	1.5	1	0.27	X	1.2	0.4	1.565
Radionuclides																	
Gross Alpha	mBq/g	35000		<60			<60		<60			<60	<60	-	-	-	-
Gross Beta	mBq/g	35000		<135			<135		<135			<135	<135	-	-	-	-

Results

Table 3-5 Summary Statistics and 95% UCLs for Zone 4. Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

Analytical Parameter	Unit	NAGD Screening Level	13-1	13-4A	13-5	13-8	13-9	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
Moisture Content	%		58.5	26.3	54.8	50.4	61.4	N	50.3	14.0	63.65
Trace Elements											
Aluminium	mg/kg		23000	11000	25000	20000	23000	N	20400.0	5549.8	25691
Arsenic	mg/kg	20	7.6	7.6	7.5	6.8	9.6	N	7.8	1.0	8.821
Cadmium	mg/kg	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Chromium	mg/kg	80	40	23	45	35	36	N	35.8	8.2	43.59
Copper	mg/kg	65	24	19	33	16	15	N	21.4	7.4	28.43
Iron	mg/kg		38000	23000	42000	32000	35000	N	34000.0	7176.4	40842
Lead	mg/kg	50	15	17	20	10	10	N	14.4	4.4	18.59
Mercury	mg/kg	0.15	0.09	0.03	0.15	0.07	0.07	N	0.08	0.04	0.124
Nickel	mg/kg	21	25	13	30	20	19	N	21.4	6.4	27.53
Phosphorus	mg/kg		670	360	820	580	520	N	590.0	171.2	753.2
Silver	mg/kg	1	0.13	<0.1	0.19	<0.1	<0.1	N	0.16	0.04	0.155
Zinc	mg/kg	200	83	110	100	59	55	N	81.4	24.3	104.6
Total Petroleum Hydrocarbons											
TPH C6-C9	mg/kg	550	<10	<10	<10	<10	<20	-	-	-	-
TPH C10-14	mg/kg	550	<10	<10	<10	<10	<20	-	-	-	-
TPH C15-28	mg/kg	550	<50	<50	<50	<50	<100	-	-	-	-
TPH C29-36	mg/kg	550	<50	<50	35	<50	<100	L	35.3	-	42.52
Poly Aromatic Hydrocarbons											
Naphthalene	µg/kg		4.7			<5			4.7	-	-
1-Methylnaphthalene	µg/kg		<5			<5		-	-	-	-
2-Methylnaphthalene	µg/kg		<5			<5		-	-	-	-
Acenaphthylene	µg/kg		<15			<15		-	-	-	-
Acenaphthene	µg/kg		<5			<5		-	-	-	-
Fluorene	µg/kg		<5			<5		-	-	-	-
Phenanthrene	µg/kg		15.3			10.9		-	13.1	3.2	-
Anthracene	µg/kg		5.3			<5		-	5.3	-	-
Fluoranthene	µg/kg		62.7			32.6		-	47.6	21.3	-
Pyrene	µg/kg		54.7			33.7		-	44.2	14.8	-
Benz(a)anthracene	µg/kg		25.3			16.3		-	20.8	6.4	-
Chrysene	µg/kg		26.0			17.4		-	21.7	6.1	-
Benzo(b)&(k)fluoranthene	µg/kg		60.0			44.6		-	52.3	10.9	-
Benzo(a)pyrene	µg/kg		31.3			21.7		-	26.5	6.8	-
Indeno(1,2,3-cd)pyrene	µg/kg		28.0			22.8		-	25.4	3.7	-
Dibenz(a,h)anthracene	µg/kg		4.7			<5		-	4.7	-	-
Benzo(g,h,i)perylene	µg/kg		28.7			22.8		-	25.7	4.1	-
Coronene	µg/kg		<10			<10		-	-	-	-
Benzo(e)pyrene	µg/kg		24.7			18.5		-	21.6	4.4	-
Perylene	µg/kg		66.7			50.0		-	58.3	11.8	-
Total PAHs (as above)	µg/kg	10000	440.0			293.5		-	366.7	103.6	-
Organochlorine Pesticides											
Aldrin	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
alpha-BHC	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
beta-BHC	µg/kg		<2	<1	<2	<2	<2	-	-	-	-

Results

Analytical Parameter	Unit	NAGD Screening Level	13-1	13-4A	13-5	13-8	13-9	Normal (N), Lognormal (L), Neither (X)	Mean / Geomean	Standard Deviation	95% UCL
gamma-BHC (Lindane)	µg/kg	0.32	<2	<1	<2	<2	<2	-	-	-	-
delta-BHC	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
cis-Chlordane	µg/kg	0.5	<2	<1	<2	<2	<2	-	-	-	-
trans-Chlordane	µg/kg	0.5	<2	<1	<2	<2	<2	-	-	-	-
p,p'-DDD	µg/kg	2	<2	<1	2.4	<2	<2	N	2.4	-	1.8
p,p'-DDE	µg/kg	2.2	2.7	<1	4.1	2.2	<2	N	3.0	1.0	3.5
p,p'-DDT	µg/kg	1.6	<2	<1	<2	<2	<2	-	-	-	-
Dieldrin	µg/kg	280	<2	<1	<2	<2	<2	-	-	-	-
alpha-Endosulfan	µg/kg		<10	<5	<10	<10	<10	-	-	-	-
beta-Endosulfan	µg/kg		<10	<5	<10	<10	<10	-	-	-	-
Endosulfan Sulphate	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
Endrin	µg/kg	10	<10	<5	<10	<10	<10	-	-	-	-
Endrin ketone	µg/kg		<10	<5	<10	<10	<10	-	-	-	-
Endrin aldehyde	µg/kg		<10	<5	<10	<10	<10	-	-	-	-
Heptachlor	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
Heptachlor epoxide	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
Hexachlorobenzene	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
Methoxychlor	µg/kg		<20	<10	<20	<20	<20	-	-	-	-
Oxychlordane	µg/kg		<2	<1	<2	<2	<2	-	-	-	-
Organotins											
Monobutyl tin	µgSn/kg		<0.5	<0.5	<0.5	<0.5	<1.0	-	-	-	-
Dibutyl tin	µgSn/kg		0.3	<0.5	0.9	<0.5	<1.0	N	0.6	0.4	0.7
Tributyl tin	µgSn/kg	9	<0.5	<0.5	0.4	<0.5	<1.0	N	0.4	-	0.444
Polychlorinated Biphenyls											
Mono-PCB congeners	µg/kg		<5			<5		-	-	-	-
Di-PCB congeners	µg/kg		<5			<5		-	-	-	-
Tri-PCB congeners	µg/kg		<5			<5		-	-	-	-
Tetra-PCB congeners	µg/kg		<5			<5		-	-	-	-
Penta-PCB congeners	µg/kg		<5			<5		-	-	-	-
Hexa-PCB congeners	µg/kg		<5			<5		-	-	-	-
Hepta-PCB congeners	µg/kg		<5			<5		-	-	-	-
Octa-PCB congeners	µg/kg		<5			<5		-	-	-	-
Nona-PCB congeners	µg/kg		<5			<5		-	-	-	-
Deca-PCB congeners	µg/kg		<5			<5		-	-	-	-
Total PCB congeners	µg/kg	23	<5			<5		-	-	-	-
Nutrients, TOC, Cyanide											
Total Nitrogen	mg/kg		1170	380	1230	820	1060	N	932.0	346.1	1262
Total Kjeldahl Nitrogen	mg/kg		1170	380	1230	820	1060	N	932.0	346.1	1262
Nitrate as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Nitrite as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
Total Organic Carbon	%		1.5	0.41	1.7	0.92	1.2	N	1.1	0.5	1.629
Radionuclides											
Gross Alpha	mBq/g	35000	<60			<60		-	-	-	-
Gross Beta	mBq/g	35000	<135			<135		-	-	-	-

Results

Table 3-6 Analytical Results for Reference Locations. Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

			Zone 1		MIDMPA		Moreton Bay Reference				
Analytical Parameter	**Unit**	**NAGD Screening Level**	**2-0**	**BC-2**	**16-1**	**16-0**	**RF2**	**RF3**	**RF4**	**RF6**	**RF7**
Moisture Content	%		19.2	42.2	59.8	61	65.2	65.5	55.9	55.1	63.7
Trace Elements											
Aluminium	mg/kg		3200	14000	27000	26000	27000	30000	22000	21000	31000
Arsenic	mg/kg	20	1.8	5.7	7.2	7.4	7.5	6.6	6.2	7	6.8
Cadmium	mg/kg	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	80	9.1	24	47	46	47	50	38	40	50
Copper	mg/kg	65	3.4	25	31	31	24	26	18	19	34
Iron	mg/kg		10000	24000	44000	44000	41000	43000	35000	36000	46000
Lead	mg/kg	50	36	26	14	14	16	17	14	13	18
Mercury	mg/kg	0.15	0.01	0.11	0.1	0.1	0.09	0.09	0.15	0.08	0.11
Nickel	mg/kg	21	6.7	17	34	33	26	28	20	23	35
Phosphorus	mg/kg		210	550	880	880	640	650	510	590	770
Silver	mg/kg	1	<0.1	0.13	0.13	0.13	<0.1	0.1	<0.1	<0.1	0.17
Zinc	mg/kg	200	43	110	93	93	85	88	65	71	100
Total Petroleum Hydrocarbons											
TPH C6-C9	mg/kg	550	<10	<10	<10	<20	<20	<20	<10	<10	<20
TPH C10-14	mg/kg	550	<10	<10	<10	<20	<20	<20	<10	<10	<20
TPH C15-28	mg/kg	550	<50	<50	<50	<100	<100	<100	<50	<50	<100
TPH C29-36	mg/kg	550	<50	50	31	<100	<100	<100	<50	<50	<100
Organochlorine Pesticides											
Aldrin	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
alpha-BHC	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
beta-BHC	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
gamma-BHC (Lindane)	µg/kg	0.32	<1	<1	<2	<2	<2	<2	<2	<2	<2
delta-BHC	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
cis-Chlordane	µg/kg	0.5	<1	1.5	<2	<2	<2	<2	<2	<2	<2
trans-Chlordane	µg/kg	0.5	<1	6.2	<2	<2	<2	<2	<2	<2	<2
p,p'-DDD	µg/kg	2	<1	0.8	<2	<2	<2	<2	<2	<2	<2
p,p'-DDE	µg/kg	2.2	<1	3.8	4.7	4.4	2.1	2.9	2.0	4.0	7.5
p,p'-DDT	µg/kg	1.6	<1	<1	<2	<2	<2	<2	<2	<2	<2
Dieldrin	µg/kg	280	<1	<1	<2	<2	<2	<2	<2	<2	<2
alpha-Endosulfan	µg/kg		<5	<5	<10	<10	<10	<10	<10	<10	<10
beta-Endosulfan	µg/kg		<5	<5	<10	<10	<10	<10	<10	<10	<10
Endosulfan Sulphate	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
Endrin	µg/kg	10	<1	<5	<10	<10	<10	<10	<10	<10	<10
Endrin ketone	µg/kg		<5	<5	<10	<10	<10	<10	<10	<10	<10
Endrin aldehyde	µg/kg		<1	<5	<10	<10	<10	<10	<10	<10	<10
Heptachlor	µg/kg		<1	<5	<2	<2	<2	<2	<2	<2	<2
Heptachlor epoxide	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
Hexachlorobenzene	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
Methoxychlor	µg/kg		<1	<1	<20	<20	<20	<20	<20	<20	<20
Oxychlordane	µg/kg		<1	<1	<2	<2	<2	<2	<2	<2	<2
Organotins											
Monobutyl tin	µgSn/kg		<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0
Dibutyl tin	µgSn/kg		<0.5	1.0	0.4	<1.0	<1.0	<1.0	<0.5	<0.5	0.8

Results

			Zone 1		MIDMPA		Moreton Bay Reference				
Analytical Parameter	**Unit**	**NAGD Screening Level**	**2-0**	**BC-2**	**16-1**	**16-0**	**RF2**	**RF3**	**RF4**	**RF6**	**RF7**
Tributyl tin	µgSn/kg	9	<0.5	1.5	0.4	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0
Nutrients, TOC, Cyanide											
Total Nitrogen	mg/kg		76	710	1320	1340	1280	1290	930	880	1280
Total Kjeldahl Nitrogen	mg/kg		76	710	1320	1340	1280	1290	930	880	1280
Nitrate as N	mg/kg		1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite as N	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	%		0.05	1.3	1.7	1.6	1.4	1.4	0.98	0.99	1.6

Table 3-7 Acid Sulfate Soil Results (Chromium Suite)

			Zone 2					Zone 3					Zone 4	
Analytical Parameter	**Units**		**5-0**	**5-1A**	**6-3**	**7-1**	**9-1**	**10-6**	**11-8**	**12-1**	**15-2**	**15-3**	**13-1**	**13-8**
pH kcl	pH units		7.9	7.9	8	8	8.6	8.6	8.4	8.1	8.6	9.1	8.5	8.9
s-TAA pH 6.5	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H+/t	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	0.005	0.07	0.16	0.06	0.09	0.04	0.16	0.09	0.05	0.06	0.03	0.09	0.1
a-Chromium Reducible Sulfur	moles H+/t	3	45	100	36	59	23	98	54	32	36	22	59	65
S_{KCl}	%w/w S	0.005	0.22	0.26	0.24	0.22	0.086	0.18	0.16	0.22	0.11	0.051	0.18	0.13
ANC_{BT}	% CaCO3	0.05	0.94	2	2.5	3.1	2.8	4.6	3.3	2	3.4	1.9	3.4	6.8
s-ANC_{BT}	%w/w S	0.05	0.3	0.65	0.8	0.98	0.9	1.5	1.1	0.65	1.1	0.62	1.1	2.2
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/t	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming rate	kg CaCO3/t	0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H+/t	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming rate without ANCE	kg CaCO3/t	0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75	<0.75

4 Data Validation

This Section provides an assessment of data validation including evaluation of QA/QC assessment of laboratory and field replicates and laboratory QA/QC procedures in order to provide scientific confidence that the presented results are valid.

4.1 Laboratory QA/QC

Details of the laboratory QA/QC for the primary and secondary laboratories are provided in Appendix C and D. A summary of this assessment is provided in the following sections. Refer to Section 2.6.2 for a description of laboratory QA/QC procedures.

4.1.1 Limits of Reporting (LORs)

Selected organic LORs were raised due to the high moisture content in selected samples. Furthermore, selected organochlorine pesticide LORs were raised due to matrix interferences.

The raised LORs resulted from inherent sediment properties in the study area. The raised LORs for selected organics are not considered problematic for the assessment against NAGD.

4.1.2 Sample Holding Times and Storage Conditions

All samples were received by the laboratories in appropriately pre-treated and preserved containers. Samples were chilled with ice whilst in the field and during delivery (ice packs). All analyses were undertaken by the laboratories within recommended holding times.

4.1.3 Laboratory Blanks

The laboratory blank assessment was satisfactory.

Measurements of laboratory blanks for the chemical analyses were always below the LOR of the specific analysis method in the primary and secondary laboratories. This indicates that samples were not contaminated by procedures followed during laboratory analysis.

4.1.4 Laboratory Duplicates

The assessment of laboratory duplicates was acceptable.

For chemical analyses conducted by the primary laboratory, RPDs for all measured components were within the laboratories acceptance criteria.

4.1.5 Surrogate and Matrix Spikes

The assessment of surrogate and matrix spike recoveries was satisfactory.

The primary laboratory AAA recorded surrogate and matrix spike recoveries outside the laboratory limits for:

- Monobutyl-tin (MBT)

The spike recovery was biased low due to matrix interference. This is not considered problematic given that all organotins species (MBT, DBT and TBT) were detected at low concentrations or below LOR.

4.2 Field QA/QC

4.2.1 Field Trip Blank

No BTEX compounds or volatile Total Petroleum Hydrocarbons (TPH C6-C9) were detected in any trip blank samples, indicating that samples were not contaminated with volatile organic carbons during field sampling and processing of samples.

4.3 Field Triplicates

The assessment of field triplicate samples taken at Locations 5-1, 11-9 and 13-4 indicated relatively homogenous sediment contaminant concentrations over smaller scales with the RSD or RPD generally below the 50% NAGD criterion Table 4-1.

The only exceptions were silver, dibutyltin and two PAH species at location 5-1. The exceedance of the NAGD criterion for these contaminants is not considered problematic given that it was either due to generally low concentrations (silver and DBT) or the exceedance was only marginal (PAHs).

For measurements at low concentrations close to LOR, small differences in concentration typically result in large changes in the RPD or RSD value.

Data Validation

Table 4-1 Summary of Triplicate Field Core Analysis for Sediment Contaminants. Orange Shading Indicates Exceedance of 50% Criterion for Relative Standard Deviation (RSD) or Relative Percent Difference (RPD)

Sample		NAGD Screening Level	5-1A	5-1B	5-1C	RSD/RPD (%)	11-9A	11-9B	11-9C	RSD/RPD (%)	13-4A	13-4B	13-4C	RSD/RPD (%)
Moisture Content	%		61.4	61.6	59.9	1.5	65.5	64.6	65.4	0.8	26.3	29.2	33.7	12.5
Trace Elements														
Aluminium	mg/kg		32000	31000	31000	1.8	31000	31000	31000	0.0	11000	11000	14000	14.4
Arsenic	mg/kg	20	7.2	5.7	5.8	13.5	7.5	7.6	7.6	0.8	7.6	6.7	7.7	7.5
Cadmium	mg/kg	1.5	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
Chromium	mg/kg	80	52	51	52	1.1	49	49	49	0.0	23	24	27	8.4
Copper	mg/kg	65	36	34	33	4.4	31	31	31	0.0	19	18	21	7.9
Iron	mg/kg		49000	51000	52000	3.0	49000	53000	49000	4.6	23000	24000	26000	6.3
Lead	mg/kg	50	19	11	11	33.8	13	12	12	4.7	17	19	27	25.2
Mercury	mg/kg	0.15	0.12	0.08	0.07	29.4	0.07	0.07	0.09	15.1	0.03	0.03	0.03	0.0
Nickel	mg/kg	21	36	44	45	11.8	38	38	38	0.0	13	14	15	7.1
Phosphorus	mg/kg		940	1000	1100	8.0	940	950	950	0.6	360	400	400	6.0
Silver	mg/kg	1	0.37	0.12	0.12	71.0	0.13	0.14	0.13	4.3	<0.1	<0.1	<0.1	-
Zinc	mg/kg	200	110	95	95	8.7	96	96	96	0.0	110	130	160	18.9
Poly Aromatic Hydrocarbons														
Naphthalene	µg/kg		3.8	<5	<5	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	µg/kg		<5	<5	<5	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	µg/kg		<5	<5	<5	-	-	-	-	-	-	-	-	-
Acenaphthylene	µg/kg		<15	<15	<15	-	-	-	-	-	-	-	-	-
Acenaphthene	µg/kg		<5	<5	<5	-	-	-	-	-	-	-	-	-
Fluorene	µg/kg		<5	<5	<5	-	-	-	-	-	-	-	-	-
Phenanthrene	µg/kg		13.1	7.1	7.1	38.6	-	-	-	-	-	-	-	-
Anthracene	µg/kg		4.4	<5	<5	-	-	-	-	-	-	-	-	-
Fluoranthene	µg/kg		48.1	22.4	24.7	44.9	-	-	-	-	-	-	-	-
Pyrene	µg/kg		51.9	21.8	23.5	52.2	-	-	-	-	-	-	-	-
Benz(a)anthracene	µg/kg		21.9	10.0	10.6	47.3	-	-	-	-	-	-	-	-
Chrysene	µg/kg		25.6	10.6	11.8	52.3	-	-	-	-	-	-	-	-
Benzo(b)&(k)fluoranthene	µg/kg		54.4	31.8	27.6	37.9	-	-	-	-	-	-	-	-
Benzo(a)pyrene	µg/kg		28.8	16.5	14.7	38.3	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	µg/kg		24.4	15.3	12.4	36.1	-	-	-	-	-	-	-	-
Dibenz(a,h)anthracene	µg/kg		3.8	<5	<5	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	µg/kg		22.5	14.7	11.2	35.9	-	-	-	-	-	-	-	-
Coronene	µg/kg		<10	<10	<10	-	-	-	-	-	-	-	-	-
Benzo(e)pyrene	µg/kg		25.0	14.7	12.9	37.1	-	-	-	-	-	-	-	-
Perylene	µg/kg		53.1	48.2	48.8	5.3	-	-	-	-	-	-	-	-
Total PAHs (as above)	µg/kg	10000	381.3	211.8	205.9	37.4	-	-	-	-	-	-	-	-
Organochlorine Pesticides														
Aldrin	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
alpha-BHC	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
beta-BHC	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
gamma-BHC (Lindane)	µg/kg	0.32	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
delta-BHC	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
cis-Chlordane	µg/kg	0.5	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
trans-Chlordane	µg/kg	0.5	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-

Data Validation

Sample		NAGD Screening Level	5-1A	5-1B	5-1C	RSD/RPD (%)	11-9A	11-9B	11-9C	RSD/RPD (%)	13-4A	13-4B	13-4C	RSD/RPD (%)
p,p'-DDD	µg/kg	2	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
p,p'-DDE	µg/kg	2.2	6.3	6.5	6.5	2.0	4.4	4.7	5.0	6.7	<1	<1	<1	-
p,p'-DDT	µg/kg	1.6	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Dieldrin	µg/kg	280	<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
alpha-Endosulfan	µg/kg		<10	<10	<10	-	<10	<10	<10	-	<5	<5	<5	-
beta-Endosulfan	µg/kg		<10	<10	<10	-	<10	<10	<10	-	<5	<5	<5	-
Endosulfan Sulphate	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Endrin	µg/kg	10	<10	<10	<10	-	<10	<10	<10	-	<5	<5	<5	-
Endrin ketone	µg/kg		<10	<10	<10	-	<10	<10	<10	-	<5	<5	<5	-
Endrin aldehyde	µg/kg		<10	<10	<10	-	<10	<10	<10	-	<5	<5	<5	-
Heptachlor	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Heptachlor epoxide	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Hexachlorobenzene	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Methoxychlor	µg/kg		<20	<20	<20	-	<20	<20	<20	-	<10	<10	<10	-
Oxychlordane	µg/kg		<2	<2	<2	-	<2	<2	<2	-	<1	<1	<1	-
Organotins														
Monobutyl tin	µgSn/kg		<1.0	<1.0	<0.5	-	<1.0	<1.0	<1.0	-	<0.5	<0.5	<0.5	-
Dibutyl tin	µgSn/kg		1.2	<1.0	0.4	97.0	<1.0	<1.0	<1.0	-	<0.5	<0.5	<0.5	-
Tributyl tin	µgSn/kg	9	<1.0	<1.0	0.3	-	<1.0	<1.0	<1.0	-	<0.5	<0.5	<0.5	-
Nutrients, TOC, Cyanide														
Total Nitrogen	mg/kg		1300	1410	1400	4.4	1420	1400	1460	2.1	380	380	470	12.7
Total Kjeldahl Nitrogen	mg/kg		1300	1410	1400	4.4	1420	1400	1460	2.1	380	380	470	12.7
Nitrate as N	mg/kg		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
Nitrite as N	mg/kg		<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-
Total Organic Carbon	%		1.6	1.7	1.7	3.5	1.6	1.5	1.6	3.7	0.41	0.53	0.7	26.7
Acid Sulfate Soils														
pH kcl	pH units		7.9	7.8	7.7	1.3	-	-	-	-	-	-	-	-
s-TAA pH 6.5	%w/w S		<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-
TAA pH 6.5	moles H^+/t		<5	<5	<5	-	-	-	-	-	-	-	-	-
Chromium Reducible Sulfur	%w/w		0.16	0.07	0.08	47.7	-	-	-	-	-	-	-	-
a-Chromium Reducible Sulfur	moles H^+/t		100	45	52	45.6	-	-	-	-	-	-	-	-
S_{KCl}	%w/w S		0.26	0.24	0.23	6.3	-	-	-	-	-	-	-	-
ANC_{BT}	% $CaCO_3$		2	2.3	1.9	10.1	-	-	-	-	-	-	-	-
s-ANC_{BT}	%w/w S		0.65	0.73	0.62	8.5	-	-	-	-	-	-	-	-
s-Net Acidity	%w/w S		<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-
a-Net Acidity	moles H^+/t		<10	<10	<10	-	-	-	-	-	-	-	-	-
Liming rate	kg $CaCO_3$/t		<0.75	<0.75	<0.75	-	-	-	-	-	-	-	-	-

4.3.1 Field Triplicate Splits

All analyses of field triplicate splits were within the ±50 % NAGD criterion for RSDs or RPDs (Table 4-2). This indicates that subsample handling and laboratory analyses were undertaken to a high standard.

Table 4-2 Summary of Triplicate Laboratory Split Analysis. Orange Shading Indicates Exceedance of 50% Criterion for Relative Standard Deviation (RSD) or Relative Percent Difference (RPD)

Sample		NAGD Screening Level	6-2A	6-2B	6-2C	RSD/RPD (%)	10-6	10-6B	10-6C	RSD/RPD (%)
Moisture Content	%		62.4	61.5		1.5	51.8	50.8		1.9
Trace Elements										
Aluminium	mg/kg		31000	31000	29400	3.0	23000	23000	19800	8.4
Arsenic	mg/kg	20	5.9	5.9	7	10.1	7.3	7.2	9	12.9
Cadmium	mg/kg	1.5	<0.1	<0.1	<1	-	<0.1	<0.1	<1	-
Chromium	mg/kg	80	52	51	55	4.0	41	40	41	1.4
Copper	mg/kg	65	39	39	41	2.9	25	25	27	4.5
Iron	mg/kg		52000	51000	54300	3.2	39000	38000	38700	1.3
Lead	mg/kg	50	11	11	17	26.6	10	11	16	26.1
Mercury	mg/kg	0.15	0.07	0.07	<0.1	0.0	0.06	0.07	<0.1	15.4
Nickel	mg/kg	21	47	46	57	12.2	25	26	30	9.8
Phosphorus	mg/kg		1200	1200		0.0	640	650		1.1
Silver	mg/kg	1	0.13	0.13	<2	0.0	0.11	0.1	<2	9.5
Zinc	mg/kg	200	120	110	146	14.8	81	81	100	12.6
Organotins										
Monobutyl tin	µgSn/kg		<1.0	<1.0	<1	-	<0.5	<0.5	<1	-
Dibutyl tin	µgSn/kg		<1.0	<1.0	<1	-	<0.5	<0.5	<1	-
Tributyl tin	µgSn/kg	9	<1.0	<1.0	1.2	-	<0.5	0.6	0.7	10.0
Nutrients, TOC, Cyanide										
Total Nitrogen	mg/kg		1480	1470	-	0.7	890	890	850	2.6
Total Kjeldahl Nitrogen	mg/kg		1480	1470	-	0.7	890	890	850	2.6
Nitrate as N	mg/kg		<0.1	<0.1	-	-	<0.1	<0.1	<0.1	-
Nitrite as N	mg/kg		<0.1	<0.1	-	-	<0.1	<0.1	<0.1	-
Total Organic Carbon	%		1.7	1.7	1.5	7.1	1.2	1.1	0.96	11.1
Acid Sulfate Soils										
pH kcl	pH units		-	-	-	-	8.6	8.6	7.4	8.4
s-TAA pH 6.5	%w/w S		-	-	-	-	<0.01	<0.01	<0.02	-
TAA pH 6.5	moles H^+/t		-	-	-	-	<5	<5	<2	-
Chromium Reducible Sulfur	%w/w		-	-	-	-	0.16	0.15	0.326	46.6
a-Chromium Reducible Sulfur	moles H^+/t		-	-	-	-	98	96	203	46.3
S_{KCl}	%w/w S		-	-	-	-	0.18	0.17		4.0
ANC_{BT}	% $CaCO_3$		-	-	-	-	4.6	3.7	3.11	19.7
s-ANC_{BT}	%w/w S		-	-	-	-	1.5	1.2	1	20.4
s-Net Acidity	%w/w S		-	-	-	-	<0.01	<0.01	<0.02	-
a-Net Acidity	moles H^+/t		-	-	-	-	<10	<10	<10	-
Liming rate	kg $CaCO_3$/t		-	-	-	-	<0.75	<0.75	<1	-

4.4 Summary of Data Validation

The evaluation of laboratory and field QA/QC procedures and assessments indicates that all sampling, sample handling and storage and laboratory analysis was undertaken to a high standard providing scientific confidence that the presented results are valid to allow an assessment of sediment quality against the NAGD guidelines.

5 References

Ahern, C.R., Ahern, M.R., Powell, B. (1998). Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998: DEH, Brisbane.

Ahern, C.R., McElnea, A.E., Sullivan, L.A. (2004) Acid Sulfate Soils Laboratory Methods Guidelines. Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

ANZECC/ARMCANZ. (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Vol. 4). Canberra: Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand.

Commonwealth of Australia (2009) National Assessment Guidelines for Dredging: Department of the Environmental, Water, Heritage and the Arts, Canberra.

Singh, A., Maichle, R., Armbya, N. (2010) ProUCL Version 4.1 User Guide (Draft) Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. U.S. Environmental Protection Agency, Washington.

WBM (2005a) Scarborough Boat Harbour Sediment Sampling and Analysis - November 2004. Report prepared for Queensland Transport.

WBM (2005b) Toondah Harbour Sediment Sampling and Analysis - November 2004. Report prepared for Queensland Transport.

Appendix A Sampling and Analysis Plan

BMT WBM

Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013

Reference: R.B20259.001.02.SAP.docx
Date: October 2013
Confidential

Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013

Prepared for:	Port of Brisbane Pty Ltd
Prepared by:	BMT WBM Pty Ltd (Member of the BMT group of companies)

Offices

Brisbane
Denver
London
Mackay
Melbourne
Newcastle
Perth
Sydney
Vancouver

Document Control Sheet

BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane 4000
Queensland Australia
PO Box 203 Spring Hill 4004

Tel: +61 7 3831 6744
Fax: + 61 7 3832 3627

ABN 54 010 830 421

www.bmtwbm.com.au

Document:	R.B20259.001.02.SAP.docx
Title:	Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013
Project Manager:	Darren Richardson
Author:	Markus Billerbeck
Client:	Port of Brisbane Pty Ltd
Client Contact:	Craig Wilson/Rachael Attard
Client Reference:	

Synopsis: **A sediment sampling and analysis plan for the assessment of physical and chemical sediment properties associated with Port of Brisbane maintenance dredging**

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	27.09.13	DLR		MMB	
1	17.10.13				

DISTRIBUTION

Destination	Revision										
	0	1	2	3	4	5	6	7	8	9	10
Port of Brisbane	PDF	PDF									
BMT WBM File	PDF	PDF									
BMT WBM Library	PDF	PDF									

Contents

Contents

List of Figures

List of Tables

1 Introduction

Port of Brisbane Pty Ltd (PBPL) is required to maintain a minimum depth of clearance below the keel of vessels calling at the port to allow for effective shipping access to the port and ensure ship safety. Channel depths are declared by the Harbour Master (Maritime Safety Queensland) and displayed on various shipping charts. PBPL undertakes an annual maintenance dredging program to ensure these minimum depths are maintained.

PBPL propose to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and Moreton Bay, primarily using the Trailer Suction Hopper Dredge (TSHD) 'Brisbane'. Maintenance dredging works extend from the Hamilton Reach of the Brisbane River to the North West Channel located in northern Moreton Bay.

PBPL aims to ensure that all dredging activities, including extraction and placement of material, are undertaken in accordance with existing legislation and with minimal environmental harm. A key component of achieving this aim is to undertake a contaminant assessment of the material proposed for dredging prior to the commencement of the dredging program.

1.1 Sediment Sampling and Analysis Plan (SAP) Objectives

The aim of this SAP is to provide a set of procedures that will allow a statistically valid evaluation of the physical and chemical sediment properties of the sediments to be dredged. The results of this assessment will assist in determining the likely impacts of unconfined offshore disposal of the dredged sediment.

The assessment of physico-chemical sediment properties will be undertaken on the basis of the approach set out in the National Assessment Guidelines for Dredging (Commonwealth of Australia 2009; henceforth NAGD).

The specific SAP objectives are to:

- Provide a summary of proposed dredging and disposal operations for the project;
- Identify a list of contaminants based on a review of existing data and potential contaminant sources;
- Determine the number of samples required to provide an adequate characterisation of the physical and chemical sediment properties;
- Develop procedures for adequate field collection and handling of sediment samples;
- Outline adequate quality assurance and quality control (QA/QC) procedures for field sampling and laboratory analysis;
- Provide a description of statistical procedures used to determine the contaminant status of the dredged material;
- Describe procedures for validating the analytical data to assess whether the sample collection, handling and laboratory analysis was undertaken to a standard allowing assessment of sediment quality against the NAGD guidelines; and

- Outline the proposed reporting framework for the sediment quality results that will address the requirements of the Determining Authority.

1.2 Proposed Dredging

PBPL's area of responsibility in relation to maintenance and capital dredging within port limits can be broadly divided into two zones on the basis of the water body type, navigable depths and nature of dredged material:

- Moreton Bay zone (enclosed/open coastal waters); and
- Brisbane River zone including the Port of Brisbane (middle/lower estuary).

This SAP only considers assessment of sediments for the Brisbane River zone. The Brisbane River zone extends from Hamilton Reach to the Outer Bar Cutting. Annual maintenance dredging is required to remove sediments accumulated by natural siltation processes within the catchment and sediment loads from residential and commercial developments.

To ensure that declared depths of navigational channels are maintained at all times, PBPL undertakes 'insurance' dredging of up to -0.5 metres below the declared depth.

On average, PBPL dredges about 400,000 m^3 to 450,000 m^3 of material each year. Additional dredging needs to be undertaken following major flood events, i.e. in 2011 and 2013.

The Brisbane River zone is divided into different dredging subareas based on existing contaminant data (Figure 2-1), comprising Zone 2, Zone 3 and Zone 4. It is noted that Zone 1 is not part of the annual dredging and samples from this zone have been used to collect control samples upstream of the actual dredging areas.

The following average dredge volumes apply to the dredge subareas (Table 1-1):

Table 1-1 Approximate Maintenance Dredge Volumes

Dredging Subarea	Extents	Average Dredge Volume (m^3)
Zone 2	Colmslie to Pinkenba	150,000
Zone 3	Within port reaches	250,000
Zone 4	Moreton Bay entrance channel	30,000

The maintenance dredging program is structured to maximise efficiencies and utilisation of PBPL's largest dredger, the trailing suction hopper dredge *TSHD Brisbane*. The *TSHD Brisbane* typically carries out the majority of the ports maintenance dredging over a two month period between January and May (actual period varies depending on other commitments of the *TSHD Brisbane* and siltation patterns). The PBPL may also utilise smaller, more manoeuvrable dredging plant, such as grab dredgers and bed levellers, to maintain more confined areas within the Port Limits.

1.3 Offshore Disposal

The PBPL's policy with regard to dredged material is to maximise its beneficial reuse. In general, most of the material dredged by the PBPL from within Port Limits is used in reclamation works

associated with development of the port. The reuse of this dredged material provides several benefits, including:

- Reduced pressure on sea disposal sites;
- The placement of any actual or potential acid sulphate material at depth beneath the water surface; and
- The containment of any contaminated material within a designated boundary, disconnected from the marine system and monitored to ensure the immobility of identified contaminants.

In 2009, the reclamation life of the Future Port Expansion (FPE) area was estimated to be approximately 30 years, based on the current level of port development at that time. Following extreme flood events in both 2011 and 2013 and the subsequent disposal of additional material in the FPE area, the estimated life of the FPE area was reduced by 20 years to 10 years. Given the importance of the FPE as an area to dispose of material unsuitable for ocean disposal, there has been a shift in thinking around the management of the FPE area.

The current proposed management of dredged material is to, where practical, dispose at sea all dredged material deemed suitable for ocean disposal. This proposed management initiative will ensure the long term viability of the FPE area for the disposal of material deemed unsuitable for ocean disposal.

In the past, significant quantities of dredged material from the Brisbane River have been placed offshore at the Mud Island Dredge Material Placement Area (DMPA) (Figure 2-1). In recent years only smaller volumes of dredged material from boat harbours in southern Moreton Bay were placed at the Mud Island DMPA. However, it is proposed that the Mud Island DMPA will be utilised for material found suitable for ocean disposal in future PBPL maintenance dredging campaigns.

2 Review of Existing Information

Prior to each annual maintenance dredging campaign, PBPL undertook assessments of sediment quality at 45 sampling locations within the dredging zones 2 to 4 (Figure 2-1).

Additional samples were obtained from three locations in Zone 1 and Breakfast Creek upstream of the dredging area in order to assess potential sediment quality impacts from the upstream catchment. The sediment quality results for the annual sampling program between 2000 and 2013 are summarised in Section 2.1.

Due to major flooding in the Brisbane River catchment in early January 2011 and late January 2013, emergency dredging was required to maintain declared depths. Twelve to twenty locations were sampled within the port and three to four locations within the Mud Island DMPA for the 2011 and 2013 flood sampling campaigns, respectively. The sediment quality assessments included elutriate and bioavailability analyses for selected trace metals and organic contaminants.

Additionally, a comparison of sediment quality (organochlorine pesticides and dioxins) at 14 sampling locations at the Mud Island DMPA and seven reference sites in Moreton Bay (Sites RF1 to RF7 in Figure 2-1) was undertaken in 2013 to assess if the emergency dredging and disposal activities impacted on sediment and water quality in Moreton Bay. The sediment quality results for the 2011 and 2013 flood sampling are summarised in Section 2.2.

Conclusions based on the review of the annual and flood sampling data are provided in Section 2.3.

2.1 Annual Sediment Quality Data 2000 – 2013

Detailed sediment quality studies have been undertaken within the Port of Brisbane since 1998. This review considers sediment quality data collected between 2000 and 2012. This comprises the studies detailed in Table 2-1.

In addition to the routine monitoring documented in Table 2-1, further sampling was carried in 2011 and 2013 (Worley Parsons 2011b, 2013b, 2013c, 2013d) to assess the effects of floods on sediment quality. Refer to Section 2.2 for a description of these studies.

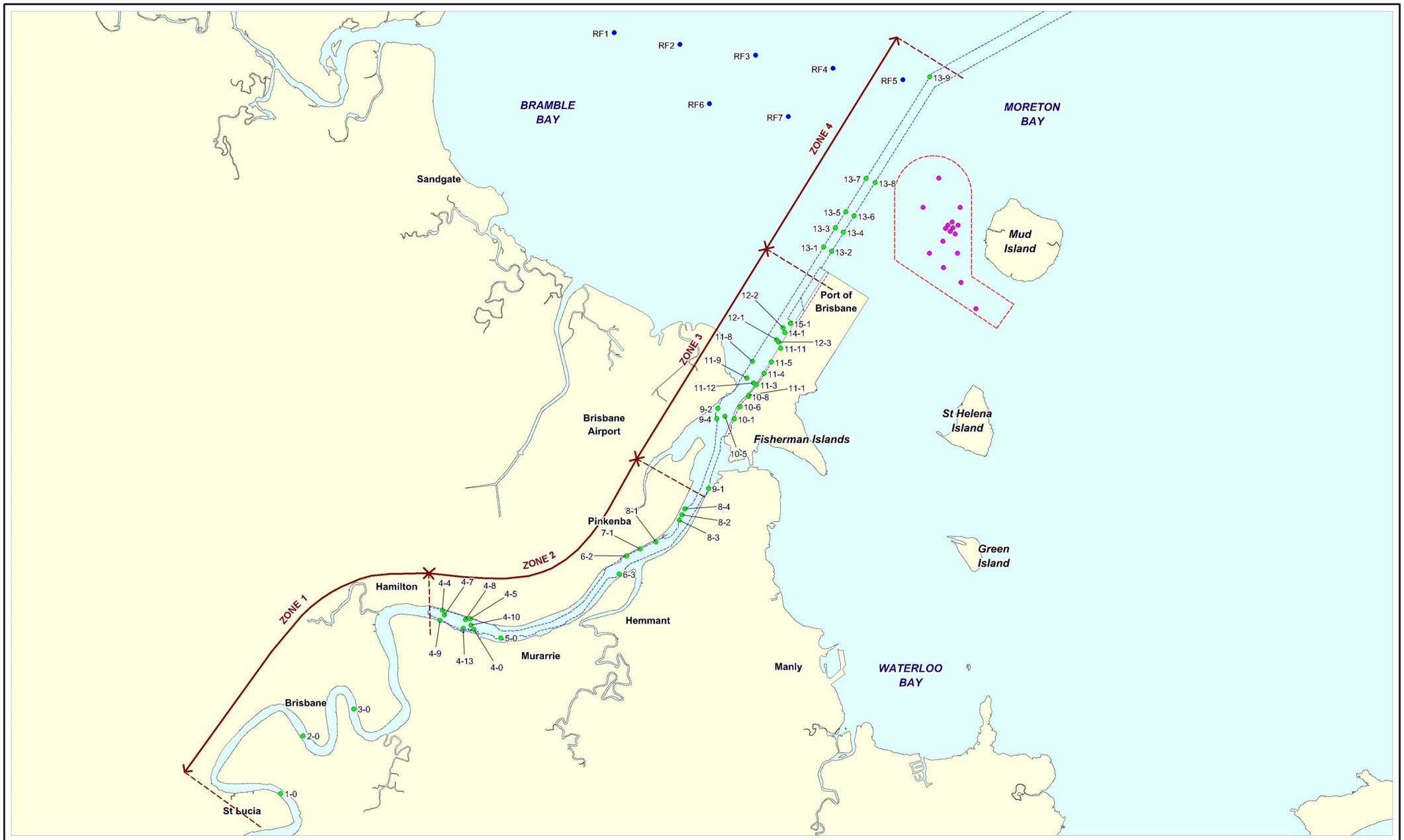
Table 2-1 Previous Routine Annual Sediment Quality Studies

Reference	Sampling Date
Maunsell McIntyre (2001)	November 2000
Butler Partners (2002)	November 2001
Hydrobiology (2003)	November 2002
Hydrobiology (2004)	November 2003
SKM (2005)	November 2004
SKM (2006)	January 2006
SKM (2007)	February 2007
Worley Parsons (2008)	January 2008
Worley Parsons (2009)	February 2009
GHD (2010)	January 2010
Worley Parsons (2011a)	December 2010
Worley Parsons (2012)	December 2011
Worley Parsons (2013a)	December 2012

A wide range of analytical parameters have been measured between 2000 and 2012 as summarised in Table 2-2. Analysis was undertaken at a total of 45 locations within the dredge areas. Additional samples were collected from three control locations upstream of the dredging areas as well as from Breakfast Creek (these locations are not within the dredge areas).

Table 2-2 Summary of Sediment Quality Data 2000 - 2012

Analytical Parameter	Measurement Events
Inorganics	
Metals & Metalloids	2000-2012
Organics	
Organotins	2000-2012
Total Petroleum Hydrocarbons (TPHs)	2000-2012
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	2000-2012
Polycyclic Aromatic Hydrocarbons (PAHs)	2000-2012 (30% of locations)
Organophosphate and Organochlorine Pesticides (OPPs and OCPs)	2000-2012 (40% of locations between 2000 and 2006)
Polychlorinated Biphenyls (PCBs)	2000-2012 (30% of locations)
Radionuclides	2010-2012
Acid Sulfate Soils	2000-2012



LEGEND

- Existing Sample Site
- Reference Sample Site
- DMPA Emergency Dredging Monitoring Sites
- Dredge Area
- Dredge Material Placement Area

Title:
Historic Sediment Sampling Locations

Figure: **2-1**

Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 2.5 5km

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B20259_I_BRH Port of Brisbane DLR\DRG\ECO_019_130923 Sediment Sampling Plan.wor

2.1.1 Metals and Metalloids

Testing for metals and metalloids has included analysis of arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc between 2000 and 2012. Antimony and silver were also tested between 2001 and 2004.

The main contaminants of potential concern in terms of metals and metalloids were mercury and nickel. Mercury and nickel concentrations frequently exceeded the NAGD screening level at the 95% Upper Confidence Limit of the mean (95% UCL). Silver exceeded the NAGD screening level at the 95% UCL between 2002 and 2004. All other metals and metalloid 95% UCL concentrations were generally below the 95% UCL between 2000 and 2013.

The temporal and spatial trends observed for trace metals between 2000 and 2012 are detailed in the following sections.

2.1.1.1 Mercury

The NAGD screening level for mercury (0.15 mg/kg) was exceeded on numerous occasions in the Brisbane River dredge zones, particularly in Zone 2. Figure 2-2 shows the number of occasions when the screening level was exceeded between 2000 and 2012 and the number of sites for dredge zones 2 to 4 where exceedances were noted.

For Zone 2, mercury concentrations exceeded the screening level on 61 - 70% of occasions at 25% of locations. At a similar number of sites in Zone 2 exceedances were noted on 20 – 40% of occasions between 2000 and 2012.

Some exceedances of the mercury screening level were noted also for Zone 3 and Zone 4. However, those exceedances occurred only at a limited number of sites whilst no screening level exceedances were noted at 70 – 80% of locations in Zone 3 and Zone 4 between 2000 and 2012.

In Zone 3 most exceedances of the mercury screening level occurred at three sites (9-2, 10-6 and 11-8) occurring on 31 – 69% of occasions. In Zone 4, exceedances were only noted at two sites (13-5 and 13-6) on 8 – 23% of occasions.

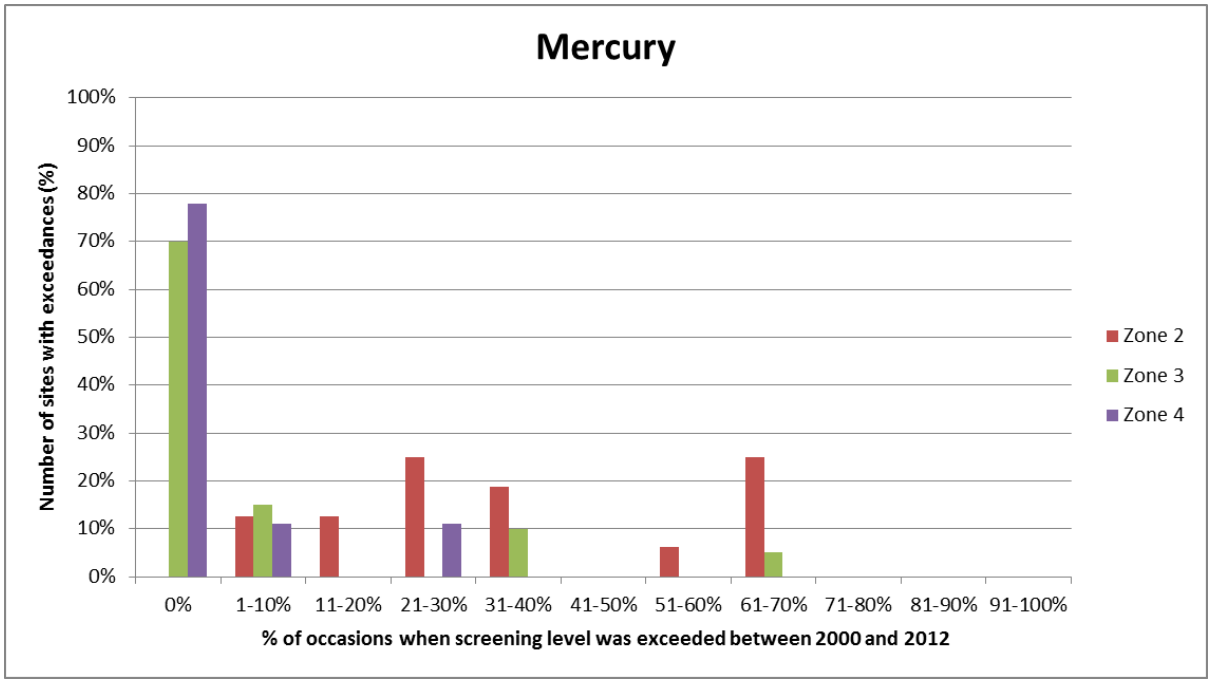


Figure 2-2 Exceedances of the NAGD Screening Level for Mercury between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.2 Nickel

Exceedances of the nickel screening level (21 mg/kg) were noted for most locations across all dredge zones (Figure 2-3). Exceedances of the screening level on more than 80% of occasions were noted at a cumulative 56% of sites in Zone 2, 20% of sites in Zone 3 and 11% of sites in Zone 4. Average Nickel concentrations were 24.2 mg/kg for Zone 2, 20.1 mg/kg for Zone 3 and 21.4 mg/kg for Zone 4, i.e. close to the nickel screening level of 21 mg/kg.

Given the widespread exceedances of the nickel screening level across all dredge zones and that exceedances were also commonly noted for the upstream control sites, it appears likely that the elevated nickel concentrations are of natural origin. It is recognised that sediments in Australia including South-East Queensland commonly have high natural levels of nickel (NAGD 2009 and Preda & Cox 2002).

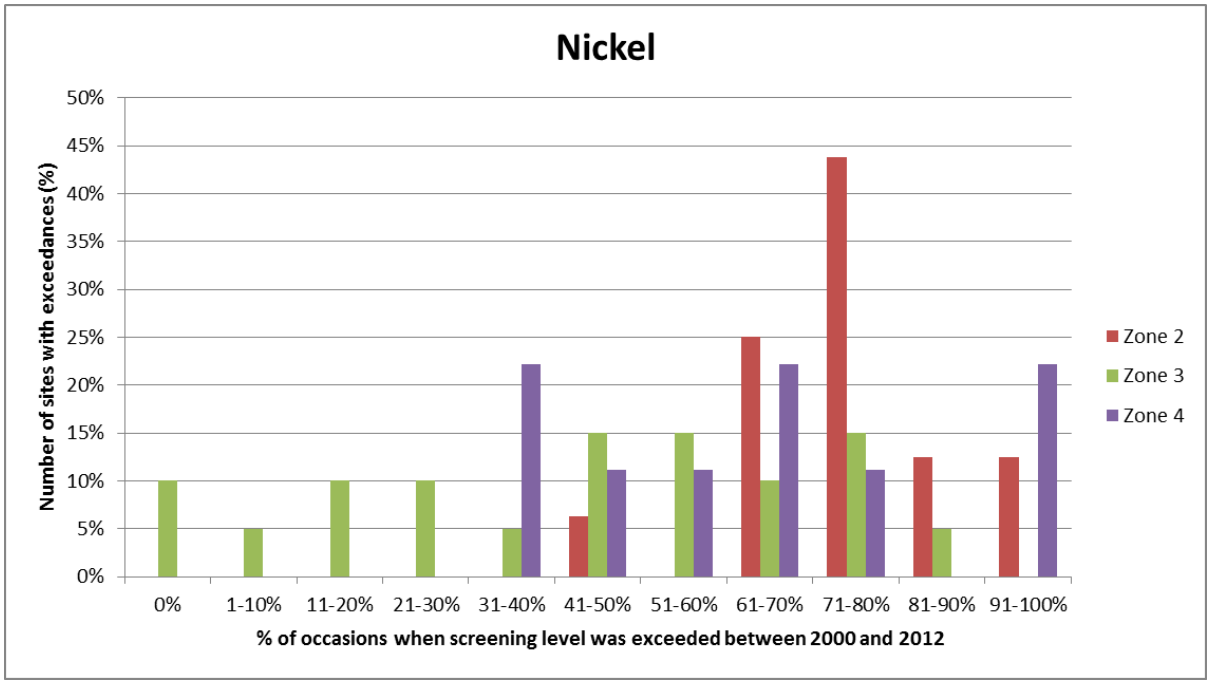


Figure 2-3 Exceedances of the NAGD Screening Level for Nickel between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.3 Arsenic

Concentrations for arsenic were below the NAGD screening level of 20 mg/kg at all locations and dredge zones between 2000 and 2012.

2.1.1.4 Cadmium

Cadmium concentrations were below the NAGD screening level of 1.5 mg/kg with the exception of one site in Zone 2 (Site 6-2) where the screening level was met or exceeded between 2007 and 2009 with concentrations ranging between 1.5 – 6.3 mg/kg.

However, cadmium concentrations were below screening level at all locations between 2010 and 2012. The 95% UCL for cadmium was below the screening level between 2000 and 2013 for all dredge zones.

Average cadmium concentrations between 2000 and 2012 were 0.30 mg/kg for Zone 2, 0.20 mg/kg for Zone 3 and 0.17 mg/kg for Zone 4, i.e. well below the screening level across all dredge zones.

2.1.1.5 Chromium

Chromium concentrations were mostly below the screening level of 80 mg/kg. The only exceptions were noted at site 9-1 in Zone 3 where the screening level was exceeded in 2002 and 2012 with concentrations ranging between 94 – 100 mg/kg. However, the 95% UCL remained below the screening level. Furthermore, exceedances of the chromium screening level were noted at four sites in Zone 2 in 2000 with concentrations ranging between 88.6 – 101 mg/kg.

2.1.1.6 Copper

Copper concentrations exceeded the NAGD screening level of 65 mg/kg on a few occasions in Zone 2 and Zone 3. No exceedances of the copper screening level were noted for Zone 4 (Figure 2-4).

In Zone 2 exceedances were noted at five out of sixteen locations, with only one to two detections noted at four of these locations between 2000 and 2012. At site 6-2 in Zone 2 exceedances of the screening level occurred on 46% of occasions. However, in 2011 and 2012 copper concentrations were below the screening level at this site.

The only exceedances of the copper screening level in Zone 3 were noted for site 9-1 in 2000 and 2008.

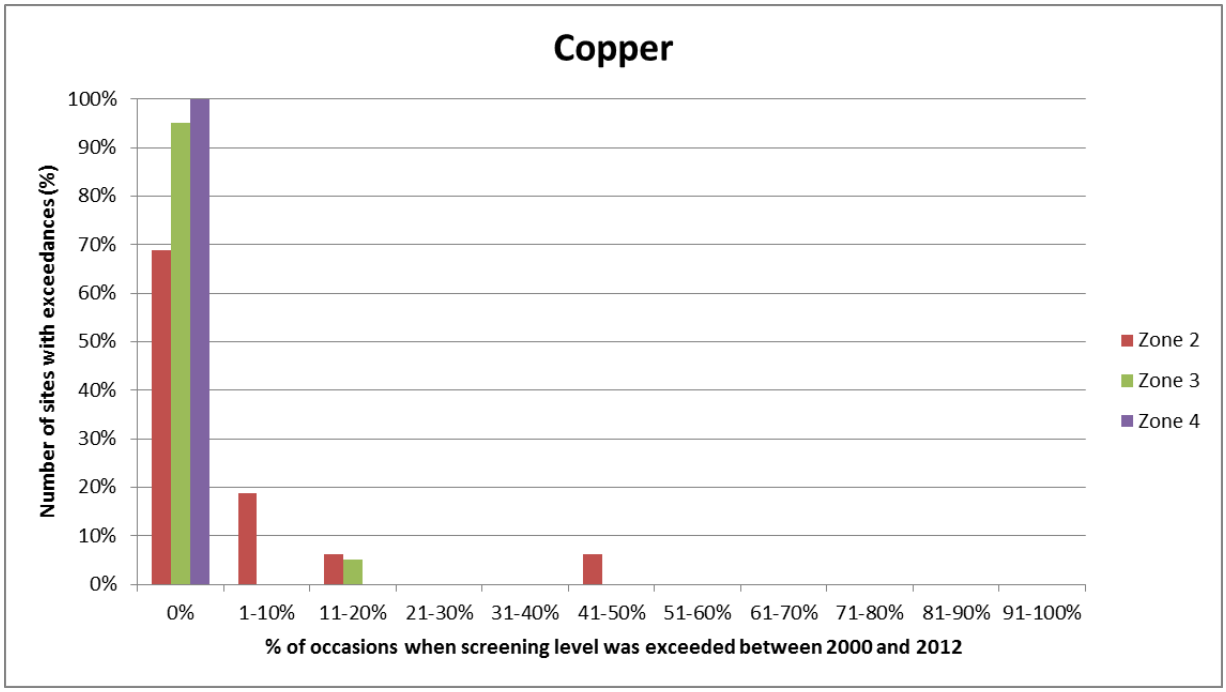


Figure 2-4 Exceedances of the NAGD Screening Level for Copper between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.7 Lead

Some individual exceedances of the lead screening level (50 mg/kg) were noted, in particular in Zone 2 where exceedances were noted at seven locations (Figure 2-5). Since 2001 there were only single detections of lead above the screening level noted per annual sampling event. The 95% UCL for lead was below the NAGD screening level since 2001.

Exceedances on individual sites were noted on less than 20% of occasions, i.e. only once or twice between 2000 and 2012 in Zone 2. In Zone 3 and Zone 4, the only exceedances of the lead screening level were noted at single sites (9-1 in Zone 3 and 13-4 in Zone 4) and only on one or two occasions between 2000 and 2012.

The last screening level exceedance was noted in 2009 for Zone 2, in 2000 for Zone 3 and in 2010 for Zone 4. The average concentrations of lead between 2000 and 2012 were 26.9 mg/kg for Zone

2, 13.7 mg/kg for Zone 3 and 12.3 mg/kg for Zone 4, i.e. well below the screening level across all dredge zones.

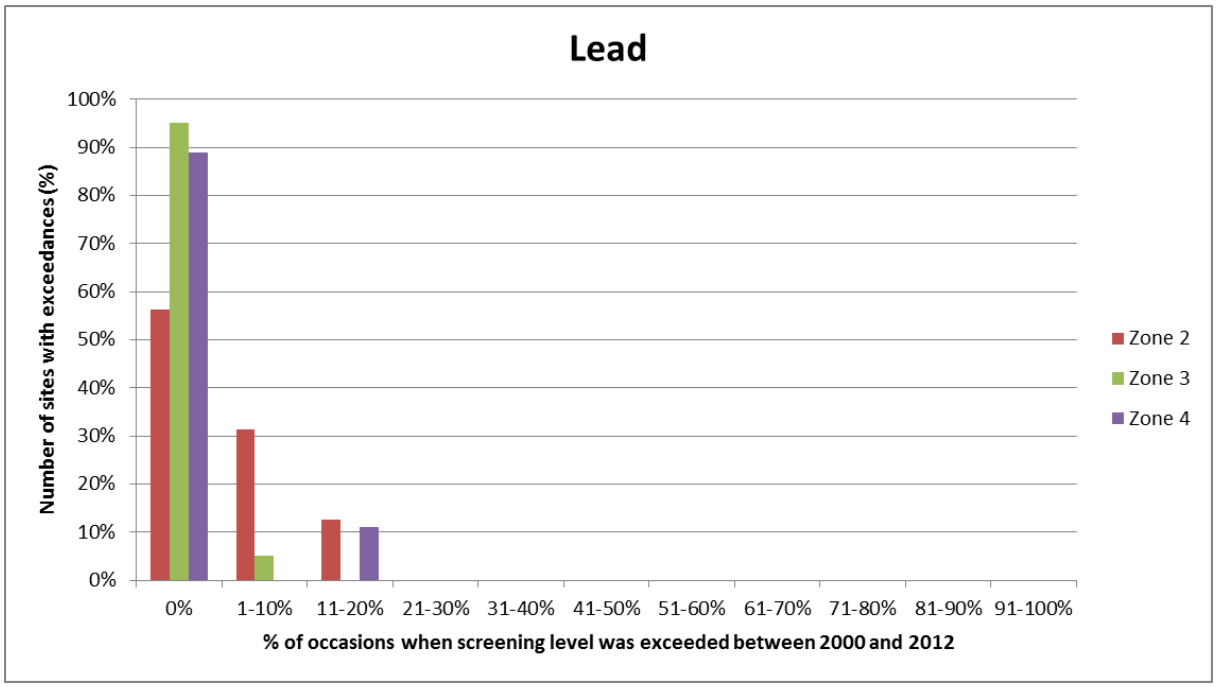


Figure 2-5 Exceedances of the NAGD Screening Level for Lead between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.8 Zinc

Individual exceedances of the zinc screening level (200 mg/kg) were noted at eight locations in Zone 2. However, most of these exceedances occurred only once or twice (<15% occurrence) between 2000 and 2012 (Figure 2-6). Only at location 6-2 exceedances occurred on more than 30% of occasions (four times between 2000 and 2012). It is noted that the last exceedance of the zinc screening level in Zone 2 occurred in 2010.

In Zone 3 only a single exceedances was noted at location 9-1 in 2000. No exceedances of the zinc screening level were noted in Zone 4.

The average zinc concentration between 2000 and 2012 was 130.3 mg/kg for Zone 2, 74.0 mg/kg for Zone 3 and 57.1 mg/kg for Zone 4, i.e. well below the NAGD screening level across all dredge zones.

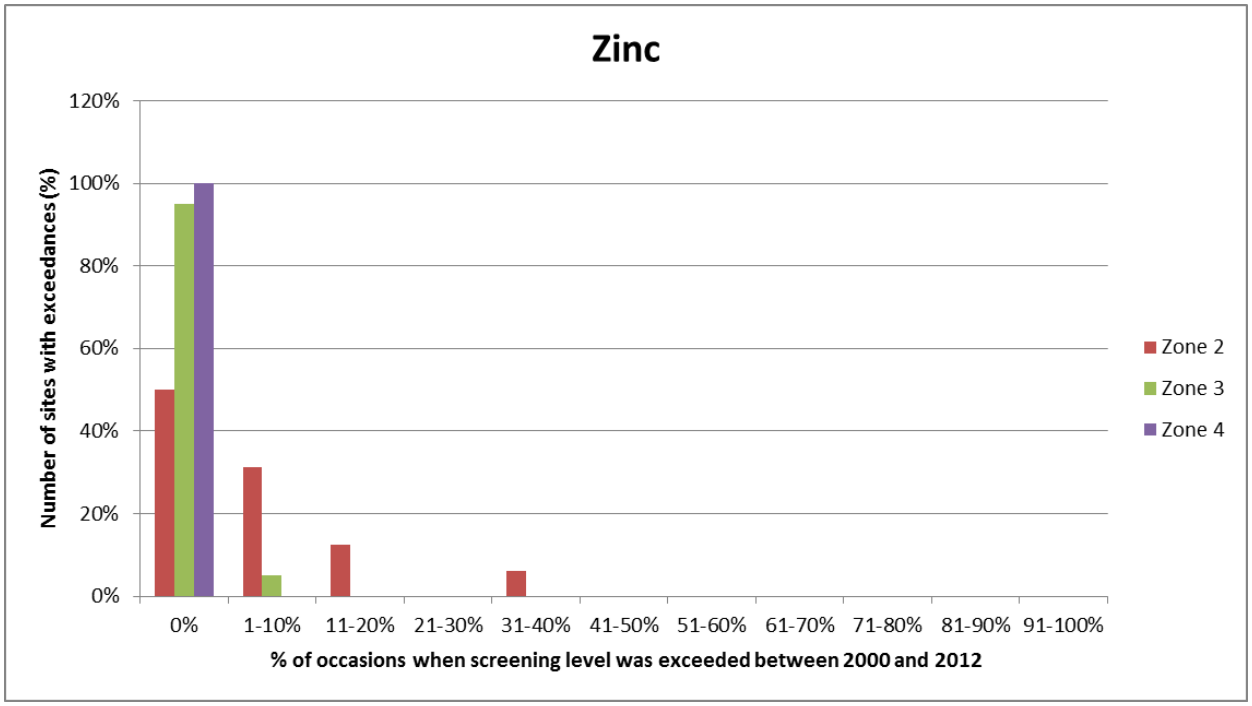


Figure 2-6 Exceedances of the NAGD Screening Level for Zinc between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.9 Antimony and Silver

In addition to the metals and metalloids outlined above, antimony and silver were tested between 2001 and 2004. While antimony concentrations remained below the Limit of Reporting (LOR) for all sampling events, silver was detected at several locations and concentrations exceeded the screening level at one site in Zone 3 (11-8) between 2002 and 2004.

2.1.2 Organotins

Concentrations of TBT at the 95% UCL frequently exceeded the NAGD screening level (9 µg Sn/kg) between 2000 and 2012, particularly in dredge zones 2 and 3.

Exceedances of the TBT screening level were noted predominantly in Zone 2, including several exceedances of the NAGD high level of 70 µg Sn/kg (Figure 2-7). At sampling site 4-4 in Zone 2, the screening level was exceeded during all sampling events except in 2001, including six exceedances of the NAGD high level. At several other locations in Zone 2, screening level exceedances were noted between 20 to 70% of occasions.

In Zone 3, exceedances of the TBT screening level were typically only noted once or twice between 2000 and 2013, corresponding to 8% and 15% of occasions in Figure 2-7. The only exception was site 9-1, where exceedances of the screening level were noted on 69% of occasions. This included five sampling events where the NAGD high level was exceeded. This corresponds to a generally higher occurrence of metal/metalloid exceedances at this site as outlined in Section 1.1.1. It is noted that site 9-1 is the site located closest to Zone 2.

Only a single exceedance of the TBT screening level was noted at site 13-1 in Zone 4 in 2006.

The average normalised TBT concentration between 2000 and 2012 was 28.8 µg Sn/kg for Zone 2, 21.8 µg Sn/kg for Zone 3 and 0.7 µg Sn/kg for Zone 4. If site 9-1 is excluded from Zone 3, the average concentration is 4.4 µg Sn/kg, i.e. less than the NAGD screening level.

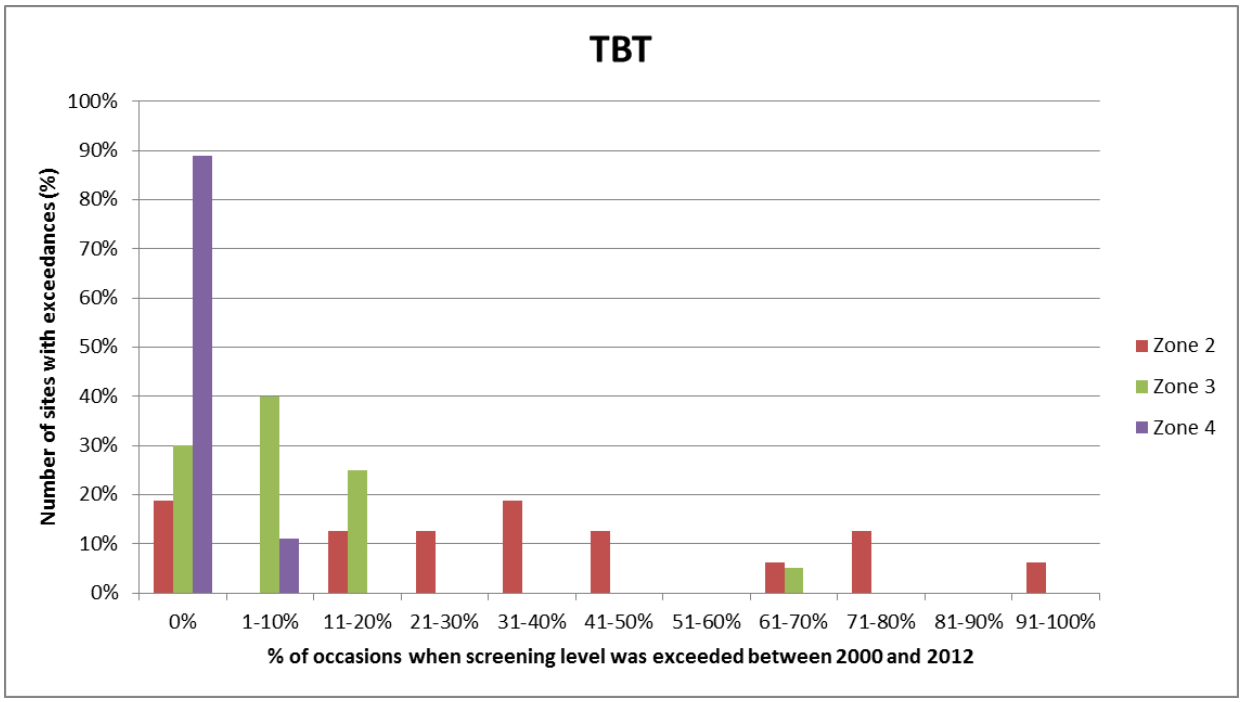


Figure 2-7 Exceedances of the NAGD Screening Level for TBT between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.3 Benzene, Toluene, Ethylbenzene and Xylene (BTEX)

BTEX concentrations were below LOR in all samples and all zones between 2000 and 2012.

2.1.4 Total Petroleum Hydrocarbons (TPHs)

While TPHs were detected on several occasions across all dredge zones, the total TPH concentration was below the NAGD screening level of 550 mg/kg at all sampling locations between 2000 and 2012. Most detections of TPHs were noted in Zone 2, with less detections noted for Zone 3 and only some isolated detections recorded in Zone 4.

2.1.5 Polycyclic Aromatic Hydrocarbons (PAHs)

Total PAHs concentrations were mostly below the NAGD screening level of 10,000 µg/kg except for two individual detections above screening level in Zone 2 and Zone 3 in 2001. The 95% UCL for PAHs exceeded the screening level in 2011. However, since 2001, the total PAHs concentrations remained well below the screening level for all dredge zones.

2.1.6 Polychlorinated Biphenyls (PCBs)

Total PCBs concentrations were mostly well below the NAGD screening level of 23 µg/kg or below LOR. The only exceptions were site 10-6 in Zone 3 where detections above the screening level were noted in 2001 and 2012 and site 13-1 in Zone 4, where a detection above screening level was noted in 2011.

2.1.7 Organochlorine Pesticides (OCPs)

The 95% UCL concentrations of the OCPs dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (DDD) and Dichlordiphenyldichloroethylene (DDE) frequently exceeded the NAGD screening level between 2000 and 2013. In some cases the 95% UCL concentrations of chlordane also exceeded the NAGD screening level.

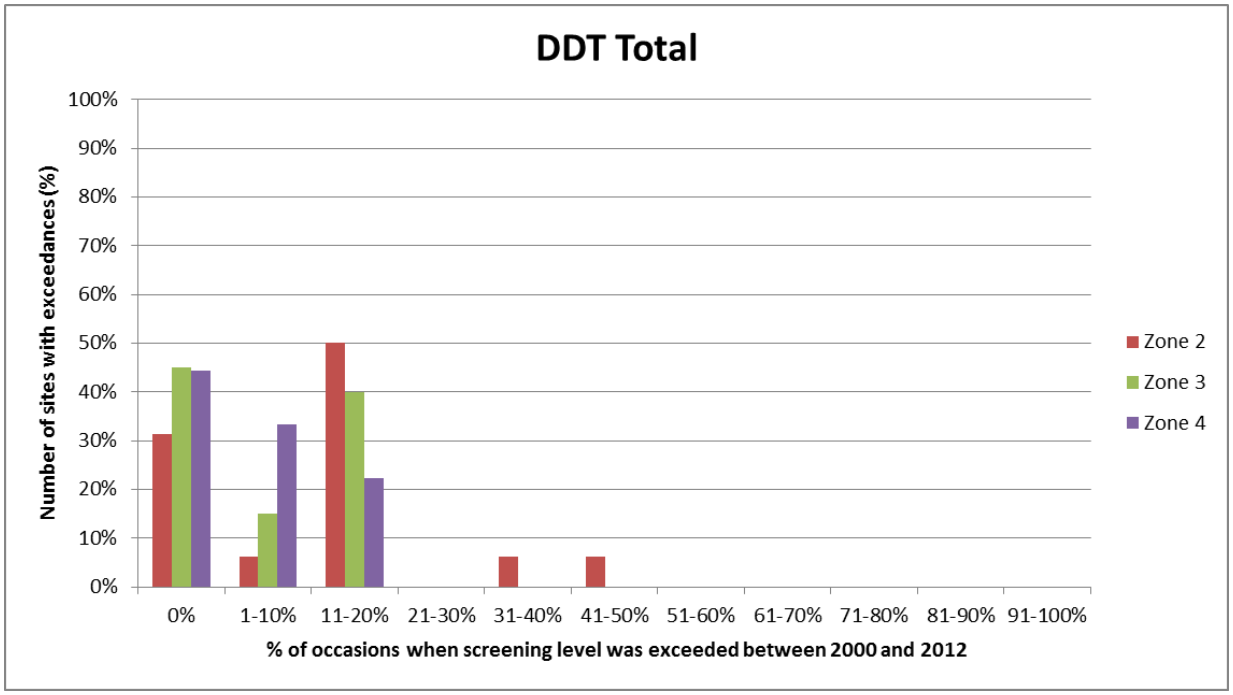
Total DDT concentrations and its metabolites DDD and DDE exceeded their respective screening levels (1.6, 2 and 2.2 µg/kg for DDT, DDD and DDE, respectively) on numerous occasions across all dredge zones (). This includes some exceedances of the NAGD high levels for DDT (46 µg/kg) and DDD (20 µg/kg), but DDE concentrations did not exceed the NADG high level of 27 µg/kg.

Most of these screening level exceedances for DDT, DDD and DDE were recorded at Zone 2, occasional exceedances of all three parameters were also recorded in Zone 3 and 4 between 2000 and 2012. The DDT breakdown product DDE was generally detected more frequently than DDT and DDD (Figure 2-8).

The presence of DDT and its metabolites across all dredge zones and consistent detections over the last decade demonstrates the long term environmental persistence of DDT and its metabolites.

Furthermore, several exceedances of the chlordane NAGD screening level of 0.5 µg/kg and the NAGD high level of 6 µg/kg were noted between 2000 and 2012.

In 2002, chlordane concentrations exceeded the screening level at all tested sampling locations in Zone 2, 3 and 4. Whilst no screening level exceedances were noted between 2003 and 2007, one to three locations in Zone 2 had concentrations higher than the screening level in 2008, 2009 and 2011 (sites 4-0, 4-4, 4-5, 4-7 and 4-8). One exceedance of the chlordane screening level was also noted in 2011 in Zone 3 (site 11-8).



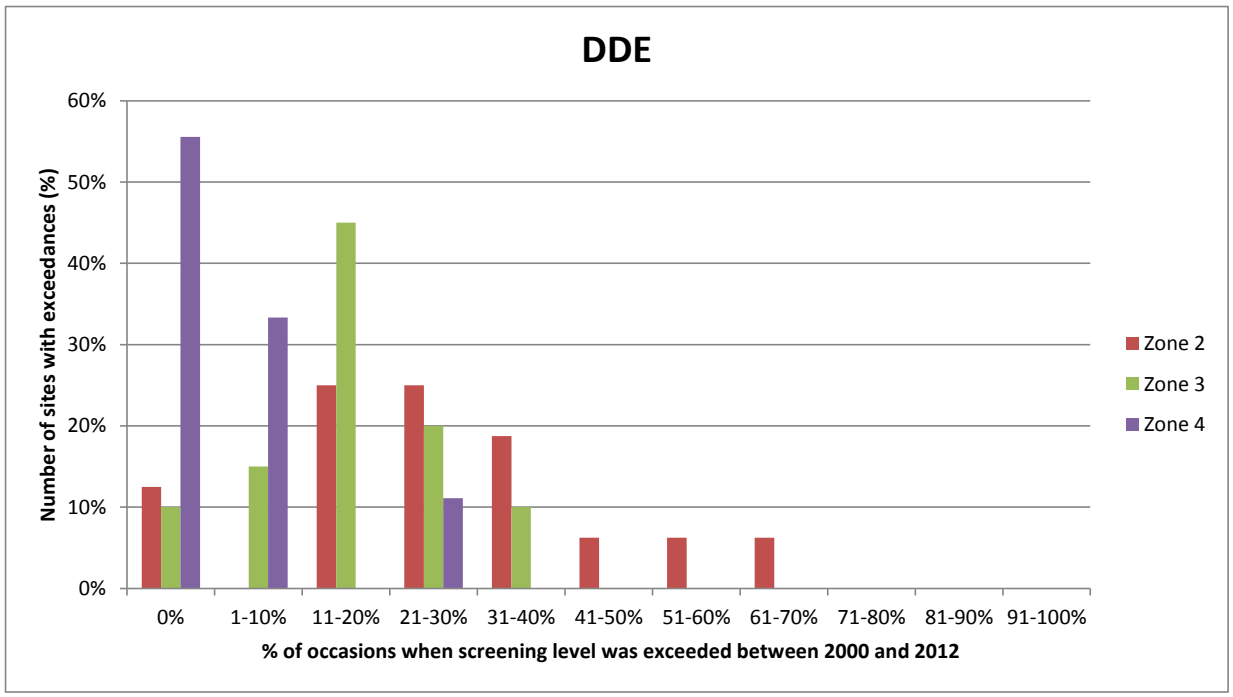


Figure 2-8 Exceedances of the NAGD Screening Level for total DDT (upper plot) and DDE (lower plot) between 2000 and 2012 in Dredge Zones 2, 3 and 4. Similar Trends for DDD.

2.1.9 Organophosphorus Pesticides (OPPs)

Concentrations of OPPs were below LOR for all sampled locations between 2000 and 2012.

2.1.10 Radionuclides

Radionuclides (gross alpha and beta) were analysed at eight sites across all dredge zones between 2010 and 2012.

Concentrations of radionuclides were detected in the January 2010 sampling but in concentrations well below the NAGD screening level of 35 Bq/g (maximum concentration 0.97 Bq/g). Radionuclide concentrations were below the LOR at all sites in all following sampling campaigns.

2.1.11 Acid Sulfate Potential

Acid sulfate soil testing indicates that the sediments in the dredge zone have no actual acidity but are generally considered to be Potential Acid Sulfate Soils (PASS). Assessments of the buffer capacity indicate that the sediments in all dredge zones have sufficient acid neutralizing capacity to buffer any acid potentially generated through onshore disposal.

Acid Sulfate Soil test results were generally consistent between 2000 and 2012.

2.2 Flood Sampling 2011 and 2013

The review of flood sampling sediment quality results included Worley Parsons (2011b, 2013b, 2013c, 2013d).

The 2011 and 2013 sampling campaigns (Worley Parsons 2011b and 2013b) included all parameters as per Table 1 of the NAGD. Additionally, porewater ammonium concentrations were measured and acid sulfate soils assessed in 2011. For both studies elutriate and bioavailability testing for nickel and mercury was undertaken.

Further testing for DDT, DDD, DDE and dioxins/furans was undertaken in 2013 including a comparison of 14 sampling locations at the Mud Island DMPA against seven Moreton Bay reference locations to assess whether the emergency dredging and disposal has affected sediment quality in Moreton Bay (Worley Parsons 2013c and 2013d).

2.2.1 Metals and Metalloids

In 2011, nickel (9 of 15 locations), mercury (3 of 15 locations) and lead (1 location) were the only metals to exceed their respective NAGD screening levels. In 2013, nickel was the only metal to exceed screening levels at 18 of the 24 locations sampled. All other metals/metalloids were below their respective screening levels.

Elutriate and bioavailability testing was undertaken for nickel and mercury in 2011 and 2013. For both sampling events, the elutriate concentrations for mercury were below LOR and nickel elutriate concentrations were well below the ANZECC/AMRCANZ (2000) 95% species protection level of 70 µg/L or below LOR. Furthermore, dilute acid extraction results for mercury and nickel indicated low bioavailability of these metals with concentrations below their respective NAGD screening level in all samples in 2011 and 2013.

These results indicated low likelihood for adverse water quality and sediment quality impacts during dredging and disposal for mercury and nickel.

2.2.1.1 Comparison to Annual Sampling

Consistent with the annual sampling undertaken between 2000 and 2012, nickel and mercury concentrations were the main contaminants of concern within the dredge areas with concentrations similar to the annual sampling events. Lead was detected above the screening level on some occasions during the annual sampling. Similar to the flood sampling, detections were noted only at single locations per annual event and 95% UCL concentrations were below the NAGD screening level.

2.2.2 Organochlorine Pesticides (OCPs)

DDT and its metabolites were detected in 2011 with DDE detected in nine of 15 locations. Whilst normalised DDD and DDE concentrations remained below their respective screening levels, normalised DDT concentrations exceeded the NAGD screening level at two locations. All other OCPs were below LOR at all locations in 2011.

In 2013, DDD was detected in one sample with a concentration exceeding the NAGD screening level. DDE exceeded the NAGD screening level of 2.2 µg/kg in all samples with a 95% UCL of 5.25 µg/kg.

2.2.2.1 Comparison to Annual Sampling

Similar to the annual sampling events, DDT and its metabolites were detected above the NAGD screening level in the flood sampling. Concentrations were similar to those detected in the annual sampling.

2.2.2.2 Comparison to Background Concentrations (2013)

Total DDT concentrations were below the LOR at all locations, including those at Mud Island DMPA and reference locations.

Sampling carried out prior to the 2013 emergency dredged material disposal event detected DDE at all 20 sampling locations within the dredged area, and one of the four locations within the DMPA. DDD was above the LOR in one sample within the dredged area (10µg/kg normalised to % TOC), and was also above the NAGD Screening level of 2 µg/kg.

Further more detailed sampling was carried out to compare contaminant concentrations at 14 locations in the DMPA and seven reference locations, following the 2013 emergency dredged material disposal event. The results of this sampling indicated that:

- DDT was again below the LOR at all locations, including those at Mud Island DMPA and reference locations.
- DDE was detected at all sampling locations with 95% UCL concentrations exceeding the NAGD screening level at both the DMPA and reference locations. This indicates that DDE was widespread throughout the study area.
- A comparison of the 80th percentile DDE of the reference locations was higher than historical levels of DDE in the Brisbane River. This indicates that the Brisbane River flood plume in

January 2013 impacted on the Brisbane River, Bramble Bay and the wider Moreton Bay region and the maintenance dredging operations undertaken by PBPL were not likely to have caused or spread this contamination.

- Additional elutriate and pore water analyses for OCPs indicated that DDD and DDE are likely adsorbed to the clay fraction of the sediment and thus not bioavailable.

2.2.3 Dioxins

Dioxins and furans were detected in the 2011 and 2013 flood sampling events. A toxic effect factor is allocated to each compounds which allows the total toxicity of combined dioxins and furans to be determined using the toxic equivalence (TEQ).

In 2011, the WHO-TEQ$_{(0.5\ LOR)}$ value (concentrations below LOR are assigned a concentration equal to half the LOR) was elevated at one location in Zone 3 with a concentration of 25.36 pg/g. All other sampling locations, including at the DMPA had concentrations between 6.02 and 10.89 pg/g WHO-TEQ.

In 2013, the WHO-TEQ concentrations were generally lower ranging between 0.5 pg/g to 5.3 pg/g.

There are no sediment quality guideline values for comparison that would apply to Australian sediments.

2.2.3.1 Comparison to Background Concentrations (2013)

The WHO-TEQ concentrations at the Mud Island DMPA sites ranged between 4.24 to 4.94 pg/g. The WHO-TEQ concentrations were higher at the reference site in comparison ranging between 7.87 to 7.97 pg/g. Approximately 99% of the sediment concentrations at all sampling locations comprised of 99% dioxins and 1% furans.

Pore water WHO-TEQs ranged between 0.5 and 7.3 pg/g at the DMPA and between 3.1 and 8.0 pg/g at the reference sites. Mean values and 95% UCL concentrations were lower than the 80th percentile of dioxins/furans at the reference area.

A comparison with historical data (Hermanussen et al. 2004; Mueller et al. 2004) shows that dioxins/furans have been historically present within Moreton Bay in elevated concentrations and that their concentrations are not directly related to dredging activities.

2.2.4 Organotins

Organotin concentrations were below the NAGD screening level or below LOR in 2011 and 2013.

2.2.4.1 Comparison to Annual Sampling

The relatively low concentrations of organotins in the flood sampling of 2011 and 2013 appear to be different to the pattern observed in the annual sampling campaigns. However, it should be noted that TBT was only detected at three locations above the NAGD screening for the annual 2010 and 2012 sampling events.

The overall low organotin concentrations across the dredge area after the 2011 and 2013 floods may be due to burial and mixing with sediments from the catchment.

2.2.5 Polychlorinated Biphenyls (PCBs)

PCB concentrations were below LOR at all sampling locations in 2011. In 2013, one location in Zone 3 had a normalised total PCB concentration (38.9 µg/kg) exceeding the NAGD screening level of 23 µg/kg. PCB concentrations were below LOR at all other locations in 2013.

2.2.5.1 Comparison to Annual Sampling

Similar to the annual sampling events, PCBs exceeded the NAGD screening level at only one location or were not detected.

2.2.6 Other Organic Contaminants

Concentrations of BTEX, TPHs, PAHs, OPPs, Phenols, Chlorobenzenes, halogenated compounds and non-organochlorine pesticides were either below LOR or below their respective screening levels in 2011 and 2013.

2.2.6.1 Comparison to Annual Sampling

The pattern observed for BTEX, TPHs, PAHs, OPPs were similar to the those observed in the annual sampling events, i.e. BTEX and OPPs were below their laboratory LORs whereas TPHs and PAHs were typically detected but at concentrations well below the respective NAGD screening levels.

2.2.7 Porewater Ammonia

Sediments at all locations had porewater concentrations below the literature derived guideline level of 11 mg/L (Batley and Simpson 2009). The only exception was one site in Zone 2 where the guideline level was marginally exceeded (16.6 mg/L).

2.2.8 Acid Sulfate Soil

Acid sulfate soils were tested in the 2011 flood sampling. Actual acidity was below the laboratory LOR for all samples, but potential acidity exceeded the QASSIT guideline limit identifying the samples as potential acid sulfate soils (PASS).

The acid neutralising capacity was sufficient in all samples resulting in a net acidity less than the LOR indicating that no liming would be required if the material would be placed on land.

2.2.8.1 Comparison to Annual Sampling

Results for the flood sampling were consistent with the annual maintenance dredge sampling.

2.3 Summary of Annual and Flood Sampling Data

Consistent across the annual and flood sampling events, the main contaminants of concern in the Brisbane River dredge area were the metals nickel and mercury, and DDT metabolites. TBT was also found above screening levels during routine annual monitoring, but was below screening levels in the 2011 and 2013 post-flood sampling episodes. This could suggest that the flood events had dispersed, diluted or buried TBT contaminated material.

Exceedances of the NAGD screening level for mercury, organochlorine pesticides and organotins were most frequently detected upstream of the Port area, i.e. in Zone 2 with a lower occurrence of screening level exceedances in the Port area (Zone 3) and the Entrance Channel area (Zone 4).

The similar spatial patterns of contaminant distribution observed between the regular annual sampling and the flood sampling indicates that catchment runoff from the urbanised and industrialised area upstream of the Port and not the Port of Brisbane is likely the main contributor of contaminants in the dredge area.

Organochlorine pesticides may be present due to broad non-point catchment sources or as legacy material. TBT is mainly originating from local marine industry sources and ships. Mercury may be introduced to the system via sewage treatment plant discharges (including trade waste) or other industrial point sources along the river.

The wide distribution of high nickel concentrations across the entire dredge area and upstream reference locations indicates that nickel is of natural origin (due to local mineralogy) across the broader catchment.

3 Sampling and Analysis

3.1 Sampling Rationale

3.1.1 Number of Sampling Locations

As per NAGD, the number of sample locations for medium sized projects (up to 500,000 m^3) should be divided into distinct sites based on their chemical characteristics. Based on the review of historical data (Section 2) and consistent with previous sampling campaigns, the dredge area was divided into three zones (Table 3-1).

Table 6 of NAGD was used to determine the number of sampling locations for each dredging subarea. Given that current, good quality data were available to support the classification, the number of sampling locations was halved and rounded up as per NAGD. Table 3-1 also shows the required number of sampling locations for Phase III testing (elutriate and bioavailability).

In addition to the required samples to be obtained from the dredge areas, samples will be collected also from upstream and downstream 'reference' areas. This includes two locations from Zone 1 which were sampled in previous sampling campaigns and five locations from Moreton Bay which were sampled as part of additional sediment sampling following the 2011 and 2013 flooding. Furthermore, two samples will be collected from the Mud Island DMPA.

Table 3-1 Number of Sampling Locations as per NAGD

Dredging Subarea	Classification	Dredge Volume (m^3)	# Locations – Phase II	# Locations – Phase III
Zone 2	Probably contaminated	150,000	10	5 + 1 replicate
Zone 3	Probably clean	250,000	11	6 + 2 replicates
Zone 4	Probably clean	30,000	5	3 + 1 replicate
Additional Samples				
Zone 1	Upstream Reference	N/A	2	N/A
Moreton Bay	Downstream Reference	N/A	5	N/A
Mud Island	DMPA	N/A	2	N/A

3.1.2 QA/QC Samples

In accordance with NAGD requirements, the following field and laboratory quality control samples will be obtained:

- Field triplicate samples (two additional grab samples at 10% of sample locations) to determine the small scale variability of the sediment physical and chemical characteristics. Based on a total of 26 primary locations in dredged areas (Zones 2, 3 and 4), field triplicate samples would be required at three locations. Two additional samples would therefore be collected at location 5-1 (Zone 2), 11-9 (Zone 3) and 13-4 (Zone 4).
- Triplicate split samples (primary sample from 5% of locations thoroughly mixed and split into three sample container sets) to assess laboratory variation, with one of the three samples sent to a second (reference) laboratory for analysis. Based on a total of 26 primary locations in dredged areas (Zones 2, 3 and 4), field split samples would be required at two locations. Split samples would be undertaken at location 6-2 (Zone 2) and 10-6 (Zone 3).

- One trip blank container per sampling day filled with inert material (e.g. chromatographic sand) to be analysed concurrent with the analysis of volatile organic substances such as; and
- One inter-batch sample from a previous batch of samples if more than one batch is submitted to the laboratory, to determine the analytical variation between batches. However, it is anticipated that all samples will be submitted in one batch.

Table 3-2 provides a summary of QA/QC samples to be obtained for the three dredging subareas.

Table 3-2 Number of Primary and QA/QC Samples

Dredging Subarea	Primary Samples	Field Triplicate Samples	Triplicate Split Samples	Trip blanks
Zone 2	10	2	2	1 per sampling day
Zone 3	11	2	2	
Zone 4	5	2		

3.1.3 Sampling for Elutriate and Bioavailability Testing

The sediment sampling will include additional sediment samples for Phase III testing (elutriate and bioavailability). Phase III testing will be undertaken for parameters which have frequently exceeded the NAGD screening levels in the past. Based on the review of historical data (Section 2) this will include:

- Metals and metalloids (nickel and mercury);
- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

Exceedances of NAGD screening levels were predominantly detected in Zone 2 and Zone 3. In accordance with Table 7 of NAGD, five locations would need to be sampled for Zone 2 and six locations for Zone 3 (Table 3-1).

In order to allow elutriate analysis, 20 L of seawater will be collected from the Mud Island DMPA.

Phase III testing for nickel and mercury (and potential other metals/metalloids) can be undertaken from the primary samples collected for the sediment quality assessment. The bioavailability analysis for nickel and mercury will involve dilute acid extraction as per NAGD. Analysis will be performed on the samples with the highest concentrations.

Bioavailability analysis for the organic contaminants (organotins and organochlorine pesticides) will require porewater testing as per NAGD. Additional samples will be collected for porewater testing at the locations which have historically shown the highest percentage of screening level exceedances. The proposed sampling locations for this testing are provided in Section 3.2.1. In order to meet required holding times, elutriate and bioavailability analysis for the organic contaminants will be undertaken concurrent with the analysis of the primary samples.

3.2 Sampling Locations

A map with the proposed sampling locations is provided in Figure 3-1. In order to provide consistency with previous sampling and to facilitate comparisons with historical data, most of the proposed sampling locations were selected from the set of historical sampling locations, and to

also focus on areas that are most frequently dredged. Additionally, sampling locations were added to close spatial gaps in sediment quality data. These include sampling locations 5-1 in Zone 2 as well as locations 9-5 and 9-6 in Zone 3 (Figure 3-1).

As outlined in more detail in Section 3.5, samples from all locations will be analysed for a basic suite of parameters. A selection of these sites will also be analysed for a detailed suite in addition to the basic suite including 'low risk' parameters that have been detected in the past but were typically below their respective NAGD screening levels.

3.2.1 Sampling Locations for Porewater Testing

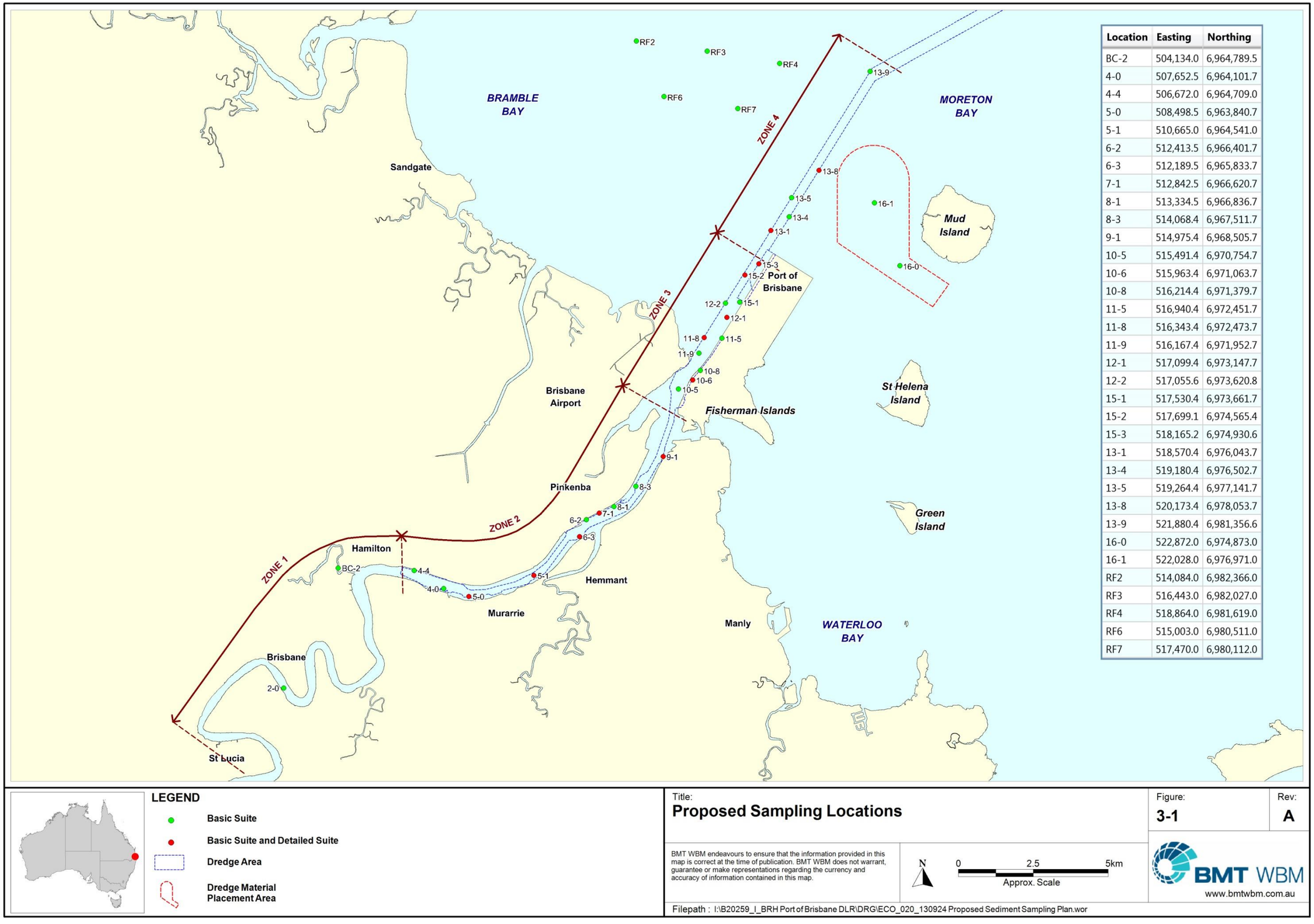
Additional sediment samples will be collected at selected locations for pore water testing of organic contaminants as part of the Phase III elutriate and bioavailability assessments (refer to Section 3.1.3).

Exceedances of NAGD screening levels were predominantly detected in Zone 2 and Zone 3. Five additional pore water samples (plus one replicate) and six samples (plus two replicates) will be collected from zones 2 and 3, respectively (see also Table 3-1). Four samples will be collected from Zone 4 however based on the historical data samples will only be analysed if contaminants exceed screening levels during Phase II sampling.

Based on the review of historical data, sample locations with the highest percentage of screening level exceedances between 2000 and 2012 were chosen for the additional pore water testing:

Zone 2: Locations 4-0, 5-0, 6-2, 7-1 and 8-3.

Zone 3: Locations 10-5, 10-6, 10-8, 11-8, 11-9 and 12-1.



Location	Easting	Northing
BC-2	504,134.0	6,964,789.5
4-0	507,652.5	6,964,101.7
4-4	506,672.0	6,964,709.0
5-0	508,498.5	6,963,840.7
5-1	510,665.0	6,964,541.0
6-2	512,413.5	6,966,401.7
6-3	512,189.5	6,965,833.7
7-1	512,842.5	6,966,620.7
8-1	513,334.5	6,966,836.7
8-3	514,068.4	6,967,511.7
9-1	514,975.4	6,968,505.7
10-5	515,491.4	6,970,754.7
10-6	515,963.4	6,971,063.7
10-8	516,214.4	6,971,379.7
11-5	516,940.4	6,972,451.7
11-8	516,343.4	6,972,473.7
11-9	516,167.4	6,971,952.7
12-1	517,099.4	6,973,147.7
12-2	517,055.6	6,973,620.8
15-1	517,530.4	6,973,661.7
15-2	517,699.1	6,974,565.4
15-3	518,165.2	6,974,930.6
13-1	518,570.4	6,976,043.7
13-4	519,180.4	6,976,502.7
13-5	519,264.4	6,977,141.7
13-8	520,173.4	6,978,053.7
13-9	521,880.4	6,981,356.6
16-0	522,872.0	6,974,873.0
16-1	522,028.0	6,976,971.0
RF2	514,084.0	6,982,366.0
RF3	516,443.0	6,982,027.0
RF4	518,864.0	6,981,619.0
RF6	515,003.0	6,980,511.0
RF7	517,470.0	6,980,112.0

LEGEND

- Basic Suite
- Basic Suite and Detailed Suite
- Dredge Area
- Dredge Material Placement Area

Title:
Proposed Sampling Locations

Figure: **3-1**
Rev: **A**

N
0 2.5 5km
Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B20259_I_BRH Port of Brisbane DLR\DRG\ECO_020_130924 Proposed Sediment Sampling Plan.wor

3.3 Sample Collection Methodology

3.3.1 Survey Vessel and Positioning

A suitable sampling vessel will be used to undertake sediment sampling. Navigation to the sampling locations will be undertaken using a differentially corrected global positioning system (GPS) with an accuracy of approximately ±1 m.

3.3.2 Sediment Grab Sampling

NAGD Appendix D states that:

'*grab samplers may be used, i.e., for maintenance dredging surveys in frequently dredged areas with substantial shipping traffic. Here, because the sediments are mixed continually, samples taken with a grab sampler can be representative as long as the grab is designed to retain the entire sample.*'

It is also noted that the one metre long sediment cores obtained in all previous sampling campaigns were always composited to single samples. Furthermore, highest contamination levels are typically expected in the top sediment layer, which would be sampled using a grab sampler. It is therefore proposed that a grab sampler will be used to obtain representative sediment samples.

All sediment sampling will be undertaken by experienced personnel. A Van Veen grab sampler (0.14 m^2 gape) will be used to collect surface sediments from all sample locations. Only samples obtained with properly closed grab jaws will be processed to ensure that the fine sediment fractions are retained.

The grab sampler will be thoroughly cleaned with De-con 90 solution prior to use and cleaned and rinsed with seawater to prevent cross contamination between samples.

In order to overcome issues with potential high variability at sampling locations, a minimum of two grabs will be collected at each sampling location and pooled as one sample. An adequate number of grabs will be obtained and pooled for each sample location to ensure that sufficient sediment is collected for all analyses.

3.3.3 Sample Handling

3.3.3.1 Sample Processing

Sample management procedures on the sampling vessel will include the careful processing of sediment samples following the recovery of the sediment grab sample from the seabed.

Photographs of the grab samples will be taken and field personnel will log each sample for its physical characteristics and variations in sediment type and texture. The grab samples from each location will be carefully homogenized in a clean container prior to the filling of analytical laboratory-supplied clean sampling jars.

Sample bottles will be labelled with a waterproof marker pen on the bottle label and lid. Sample bottles for organic analyses will be filled with zero headspace to prevent volatilisation. QA/QC samples will be blind-labelled to ensure that the laboratories cannot relate the QA sample back to the primary sample.

3.3.3.2 Sample Log

All sediment samples will be geotechnically logged upon collection on a standardised pro-forma. The following information will be recorded:

- Project name and number;
- The name of the sample collector;
- Date and Time of sampling;
- Type of grab sampler used;
- Field sample number;
- Northing and Easting of sample location (from onboard DGPS);
- Sediment colour;
- Sediment odour;
- Field texture (fine sand, silt, clay, sand, clayey sand);
- Tidal predictions and water depth at sample location (derived from onboard depth sounder);
- Weather and sea state conditions at the time of sampling; and
- General comments pertaining to the sample (e.g. presence of organic matter or benthic organisms, etc.

3.3.3.3 Sample Processing QA/QC

All sample handling and processing will be performed to minimise contamination and sample mix-ups. All sample equipment will be cleaned prior to sample collection using a scrub with decontamination solution followed by a rinse with seawater.

The workspace on the vessel will be washed down regularly with ambient seawater to clean all surfaces and minimize the potential for dust contamination of samples. All sample processing will be undertaken away from any potential contamination sources such as engine exhausts, fuels, oils, greases, lead weights, zinc anodes, antifouling paint etc.

Nitrile gloves will be worn by all field personnel handling the sediment, and gloves will be disposed of after processing of each sample.

Utmost care will be maintained in ensuring that cross-contamination between samples is not possible. Samples collected from each location will be placed into appropriately cleaned and preserved containers (labelled prior to filling) provided by the analytical laboratories.

Following sample processing and filling of sample containers, all samples will be immediately chilled on ice following sample collection. All acid sulfate soil samples will be transferred to a freezer at the end of each sampling day to minimise potential oxidation of the samples.

3.3.3.4 Sample Submission and Chain of Custody

All samples will be traced using Chain of Custody (COC) documentation submitted to the laboratory. This will ensure that sample possession and processing can be traced from sample collection to reporting of results.

The COC record may include, but is not limited to, the following information:

- Project name and number;
- Name(s) of sampler(s);
- Sample type, identification number and location;
- Date of collection;
- Number and types of containers;
- Required analyses;
- Preservatives (if any) and storage conditions; and
- Signatures documenting change of sample custody.

At the conclusion of the sampling program the sediment samples will be submitted to the analytical laboratories for processing and analysis in a single batch within prescribed holding times.

3.4 Health & Safety and Contingency Plan

3.4.1 Health and Safety

The vessel skipper will keep in close contact with Brisbane VTS/Harbour Control during sampling. Grab sampling can be completed at each location in around 20 minutes with logging and processing undertaken in locations out of the path of large vessels (as necessary and dependent upon shipping movements).

A single anchor may be used to anchor the vessel. The anchor would be placed upstream and upwind of the vessel. A marker buoy may be placed on the anchor if required.

The sampling vessel will display appropriate flags (R over Y) for the work being carried out at all times. Interactions with other vessel traffic will be minimised by being mindful of approaching vessels.

3.4.2 Adverse Weather

The planning of field sampling will involve regular checking of available weather forecast services for the study area. There are no unusual hazards in operating the grab sampler in wet weather.

In case of adverse weather conditions that would make sampling unacceptable due to strong winds and high waves, the sampling team and vessel operator would remain on stand-by until weather conditions improve to allow rigorous and safe collection of sediment samples.

3.4.3 Equipment Failure

The grab sampler and lifting arrangement is sufficiently robust and no failure of the equipment is expected to occur during the sampling. Prior to sampling, all equipment will be thoroughly checked and repaired if necessary.

In the unlikely event of equipment failure during sampling, repairs to any equipment would be undertaken as soon as possible to minimise delays as far as practical.

3.5 Contaminants List

3.5.1 Rationale for Selection of Sampling Parameters

In accordance with NAGD, the contaminants to be investigated should include:

- Toxic substances known, from previous investigations, to occur in dredge area sediments at levels greater than one-tenth of the screening levels; or
- Based on the historical review, substances potentially present at such levels in the sediments to be dredged.

Based on the review of existing sediment quality data (Section 2), samples will be analysed as follows:

Basic List of Parameters:

- Analysis undertaken at all sampling locations;
- Analysis includes contaminants of (potential) concern and supplementary parameters:
  - Metals/Metalloids (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, Al, Fe);
  - Organotins (MBT, DBT, TBT);
  - Organochlorine Pesticides (including DDT, DDD, DDE, chlordane);
  - Particle size distribution;
  - Moisture content; and
  - Total Organic Carbon.

Detailed List of Parameters:

- Analysis undertaken at 30% of sampling locations and new sampling locations (i.e. 5-1, 9-5 and 9-6).
- Analysis includes ‘low risk’ parameters that have been detected in the past but generally in concentrations below LOR or NAGD screening levels:
  - Polycyclic Aromatic Hydrocarbons (PAHs);
  - Total Petroleum Hydrocarbons (TPHs);
  - Polychlorinated Biphenyls (PCBs);
  - Acid Sulfate Soils;
  - Nutrients (TP, TN, NOx, TKN); and

- Radionuclides.

Elutriate and Bioavailability Testing:

- Metals/Metalloids (Hg and Ni);
- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

3.6 Laboratory Analysis

3.6.1 Analytical Laboratories

Primary analysis of the sediment samples will be conducted by Advanced Analytical Australia Pty Ltd (AAA). Australian Laboratory Services (ALS) will be used as the secondary (reference) laboratory for inter-laboratory quality testing.

Both analytical laboratories are fully accredited by the National Association of Testing Authorities (NATA). AAA will subcontract some of the analyses to specialised NATA accredited laboratories, i.e. Sydney Analytical Laboratories (ammonia, Total Organic Carbon) and Microanalysis (Particle Size Distribution).

3.6.2 Analytical Tests

The primary laboratory Advanced Analytical Australia will perform all analyses in accordance with NAGD and will meet or provide better practical quantitation limits (PQL) than the target PQL's (Table 3-3).

Table 3-3 Analytical Parameters and Practical Quantitation Limits

Parameter	Target Practical Quantitation Limit (required)	Practical Quantitation Limit (Advanced Analytical Australia)
Moisture Content	0.1%	0.1%
Particle Size (sieve and sedigraph)	Size distribution (sieve + hydrometer or equivalent) and rates of settlement after 50% and 90% of settlement in seawater if possible.	10 to 0.001mm Settling velocities in m/s for all particle size fractions
Total Organic Carbon	0.1%	0.01%
Total Petroleum Hydrocarbons	100 mg/kg	10-50 mg/kg
Polychlorinated Biphenyls	5 µg/kg	5 µg/kg
PAHs (naphthalene, acenaphthalene, acenapthene, fluorene, phenanthene, anthracene, total fluoranthene, benzo [a]anthracene, benzo [a] pyrene, chrysene, dibenz[a,h] anthracene, pyrene, 2-methylnapthalene)	Individual - 5 µg/kg; Sum of PAHs - 100 µg/kg	Individual - 5 µg/kg; Sum of PAHs - 100 µg/kg

Parameter	Target Practical Quantitation Limit (required)	Practical Quantitation Limit (Advanced Analytical Australia)
Trace Metals and Metalloids (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc)	0.1 – 100 mg/kg, Hg- 0.01 mg/kg	0.1 – 5 mg/kg, Hg – 0.01 mg/kg
Organotins (MBT, DBT, TBT)	1 µg Sn/kg	0.5 µg Sn/kg
OCP Pesticides	1 µg/kg	OCP-1 µg/kg
Total Nitrogen Total Kjeldahl Nitrogen Nitrate & Nitrite as N Total Phosphorus	N/A N/A 0.1 mg/kg N/A	20 mg/kg 20 mg/kg 0.1 mg/kg 1 mg/kg
Acid Sulfate Soils	N/A	2 mole H^+/tonne
Radionuclides	N/A	35 Bq/g

3.6.3 Sample Containers

Based on the proposed analyses, the following sample containers would be required per sample:

- 2 x 250 mL glass jar – organic/inorganic chemical analysis;
- 1 x 125 mL glass jar – nutrient analyses;
- 1 x medium plastic clipseal bag (50-100 g) – particle size distribution; and
- 1 x small clipseal bag (200 g) – acid sulfate soil.

3.6.4 Quality Control – Laboratory Analysis

Both laboratories will follow laboratory QC procedures in accordance with requirements outlined in Appendix F of NAGD. This includes analysis of laboratory blanks, duplicates, certified reference materials and spiked samples.

3.6.4.1 Laboratory Blanks

The purpose of this assessment is to monitor a potential laboratory contamination of samples due to potential cross-contamination of samples during laboratory preparation, extraction or analysis. Blank sample concentrations should be at or near the detection limit of the method used.

3.6.4.2 Laboratory Duplicates

This assessment refers to a randomly selected intra-laboratory split sample, which provides information regarding the method precision and sample heterogeneity. Results are presented as Relative Percent Difference (RPD) values of two sample concentrations for a specific contaminant.

NAGD recommends that duplicates should agree within a typical RPD of the method of ±35 %. This recommended RPD is typically not adopted by analytical laboratories as it does not account for the greater uncertainty for contaminant concentrations close to the method's detection limit.

The primary laboratory AAA uses the following approach to assess duplicate RPD's:

- Result <10 times LOR – no limit to RPD; and
- Result >10 times LOR – RPD between 0% and 50%.

The secondary laboratory ALS adopts specific RPDs for individual compounds.

3.6.4.3 Surrogate and Matrix Spikes

Laboratory Control Samples are either certified reference materials or a blank sample spiked with known concentrations of the analytes of interest. The purpose of this measurement is to monitor method accuracy.

Matrix spikes refer to an intra-laboratory split sample spiked with a representative set of target analytes of known concentration. Matrix spikes are assessed to monitor potential sample matrix effects on analyte recoveries.

Surrogate spikes are used for organic analytes. Surrogates are known additions to samples which mimic the compounds of interest and are not normally expected to be present in the sample.

For both surrogate and matrix spikes, a calculation of the percent recovery of the spiked amount against the returned concentration is performed indicating analytical performance in terms of extraction efficiency.

NAGD states that recovery limits of 75% - 125% are generally acceptable. Analytical laboratories typically adopt specific surrogate and matrix spike recovery limits for the various contaminant compound groups. It is also noted that ideal recovery ranges may be waived in the event of sample matrix interference.

The primary laboratory AAA adopts the following acceptable surrogate and matrix spike recovery limits:

- Trace elements: 70-130%;
- Organic analyses: 50-150%;
- SVOC & speciated phenols: 10-140%; and
- Surrogates: 10-140%.

The secondary laboratory ALS adopts specific recovery limits for individual compounds.

3.7 Data Analysis

3.7.1 Sediment Contaminants

Concentrations of chemicals measured in sediment samples at each dredging sub-area (or reference area) will be compared to screening levels listed in Table 2 of NAGD. This will provide a basis for determining whether dredged material is suitable for unconfined placement at sea or if further analyses, such as elutriate, bioavailability or toxicity testing, are required.

For each dredging sub-area, the mean concentrations of chemical parameters at the upper 95% confidence level (95% UCL) will be calculated and compared against NAGD guideline levels. This involves the following steps.

Data pre-treatment

Analytical values below detection limit will be set to one-half of the laboratory Limit of Reporting (LOR) as per NAGD recommendation to facilitate 95% UCL calculation. Organic contaminant results will be normalised to 1% Total Organic Carbon (TOC) where the measured value is within the range of 0.2-10%. If TOC values are outside of this range, the highest (10%) or lowest (0.2%) value will be adopted as appropriate. Organic parameters with concentrations below detection limits will not be normalised to 1% TOC but included at half their LOR.

One assumption in the calculation of the 95% UCL is that the samples are statistically independent. Therefore, field triplicate samples and laboratory split samples will not be included in the 95% UCL calculation.

Outliers

Outliers will be treated in accordance with the procedure in NAGD. In summary this will involve:

(a) Outliers (for all parameters) will be identified as any data points greater than two standard deviations.

(b) For TBT, where outliers are detected, the stored portion of the sample will be analysed in triplicate.

(c) If the original result is not confirmed through the re-analysis, it will be discarded in favour of the mean of the three triplicate samples.

NAGD does not provided guidance on treatment of outliers for other parameters. Outliers for other parameters will be noted in the report but included in calculation of the 95% UCL.

Selection of appropriate 95% UCL Calculation Method

The methodology for calculating the 95% UCL follows the approach recommended in Appendix A of NAGD. A Shapiro-Wilk test will be used to determine whether data followed a normal distribution. The ProUCL (Version 4.1.00) software package will be used for these calculations (Singh et al. 2010).

Calculation of 95% UCL and Comparison to Screening Levels

ProUCL Version 4.1.00 will be used to calculate the 95% UCL. For normally distributed data, the arithmetic mean and standard deviation will be calculated, and the 95% UCL calculated using the one-tailed Student's *t* UCL test. For data that follows a log-normal (or other) distribution, the geomean will be calculated, and the 95% UCL analysed using non-parametric Jack-Knife analysis as per NAGD recommendation.

In cases where an insufficient number of discrete values in the dataset would not allow calculation of the 95% UCL (e.g. most values below LOR), the maximum recorded value of the dataset will be conservatively used instead for comparison against NAGD trigger levels.

Should 95% UCL values for all analysed parameters fall below NAGD screening levels, the sediment would be considered clean and suitable for unconfined disposal at sea.

3.7.2 Baseline Concentrations

NAGD states that ambient baseline concentrations can be determined by sampling of sediment at reference areas in the vicinity of an existing disposal site. Similar to the approach followed in Worley Parsons (2013c, d), the data collected from the five reference locations in Moreton Bay would be used to derive ambient baseline concentrations if required (RF2, 3, 4, 6 and 7 in Figure 3-1).

3.8 Elutriate and Bioavailability Testing

As outlined on Section 3.1.3, elutriate and bioavailability testing will be undertaken as per NAGD for a range of contaminants which have regularly exceeded screening levels in the past.

Elutriate Testing:

The elutriate test is designed to simulate release of contaminants from sediment during dredged material disposal. Testing will be carried out using the USEPA's standard seawater elutriate test which involves shaking the sediment samples with four times the volume of seawater at room temperature for 30 minutes. The sample will be allowed to settle for one hour and the supernatant centrifuged or filtered (0.45 µm) within sixty minutes, and analysed using analytical methods appropriate for determining ultra-trace levels in seawater.

Results will be compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% or 99% protection of species, as appropriate).

Bioavailability Testing:

The Dilute Acid Extraction (DAE) method will be used to provide an estimate of the bioavailable fraction of the contaminant of concern in case of metal/metalloid analysis. The sediment samples will be extracted using a weak acid and the results compared against the respective NAGD screening levels.

Porewater analysis would be undertaken for organic contaminants such as TBT. Porewater is assumed to represent the major route of exposure to sediment contaminants by benthic organisms and is the recommended bioavailability test for organic contaminants as per NAGD. Porewater results would be compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Should both elutriate and bioavailability tests result in values less than the respective guideline limits, the material would be considered clean and suitable for ocean disposal.

3.8.1 Acid Sulfate Soils

The results of the chromium-suite acid sulfate analysis will be assessed against the Australian framework for Acid Sulfate Soil management in coastal systems (Ahern et al. 1998). The risk of acidification will be determined by the acid-base accounting approach (Ahern et al. 2004). Net acidity will be calculated from the results as a measure of the acid producing capacity of the sampled sediment upon complete oxidation.

The calculated net acidity will then be compared to the QASSIT action criteria of 0.03% S or 18 mol H+/tonne to assess the need for acid sulfate soil management if the dredged sediments were to be placed on land.

The liming rate will indicate the amount of lime that needs to be added to the soil to manage its acid generating capacity.

3.9 Data Validation

All laboratory analyses will be validated in accordance with Appendix A of NAGD to confirm suitable data quality for undertaking a rigorous characterisation of the proposed dredge material.

Data Validation will involve assessment of the following:

- Sample holding times and storage conditions;
- Laboratory blanks, duplicates and surrogate/matrix spikes; and
- Field triplicates samples, triplicate sample splits and trip blank.

The proposed data quality objectives for data validation are outlined in Table 3-4.

Table 3-4 Data Quality Objectives for Data Validation

Parameter	Data Quality Objective
Holding Time	Samples received within specified holding time (NAGD Appendix H)
Field Triplicate Samples	Relative Standard Deviation <50%
Triplicate Split Samples, including inter-laboratory samples	Relative Standard Deviation <50%
Laboratory Blanks	At or near the Limit of Reporting (LOR)
Laboratory Duplicate Samples	Relative Percent Difference (RPD) <35% or as per laboratory requirements
Laboratory Matrix Spikes	Recovery as per laboratory requirements
Surrogate Spikes	Recovery as per laboratory requirements

3.10 Reporting

The reporting of sediment quality results will be undertaken in a SAP Implementation Report in accordance with NAGD including the following components:

- Summary of the SAP, or SAP appended to the report;
- Outline of potential problems encountered and deviations from the SAP, including justification;
- Description of the sampling carried out, along with the actual sampling locations, sample numbers (including replicates and QA samples), completed COC forms, field logs and description of sediments;
- Comparison of the 95% UCL of mean chemical concentrations of sediments in the dredge subareas;
- Assessment of QA/QC procedures for both field and laboratory data;

- Data validation including comparison to data quality objectives;
- Appendices including all laboratory and field data; and
- Conclusions as to the acceptability or otherwise of the dredge material for unconfined ocean disposal and recommendations as to further work required.

4 References

Ahern, C.R., Ahern, M.R., Powell, B. (1998). Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998: DEH, Brisbane.

Ahern, C.R., McElnea, A.E., Sullivan, L.A. (2004) Acid Sulfate Soils Laboratory Methods Guidelines. Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

ANZECC/ARMCANZ. (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Vol. 4). Canberra: Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand.

Batley, G.E. & Simpson, S.L. (2009) Development of guidelines for ammonia in estuarine and marine water systems. Marine Pollution Bulletin 58, 1472-1476.

Butler Partners (2002) Sediment Sampling & Analysis Plan Brisbane River & Outer Bar, Moreton Bay (November 2001). Report prepared for Port of Brisbane Corporation.

Commonwealth of Australia (2009) National Assessment Guidelines for Dredging: Department of the Environmental, Water, Heritage and the Arts, Canberra.

GHD (2010) Report for Sediment Sampling and Analysis Plan – Brisbane River and Moreton Bay, Revision 1 (May 2010). Report prepared for Port of Brisbane Corporation.

Hydrobiology (2003) Sediment Sampling and Analysis Plan for the Brisbane River and Outer Bar (November 2002). Report prepared for Port of Brisbane Corporation.

Hydrobiology (2004) Sediment Sampling and Analysis Plan for the Brisbane River and Outer Bar (November 2003). Report prepared for Port of Brisbane Corporation.

Maunsell McIntyre (2001) Sediment Sampling and Analysis Plan (SAP) in the Brisbane River and Outer Bar (November 2000). Report prepared for Port of Brisbane Corporation.

SKM (2005) Sediment Sampling and Analysis Plan (SAP) for Brisbane River and Moreton Bay (November 2004). Report prepared for Port of Brisbane Corporation.

SKM (2006) Sediment Sampling and Analysis Plan (SAP) for Brisbane River and Moreton Bay (January 2006). Report prepared for Port of Brisbane Corporation.

SKM (2007) Sediment Sampling and Analysis Plan (SAP) for Brisbane River and Moreton Bay 2007. Report prepared for Port of Brisbane Corporation.

Preda, M. & Cox, M.E. (2002) Trace metal occurrence and distribution in sediments and mangroves, Pumicestone region, southeast Queensland, Australia. Environment International 28, 433-449.

Singh, A., Maichle, R., Armbya, N. (2010) ProUCL Version 4.1 User Guide (Draft) Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. U.S. Environmental Protection Agency, Washington.

Worley Parsons (2008) Sediment Sampling and Analysis Plan – Brisbane River and Moreton Bay (January 2008). Report prepared for Port of Brisbane Corporation.

References

Worley Parsons (2009) Sediment Sampling and Analysis Plan – Brisbane River and Moreton Bay (February 2009). Report prepared for Port of Brisbane Corporation.

Worley Parsons (2011a) Brisbane River and Moreton Bay – Annual Sediment Characterisation Report 2011. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2011b) Emergency Dredging Sediment Sampling Results 2011. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2012) Brisbane River and Moreton Bay – Annual Sediment Characterisation Report 2012. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2013a) Brisbane River and Moreton Bay – Annual Sediment Characterisation Report 2013. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2013b) Emergency Dredging Sediment Sampling Results 2013. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2013c) Emergency Dredging Sediment Sampling – Round 2 Organochlorine Pesticides Results. Report prepared for Port of Brisbane Pty Ltd.

Worley Parsons (2013d) Emergency Dredging Sediment Sampling – Round 2 Dioxin Results. Report prepared for Port of Brisbane Pty Ltd.

BMT WBM Bangalow
6/20 Byron Street Bangalow 2479
Tel +61 2 6687 0466 Fax +61 2 66870422
Email bmtwbm@bmtwbm.com.au
Web www.bmtwml.com.au

BMT WBM Brisbane
Level 8, 200 Creek Street Brisbane 4000
PO Box 203 Spring Hill QLD 4004
Tel +61 7 3831 6744 Fax +61 7 3832 3627
Email bmtwbm@bmtwbm.com.au
Web www.bmtwml.com.au

BMT WBM Denver
8200 S. Akron Street, #B120
Centennial Denver Colorado 80112 USA
Tel +1 303 792 9814 Fax +1 303 792 9742
Email denver@bmtwbm.com
Web www.bmtwbm.com

BMT WBM London
1st Floor, International House
St Katherine's Way London E1W1TW
Email london@bmtwbm.co.uk
Web www.bmtwbm.com.au

BMT WBM Mackay
Suite 1, 138 Wood Street Mackay 4740
PO Box 4447 Mackay QLD 4740
Tel +61 7 4953 5144 Fax +61 7 4953 5132
Email mackay@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Melbourne
Level 5, 99 King Street Melbourne 3000
PO Box 604 Collins Street West VIC 8007
Tel +61 3 8620 6100 Fax +61 3 8620 6105
Email melbourne@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Newcastle
126 Belford Street Broadmeadow 2292
PO Box 266 Broadmeadow NSW 2292
Tel +61 2 4940 8882 Fax +61 2 4940 8887
Email newcastle@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Perth
Suite 6, 29 Hood Street Subiaco 6008
Tel +61 8 9328 2029 Fax +61 8 9486 7588
Email perth@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Sydney
Level 1, 256-258 Norton Street Leichhardt 2040
PO Box 194 Leichhardt NSW 2040
Tel +61 2 8987 2900 Fax +61 2 8987 2999
Email sydney@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Vancouver
Suite 401, 611 Alexander Street
Vancouver British Columbia V6E 3W1 Canada
Tel +1 604 683 5777 Fax +1 604 608 3232
Email vancouver@bmtwbm.com.au
Web www.bmtwbm.com

Appendix B Sediment Sample Logs

Sediment Sample Logs

Project number: B20259

Project Name: PoB Sediment Sampling

Samplers: Brad Hiles, Conor Jones and Brandon John

Site No.	Date	Time	General Location	Easting	Northing	Depth	Weather conditions	Type of Sampler	Colour	Field Texture (Fine/course sand, silt, clay clayey sand)	Palasticity	Odour	Shell grit	biota	General Comment
RF6	21/10/2013	9:41	Moreton Bay	515003	6980511	7.7	Fine	Grab	grey/brown	silt/fine sand	no	no	0	0	
RF2	21/10/2013	9:33	Moreton Bay	514083	6982366	8.7	Fine	Grab	greybrown	silt/fine sand	no	no	0	0	small % of fine shell grit
RF3	21/10/2013	10:06	Moreton Bay	516442	6982026	9.5	Fine	Grab	grey	mud/silt	no	no	0	0	fine layer of brown silt above grey mud
RF7	21/10/2013	10:20	Moreton Bay	517470	6980112	8.5	Fine	Grab	grey	mud/silt	no	no	0	0	fine layer of brown silt above grey mud
RF4	21/10/2013	10:33	Moreton Bay	518863	6981618	10.2	Fine	Grab	grey	mud/silt	no	no	5	0	fine layer of brown silt above grey mud
13_9	21/10/2013	11:02	Zone 4	521880	6981357	13.7	Fine	Grab	grey	fine sand/mud	no	no	5	0	fine layer of brown silt above grey mud
16_0	21/10/2013	11:25	Mud Island	522872	6974873	10.1	Fine	Grab	brown/grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
16_1	21/10/2013	11:45	Mud Island	522028	6976970	9.4	Fine	Grab	brown/grey	fine sand/mud	no	no	0	1	fine layer of brown silt above grey mud
13_8	21/10/2013	12:21	Zone 4	520125	6978050	12	N 5kts / fine	Grab	grey	silt/mud	no	no	2	0	fine layer of brown silt above grey mud
13_5	21/10/2013	12:41	Zone 4	519281	6977138	7.9	N 8kts / fine	Grab	grey	silt/mud	yes	no	0	0	
13_4A	21/10/2013	13:12	Zone 4	519166	6976497	7.3	N 10kts /fine	Grab	grey	mud	no	no	15	0	course shell grit
13_4B	21/10/2013	13:10	Zone 4	519166	6976497	7.3	N 10kts /fine	Grab	grey	mud	no	no	15	0	course shell grit
13_4C	21/10/2013	13:10	Zone 4	519166	6976497	7.3	N 10kts /fine	Grab	grey	mud	no	no	15	0	course shell grit
13_1	21/10/2013	13:10	Zone 4	518570	6976043	7	N 15kts /fine	Grab	grey	silt/mud	no	no	1	0	fine layer of brown silt above grey mud
11_8	21/10/2013	14:09	Zone 3	516343	6972473	2.9	NE 12kts /fine	Grab	grey	silt/mud	no	no	1	0	fine layer of brown silt above grey mud
11_9A	21/10/2013	14:32	Zone 3	516163	6971958	14.2	NE 12kts /fine	Grab	grey	fine sand/silt/mud	no	no	0	0	
11_9B	21/10/2013	14:36	Zone 3	516163	6971958	14.2	NE 12kts /fine	Grab	grey	silt/mud	no	no	0	0	sediments very soft
11_9C	21/10/2013	14:41	Zone 3	516163	6971958	14.3	NE 12kts /fine	Grab	grey	silt/mud	no	yes	0	0	
15_3	22/10/2013	9:17	Zone 3	518165	6974930	12.4	N 2-5kts /fine	Grab	grey	silt/mud	no	no	0	0	
15_2	22/10/2013	9:35	Zone 3	517698	6974564	13.1	N 2-5kts /fine	Grab	grey/brown	Silt/sand	no	no	40	0	
15_1	22/10/2013	9:53	Zone 3	517530	6973661	15.4	N 2-5kts /fine	Grab	Brown	mud	no	no	0	0	soft
12_2	22/10/2013	10:07	Zone 3	517055	6973621	8.4	N 2-5kts /fine	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud, trawler 'Mega Rose' trawled over the site prior to undertaking sampling
12_1	22/10/2013	10:26	Zone 3	517099	6973147	16.4	N 2-5kts /fine	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
11_5	22/10/2013	10:42	Zone 3	515491	6970754	15.3	10kts NE	Grab	brown	silt/mud	no	no	0	0	very fine layer of sand above muddy substrate
10_8	22/10/2013	11:01	Zone 3	516205	6971378	15.3	10kts NE	Grab	brown	silt/mud	no	no	0	0	very fine layer of sand above muddy substrate
10_6	22/10/2013	11:34	Zone 3	515963	6971063	6.9	8kts NE	Grab	brown	fine sand/clay/mud	no	no	0	0	muddy substrate with soft clay pieces and fine sand/organic matter layer
10_5	22/10/2013	12:00	Zone 3	515491	6970754	16	12kts NE	Grab	brown	silt/mud	no	no	1	0	
9_1	22/10/2013	13:20	Zone 2	514975	6968505	11.4	12kts NE	Grab	grey	silt/mud	no	no	2	0	muddy substrate with sand/shell grit upper layer
8_3	22/10/2013	13:40	Zone 2	514068	6967511	10.1	15kts NE	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
8_1	22/10/2013	14:00	Zone 2	513334	6966836	12	15kts NE	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
7_1	22/10/2013	14:21	Zone 2	512842	6966620	11.9	Fine / ESE 18kts	Grab	grey	silt/mud	no	no	5	0	grey muddy substrate with brown fine silt overlayer
6_2	22/10/2013	14:45	Zone 2	512413	6966401	11	Fine / E 12kts	Grab	grey	fine sand/silt/mud	no	no	0	0	
6_3	22/10/2013	15:05	Zone 2	512189	6965833	11.9	Fine / E 12kts	Grab	grey	fine sand/silt/mud	no	no	0	0	
5_1A	22/10/2013	15:35	Zone 2	510663	6964656	6.9	Fine / E 12kts	Grab	dark brown	silt/mud	no	no	0	0	Original site was located in the middle of the channel, however due to high currents and inability to obtain a full grab sample the site was re-positioned closer to the edge of the channel. Original grab location consisted of muddy/sand loam with course shell grit (~60% of grab)
5_1B	22/10/2013	15:39	Zone 2	510663	6964656	6.4	Fine / E 12kts	Grab	dark brown	silt/mud	no	no	0	0	
5_1C	22/10/2013	15:42	Zone 2	510663	6964656	6.7	Fine / E 12kts	Grab	dark brown	silt/mud	no	no	0	0	
2_0	23/10/2013	8:35	Zone 1	502319	6960782	10.3	Fine / W 10kts	Grab	light olive grey	fine-medium sands	no	no	0	0	
BC-2	23/10/2013	9:20	Zone 1	504133	6964789	3.5	Fine / W 10kts	Grab	grey	mud/fine sand	no	no	0	1	
4_4	23/10/2013	9:37	Zone 2	506671	6964708	9.8	Fine / SW 5kts	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
4_0	23/10/2013	9:55	Zone 2	507652	6964101	10.2	Fine / SW 5kts	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud
5_0	23/10/2013	10:06	Zone 2	508498	6963840	9.8	Fine / NW 10kts	Grab	grey	silt/mud	no	no	0	0	fine layer of brown silt above grey mud


2-0


BG-2


4-0


4-4


5-0


5-1A


5-1B


5-1C


6-2

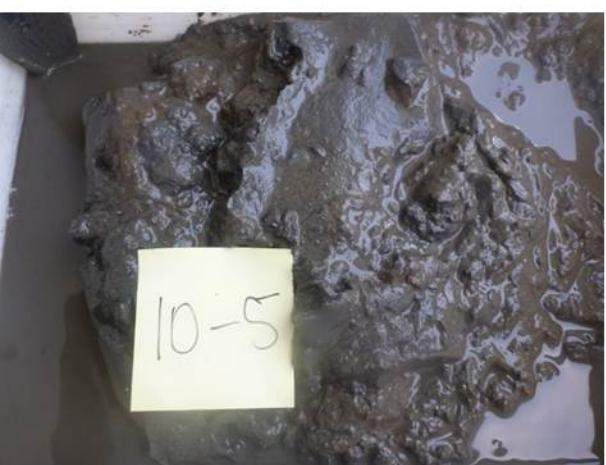

6-3


7-1


8-1


8-3


9-1


10-5

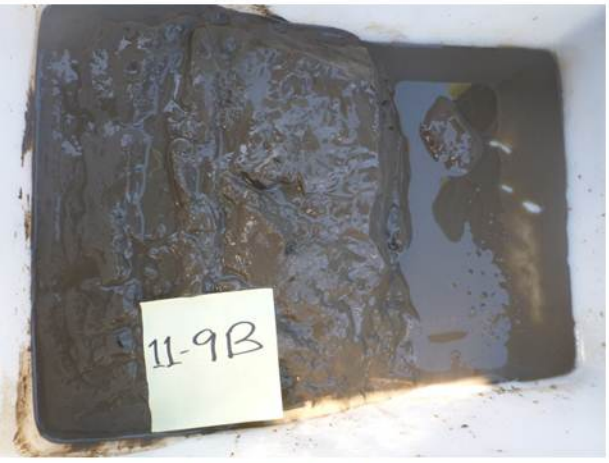

10-6


10-8


11-5


11-8


11-9A


11-9B


11-9C

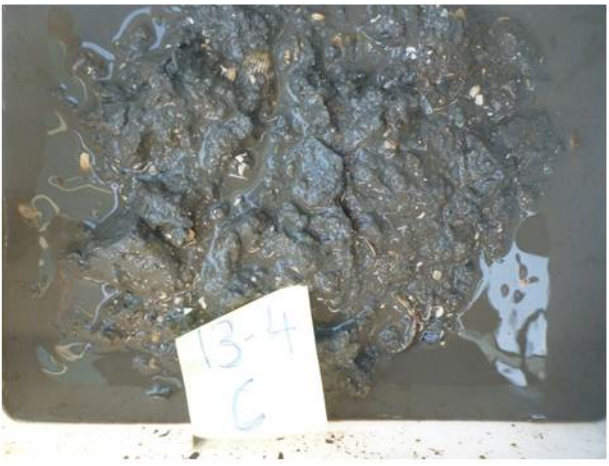

12-1


12-2


13-1


13-4
A


13-4
B


13-4
C


13-5


13-8


13-9

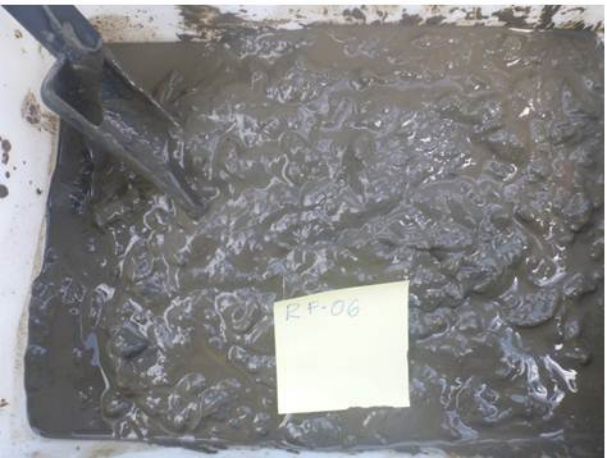

16-0


16-1


RF2


RF3


RF4


RF-06


RF 7

Appendix C Laboratory Results – Primary Laboratory

Brisbane Office:

BMT WBM Pty Ltd
Level 1, 490 Upper Edward Street
SPRING HILL QLD 4004
Australia

PO Box 203
Spring Hill QLD 4004

Telephone (07) 3831 6744
Facsimile (07) 3832 3627

Newcastle Office:

BMT WBM Pty Ltd
126 Belford Street
BROADMEADOW NSW 2292
Australia

PO Box 266
BROADMEADOW NSW 2292

Telephone (02) 4940 8882
Facsimile (02) 4940 8887

Melbourne Office:

BMT WBM Pty Ltd
Level 5, 99 King Street
MELBOURNE VIC 3000
Australia

PO Box 604
Collins Street West VIC 8007

Telephone (03) 8620 6100
Facsimile (03) 8620 6105

Sydney Office:

BMT WBM Pty Ltd
Suites 206 & 207
118 Great North Road
Fivedock NSW 2046
Australia

PO Box 129
Fivedock NSW 2046

Telephone (02) 9713 4836
Facsimile (02) 9713 4890

AB158156

BMT WBM

BMT WBM Sample Analysis Sheet

Laboratory: Advanced Analytical Australia Pty Ltd

Attention: Andrew Bradbury ..... Date Results Required: normal turnaround

Project Title: Port of Brisbane Sediment Sampling

Project No: B20259 ..... Contact (incl. office): Markus Billerbeck

Nature of Samples: Sediment/Soil [x] Water [ ] Fresh [ ] Saline/Marine [x] Preserved in ice/fridge [x]

Other: ..... Courier Used: delivered in person

No. of Samples: 46 ..... Date Collected: 21 to 23 October 2013

Please analyse the attached samples for the following: please refer to attached basic and detailed list of parameters

Nutrients
[ ] Ortho-P
[ ] Total-P
[ ] Ammonia-N
[ ] Total Kjeldahl N (Org N + NH_3)
[ ] NO_2 + NO_3
[ ] Organic-N
[ ] Total N

Physical
[ ] Suspended Solids
[ ] Chlorophyll *a*
[ ] pH
[ ] Conductivity
[ ] Salinity
[ ] Turbidity
[ ] True & Apparent Colour
[ ] Total Hardness
[ ] S.A.R.
[ ] Alkalinity
[ ] BOD

Bacteriological
[ ] E. coli
[ ] Enterococci
[ ] Faecal coliforms

Organics
[ ] Organochlorines
[ ] Organophosphates
[ ] PCB's
[ ] PAH's
[ ] Oil and Grease
[ ] TPH (by GC)
[ ] TPH (by IR)
[ ] Organic Content

Other
[ ]
[ ]
[ ]

Heavy Metals
[ ] Aluminum
[ ] Arsenic
[ ] Cadmium
[ ] Chromium
[ ] Copper
[ ] Iron
[ ] Lead
[ ] Manganese
[ ] Mercury
[ ] Nickel
[ ] Silver
[ ] Zinc

Particle Size Dist
[ ] Sieve
[ ] Hydrometer
[ ] Other

Remarks: .....

Relinquished by: Conor Jones ..... Date: 23 October 2013

Received by: ..... Date: .....

PLEASE RETURN TO WBM A COPY OF SIGNED SHEET UPON SATISFACTORY RECEIPT OF SAMPLES (INCLUDING LAB. REFERENCE FOR SAMPLES OVERLEAF).

DETAILS OF SAMPLING

	OUR REF NO (sample ID)	REMARKS (Sampling Location/Address, Date/Time of sample collection etc)	LAB REF NO
1	2-0	Basic List	
2	BC-2	Basic List	
3	4-4	Basic List	
4	4-0	Basic List	
5	5-0	Basic List and Detailed List	
6	5-1 A	Basic List and Detailed List	
7	5-1 B	Basic List	
8	5-1 C	Basic List	
9	6-3	Basic List and Detailed List	
10	6-2 A	Basic List	
11	6-2 B	Basic List	
12	7-1	Basic List and Detailed List	
13	8-1	Basic List	
14	8-3	Basic List	
15	9-1	Basic List and Detailed List	
16	10-5	Basic List	
17	10-6	Basic List and Detailed List	
18	10-6 B	Basic List	
19	10-8	Basic List	
20	11-9 A	Basic List	
21	11-9 B	Basic List	
22	11-9 C	Basic List	
23	11-8	Basic List and Detailed List	
24	11-5	Basic List	
25	12-1	Basic List and Detailed List	
26	12-2	Basic List	
27	15-1	Basic List	
28	15-2	Basic List and Detailed List	
29	15-3	Basic List and Detailed List	
30	13-1	Basic List and Detailed List	

	OUR REF NO (sample ID)	REMARKS (Sampling Location/Address, Date/Time of sample collection etc)	LAB REF NO
31	13-4 A	Basic List	
32	13-4 B	Basic List	
33	13-4 C	Basic List	
34	13-5	Basic List	
35	13-8	Basic List and Detailed List	
36	13-9	Basic List	
37	16-1	Basic List	
38	16-0	Basic List	
39	RF 2	Basic List	
40	RF 3	Basic List	
41	RF 4	Basic List	
42	RF 6	Basic List	
43	RF 7	Basic List	
44	TP 2 /10/13	Trip Blank	
45	TP 2 /10/13	Trip Blank	
46	TP 2 /10/13	Trip Blank	

Basic List of Parameters:

- Analysis includes
  - Metals/Metalloids (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, Al, Fe);
  - Organotins (MBT, DBT, TBT);
  - Organochlorine Pesticides (including DDT, DDD, DDE, chlordane);
  - Particle size distribution (sieve and sedigraph);
  - Moisture content; and
  - Total Organic Carbon.

Detailed List of Parameters:

- Analysis includes
  - Polycyclic Aromatic Hydrocarbons (PAHs);
  - Total Petroleum Hydrocarbons (TPHs);
  - Polychlorinated Biphenyls (PCBs);
  - Acid Sulfate Soils (Chromium Suite);
  - Nutrients (TP, TN, NOx, TKN), and
  - Radionuclides.

Trip Blanks:

- Analysis includes
  - BTEX / TPH C6-C9

REPORT OF ANALYSIS

Laboratory Reference: A13/5156-A [R01]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

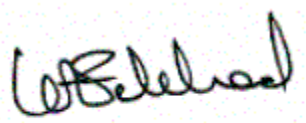
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment Analysis
Sample Type: Sediment
No. of Samples: 46
Date Received: 18/10/2013
Date Completed: 2/12/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/1** **2-0** **23/10/2013**	**/2** **BC-2** **23/10/2013**	**/3** **4-4** **23/10/2013**	**/4** **4-0** **23/10/2013**
Moisture Content						
Moisture Content	04-004	%	19.2	42.2	63.0	59.7
Trace Elements						
Aluminium	04-001	mg/kg	3,200	14,000	29,000	28,000
Arsenic	04-001	mg/kg	1.8	5.7	7.7	6.9
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	9.1	24	53	50
Copper	04-001	mg/kg	3.4	25	41	35
Iron	04-001	mg/kg	10,000	24,000	47,000	48,000
Lead	04-001	mg/kg	36	26	15	14
Mercury	04-002	mg/kg	0.01	0.11	0.1	0.09
Nickel	04-001	mg/kg	6.7	17	41	38
Phosphorus*	04-001	mg/kg	210	550	1,100	980
Silver	04-001	mg/kg	<0.1	0.13	0.18	0.16
Zinc	04-001	mg/kg	43	110	120	110
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<10	<20.0	<10
TPH C10-14	04-020	mg/kg	<10	<10	<20	<10
TPH C15-28	04-020	mg/kg	<50	<50	<100	<50
TPH C29-36	04-020	mg/kg	<50	65	<100	55
Surrogate Recovery	04-020	%	99	101	88	101
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Poly Aromatic Hydrocarbons						
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<1.0	<1.0	<2	<2
alpha-BHC	04-024	µg/kg	<1.0	<1.0	<2	<2
beta-BHC	04-024	µg/kg	<1.0	<1.0	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<1.0	<1.0	<2	<2
delta-BHC	04-024	µg/kg	<1.0	<1.0	<2	<2
cis-Chlordane	04-024	µg/kg	<1.0	2.0	<2	<2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/1** **2-0** **23/10/2013**	**/2** **BC-2** **23/10/2013**	**/3** **4-4** **23/10/2013**	**/4** **4-0** **23/10/2013**
trans-Chlordane	04-024	µg/kg	<1.0	8.0	<2	<2
p,p'-DDD	04-024	µg/kg	<1.0	1.0	<2	<2
p,p'-DDE	04-024	µg/kg	<1.0	5.0	8.0	8.0
p,p'-DDT	04-024	µg/kg	<1.0	<1.0	<2	<2
Dieldrin	04-024	µg/kg	<1.0	<1.0	<2	<2
alpha-Endosulfan	04-024	µg/kg	<5	<5	<10	<10
beta-Endosulfan	04-024	µg/kg	<5	<5	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<1.0	<1.0	<2	<2
Endrin	04-024	µg/kg	<1.0	<5	<10	<10
Endrin ketone	04-024	µg/kg	<5	<5	<10	<10
Endrin aldehyde	04-024	µg/kg	<1.0	<5	<10	<10
Heptachlor	04-024	µg/kg	<1.0	<5	<2	<2
Heptachlor epoxide	04-024	µg/kg	<1.0	<1.0	<2	<2
Hexachlorobenzene	04-024	µg/kg	<1.0	<1.0	<2	<2
Methoxychlor	04-024	µg/kg	<1.0	<1.0	<20	<20
Oxychlordane*	04-024	µg/kg	<1.0	<1.0	<2	<2
Surrogate Recovery	04-024	%	92	98	98	95
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Polychlorinated Biphenyls						
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<0.50	<1.0	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	1.3	<1.0	1.1
Tributyl tin	04-026	µgSn/kg	<0.50	1.9	1.8	3.5
Surrogate 1 Recovery	04-026	%	108	97	92	95
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	76	710	1,540	1,340
Total Kjeldahl Nitrogen	SUB	mg/kg	76	710	1,540	1,340
Nitrate as N	SUB	mg/kg	1.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	0.05	1.3	1.8	1.7

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/1	/2	/3	/4
Client Reference:	-	-	2-0	BC-2	4-4	4-0
Date Sampled:	-	-	23/10/2013	23/10/2013	23/10/2013	23/10/2013
Analysis Description	**Method**	**Units**				
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Laboratory Reference:	-	-	/5	/6	/7	/8
Client Reference:	-	-	5-0	5-1A	5-1B	5-1C
Date Sampled:	-	-	23/10/2013	22/10/2013	22/10/2014	22/10/2015
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	59.0	61.4	61.6	59.9
Trace Elements						
Aluminium	04-001	mg/kg	28,000	32,000	31,000	31,000
Arsenic	04-001	mg/kg	7.0	7.2	5.7	5.8
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	50	52	51	52
Copper	04-001	mg/kg	36	36	34	33
Iron	04-001	mg/kg	48,000	49,000	51,000	52,000
Lead	04-001	mg/kg	13	19	11	11
Mercury	04-002	mg/kg	<0.01	0.12	0.08	0.07
Nickel	04-001	mg/kg	37	36	44	45
Phosphorus*	04-001	mg/kg	990	940	1,000	1,100
Silver	04-001	mg/kg	0.13	0.37	0.12	0.12
Zinc	04-001	mg/kg	100	110	95	95
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<20.0	<20.0	<10
TPH C10-14	04-020	mg/kg	<10	<20	<20	<10
TPH C15-28	04-020	mg/kg	<50	<100	<100	<50
TPH C29-36	04-020	mg/kg	<50	<100	<100	<50
Surrogate Recovery	04-020	%	99	96	92	97
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	1/11/2013	1/11/2013	1/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	<5.0	6.0	<5.0	<5.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/5** **5-0** **23/10/2013**	**/6** **5-1A** **22/10/2013**	**/7** **5-1B** **22/10/2014**	**/8** **5-1C** **22/10/2015**
1-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	<5.0	<5.0
2-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	<5.0	<5.0
Acenaphthylene	04-022	µg/kg	<15	<15	<15	<15
Acenaphthene	04-022	µg/kg	<5.0	<5.0	<5.0	<5.0
Fluorene	04-022	µg/kg	<5.0	<5.0	<5.0	<5.0
Phenanthrene	04-022	µg/kg	24	21	12	12
Anthracene	04-022	µg/kg	8.0	7.0	<5.0	<5.0
Fluoranthene	04-022	µg/kg	77	77	38	42
Pyrene	04-022	µg/kg	74	83	37	40
Benz(a)anthracene	04-022	µg/kg	34	35	17	18
Chrysene	04-022	µg/kg	37	41	18	20
Benzo(b)&(k)fluoranthene	04-022	µg/kg	78	87	54	47
Benzo(a)pyrene	04-022	µg/kg	42	46	28	25
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	37	39	26	21
Dibenz(a,h)anthracene	04-022	µg/kg	6.0	6.0	<5.0	<5.0
Benzo(g,h,i)perylene	04-022	µg/kg	31	36	25	19
Coronene	04-022	µg/kg	<10	<10	<10	<10
Benzo(e)pyrene	04-022	µg/kg	34	40	25	22
Perylene	04-022	µg/kg	96	85	82	83
Total PAHs (as above)	04-022	µg/kg	580	610	360	350
Surrogate 1 Recovery	04-022	%	82	87	77	80
Surrogate 2 Recovery	04-022	%	91	95	90	91
Surrogate 3 Recovery	04-022	%	97	97	94	97
Date Extracted	04-022	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-022	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/5** **5-0** **23/10/2013**	**/6** **5-1A** **22/10/2013**	**/7** **5-1B** **22/10/2014**	**/8** **5-1C** **22/10/2015**
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDE	04-024	µg/kg	6.0	10	11	11
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	96	99	95	96
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Di-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Tri-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Tetra-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Penta-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Hexa-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Hepta-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Octa-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Nona-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Deca-PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Total PCB congeners	04-029	µg/kg	<5.0	<5.0	<5.0	<5.0
Surrogate 1 Recovery	04-029	%	91	98	88	88
Surrogate 2 Recovery	04-029	%	97	104	93	92
Date Extracted	04-029	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/5	/6	/7	/8
Client Reference:	-	-	5-0	5-1A	5-1B	5-1C
Date Sampled:	-	-	23/10/2013	22/10/2013	22/10/2014	22/10/2015
Analysis Description	**Method**	**Units**				
Date Analysed	04-029	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<1.0	<1.0	<0.50
Dibutyl tin	04-026	µgSn/kg	0.80	1.9	<1.0	0.70
Tributyl tin	04-026	µgSn/kg	2.4	<1.0	<1.0	0.50
Surrogate 1 Recovery	04-026	%	93	89	91	88
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	4/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,260	1,300	1,410	1,400
Total Kjeldahl Nitrogen	SUB	mg/kg	1,260	1,300	1,410	1,400
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.5	1.6	1.7	1.7
Chromium Reducible Suite	SUB		See Comments	See Comments	See Comments	See Comments
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Laboratory Reference:	-	-	/9	/10	/11	/12
Client Reference:	-	-	6-3	6-2A	6-2B	7-1
Date Sampled:	-	-	22/10/2016	22/10/2017	22/10/2018	22/10/2019
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	64.0	62.4	61.5	61.2
Trace Elements						
Aluminium	04-001	mg/kg	30,000	31,000	31,000	29,000
Arsenic	04-001	mg/kg	6.8	5.9	5.9	6.3
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	50	52	51	50
Copper	04-001	mg/kg	35	39	39	34
Iron	04-001	mg/kg	49,000	52,000	51,000	49,000
Lead	04-001	mg/kg	12	11	11	12
Mercury	04-002	mg/kg	0.07	0.07	0.07	0.08

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/9** **6-3** **22/10/2016**	**/10** **6-2A** **22/10/2017**	**/11** **6-2B** **22/10/2018**	**/12** **7-1** **22/10/2019**
Nickel	04-001	mg/kg	40	47	46	42
Phosphorus*	04-001	mg/kg	990	1,200	1,200	1,000
Silver	04-001	mg/kg	0.15	0.13	0.13	0.14
Zinc	04-001	mg/kg	100	120	110	100
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<20.0	<20.0	<20.0	<20.0
TPH C10-14	04-020	mg/kg	<20	<20	<20	<20
TPH C15-28	04-020	mg/kg	<100	<100	<100	<100
TPH C29-36	04-020	mg/kg	<100	<100	<100	<100
Surrogate Recovery	04-020	%	91	96	91	97
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	6.0	[NA]	[NA]	6.0
1-Methylnaphthalene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
2-Methylnaphthalene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
Acenaphthylene	04-022	µg/kg	<15	[NA]	[NA]	<15
Acenaphthene	04-022	µg/kg	<5.0	[NA]	[NA]	5.0
Fluorene	04-022	µg/kg	<5.0	[NA]	[NA]	5.0
Phenanthrene	04-022	µg/kg	19	[NA]	[NA]	14
Anthracene	04-022	µg/kg	6.0	[NA]	[NA]	6.0
Fluoranthene	04-022	µg/kg	66	[NA]	[NA]	58
Pyrene	04-022	µg/kg	61	[NA]	[NA]	54
Benz(a)anthracene	04-022	µg/kg	27	[NA]	[NA]	22
Chrysene	04-022	µg/kg	29	[NA]	[NA]	24
Benzo(b)&(k)fluoranthene	04-022	µg/kg	61	[NA]	[NA]	57
Benzo(a)pyrene	04-022	µg/kg	31	[NA]	[NA]	31
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	28	[NA]	[NA]	27
Dibenz(a,h)anthracene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
Benzo(g,h,i)perylene	04-022	µg/kg	24	[NA]	[NA]	23
Coronene	04-022	µg/kg	<10	[NA]	[NA]	<10
Benzo(e)pyrene	04-022	µg/kg	28	[NA]	[NA]	26

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/9** **6-3** **22/10/2016**	**/10** **6-2A** **22/10/2017**	**/11** **6-2B** **22/10/2018**	**/12** **7-1** **22/10/2019**
Perylene	04-022	µg/kg	97	[NA]	[NA]	95
Total PAHs (as above)	04-022	µg/kg	480	[NA]	[NA]	450
Surrogate 1 Recovery	04-022	%	82	[NA]	[NA]	79
Surrogate 2 Recovery	04-022	%	90	[NA]	[NA]	89
Surrogate 3 Recovery	04-022	%	97	[NA]	[NA]	96
Date Extracted	04-022	-	29/10/2013	[NA]	[NA]	29/10/2013
Date Analysed	04-022	-	1/11/2013	[NA]	[NA]	1/11/2013
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDD	04-024	µg/kg	<2	<2	<2	4.0
p,p'-DDE	04-024	µg/kg	8.0	12	11	9.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	96	93	97	96
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/9	/10	/11	/12
Client Reference:	-	-	6-3	6-2A	6-2B	7-1
Date Sampled:	-	-	22/10/2016	22/10/2017	22/10/2018	22/10/2019
Analysis Description	**Method**	**Units**				
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Di-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Tri-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Tetra-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Penta-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Hexa-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Hepta-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Octa-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Nona-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Deca-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Total PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Surrogate 1 Recovery	04-029	%	92	[NA]	[NA]	90
Surrogate 2 Recovery	04-029	%	95	[NA]	[NA]	96
Date Extracted	04-029	-	29/10/2013	[NA]	[NA]	29/10/2013
Date Analysed	04-029	-	1/11/2013	[NA]	[NA]	1/11/2013
Organotins						
Monobutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Dibutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Tributyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Surrogate 1 Recovery	04-026	%	92	92	89	89
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,520	1,480	1,470	1,520
Total Kjeldahl Nitrogen	SUB	mg/kg	1,520	1,480	1,470	1,520
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.8	1.7	1.7	1.9
Chromium Reducible Suite	SUB		See Comments	[NA]	[NA]	See Comments
Particle Size Distribution	SUB		See Comments	See Comments	[NA]	See Comments

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/13	/14	/15	/16
Client Reference:	-	-	8-1	8-3	9-1	10-5
Date Sampled:	-	-	22/10/2020	22/10/2021	22/10/2022	22/10/2023
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	56.0	60.4	46.0	58.7
Trace Elements						
Aluminium	04-001	mg/kg	26,000	27,000	18,000	26,000
Arsenic	04-001	mg/kg	5.7	7.2	5.6	6.6
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	47	46	39	44
Copper	04-001	mg/kg	31	31	24	28
Iron	04-001	mg/kg	46,000	45,000	36,000	43,000
Lead	04-001	mg/kg	10	13	7.5	11
Mercury	04-002	mg/kg	0.07	0.11	0.05	0.08
Nickel	04-001	mg/kg	40	35	32	34
Phosphorus*	04-001	mg/kg	1,000	910	750	850
Silver	04-001	mg/kg	0.11	0.13	<0.1	0.11
Zinc	04-001	mg/kg	89	95	73	86
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<20.0	<10	<10
TPH C10-14	04-020	mg/kg	<10	<20	<10	<10
TPH C15-28	04-020	mg/kg	<50	<100	<50	<50
TPH C29-36	04-020	mg/kg	<50	<100	<50	<50
Surrogate Recovery	04-020	%	104	95	100	96
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
1-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
2-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Acenaphthylene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Acenaphthene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Fluorene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Phenanthrene	04-022	µg/kg	[NA]	[NA]	6.0	[NA]
Anthracene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/13** **8-1** **22/10/2020**	**/14** **8-3** **22/10/2021**	**/15** **9-1** **22/10/2022**	**/16** **10-5** **22/10/2023**
Fluoranthene	04-022	µg/kg	[NA]	[NA]	18	[NA]
Pyrene	04-022	µg/kg	[NA]	[NA]	20	[NA]
Benz(a)anthracene	04-022	µg/kg	[NA]	[NA]	8.0	[NA]
Chrysene	04-022	µg/kg	[NA]	[NA]	9.0	[NA]
Benzo(b)&(k)fluoranthene	04-022	µg/kg	[NA]	[NA]	22	[NA]
Benzo(a)pyrene	04-022	µg/kg	[NA]	[NA]	10	[NA]
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	[NA]	[NA]	10	[NA]
Dibenz(a,h)anthracene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Benzo(g,h,i)perylene	04-022	µg/kg	[NA]	[NA]	10	[NA]
Coronene	04-022	µg/kg	[NA]	[NA]	<10	[NA]
Benzo(e)pyrene	04-022	µg/kg	[NA]	[NA]	10	[NA]
Perylene	04-022	µg/kg	[NA]	[NA]	53	[NA]
Total PAHs (as above)	04-022	µg/kg	[NA]	[NA]	180	[NA]
Surrogate 1 Recovery	04-022	%	[NA]	[NA]	80	[NA]
Surrogate 2 Recovery	04-022	%	[NA]	[NA]	92	[NA]
Surrogate 3 Recovery	04-022	%	[NA]	[NA]	96	[NA]
Date Extracted	04-022	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-022	-	[NA]	[NA]	1/11/2013	[NA]
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<1.0	<2
alpha-BHC	04-024	µg/kg	<2	<2	<1.0	<2
beta-BHC	04-024	µg/kg	<2	<2	<1.0	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<1.0	<2
delta-BHC	04-024	µg/kg	<2	<2	<1.0	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<1.0	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<1.0	<2
p,p'-DDD	04-024	µg/kg	<2	<2	<1.0	<2
p,p'-DDE	04-024	µg/kg	8.0	8.0	4.0	8.0
p,p'-DDT	04-024	µg/kg	<2	<2	<1.0	<2
Dieldrin	04-024	µg/kg	<2	<2	<1.0	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<5	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<5	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<1.0	<2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/13** **8-1** **22/10/2020**	**/14** **8-3** **22/10/2021**	**/15** **9-1** **22/10/2022**	**/16** **10-5** **22/10/2023**
Endrin	04-024	µg/kg	<10	<10	<5	<10
Endrin ketone	04-024	µg/kg	<10	<10	<5	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<5	<10
Heptachlor	04-024	µg/kg	<2	<2	<1.0	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<1.0	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<1.0	<2
Methoxychlor	04-024	µg/kg	<20	<20	<10	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<1.0	<2
Surrogate Recovery	04-024	%	101	92	97	94
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Di-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tri-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tetra-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Penta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Hexa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Hepta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Octa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Nona-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Deca-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Total PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Surrogate 1 Recovery	04-029	%	[NA]	[NA]	92	[NA]
Surrogate 2 Recovery	04-029	%	[NA]	[NA]	98	[NA]
Date Extracted	04-029	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-029	-	[NA]	[NA]	1/11/2013	[NA]
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<1.0	<0.50	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	<1.0	<0.50	<0.50
Tributyl tin	04-026	µgSn/kg	0.60	1.1	<0.50	0.50
Surrogate 1 Recovery	04-026	%	87	100	90	95
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/13	/14	/15	/16
Client Reference:	-	-	8-1	8-3	9-1	10-5
Date Sampled:	-	-	22/10/2020	22/10/2021	22/10/2022	22/10/2023
Analysis Description	**Method**	**Units**				
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,400	1,350	880	1,230
Total Kjeldahl Nitrogen	SUB	mg/kg	1,400	1,350	880	1,230
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.7	1.7	1.0	1.5
Chromium Reducible Suite	SUB		[NA]	[NA]	See Comments	[NA]
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Laboratory Reference:	-	-	/17	/18	/19	/20
Client Reference:	-	-	10-6	10-6B	10-8	11-9A
Date Sampled:	-	-	22/10/2024	22/10/2025	22/10/2026	21/10/2013
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	51.8	50.8	65.0	65.5
Trace Elements						
Aluminium	04-001	mg/kg	23,000	23,000	31,000	31,000
Arsenic	04-001	mg/kg	7.3	7.2	7.8	7.5
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	41	40	49	49
Copper	04-001	mg/kg	25	25	32	31
Iron	04-001	mg/kg	39,000	38,000	49,000	49,000
Lead	04-001	mg/kg	10	11	12	13
Mercury	04-002	mg/kg	0.06	0.07	0.07	0.07
Nickel	04-001	mg/kg	25	26	38	38
Phosphorus*	04-001	mg/kg	640	650	940	940
Silver	04-001	mg/kg	0.11	0.10	0.13	0.13
Zinc	04-001	mg/kg	81	81	98	96
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<10	<20.0	<20.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	**-**	**-**	**/17**	**/18**	**/19**	**/20**
Client Reference:	**-**	**-**	**10-6**	**10-6B**	**10-8**	**11-9A**
Date Sampled:	**-**	**-**	**22/10/2024**	**22/10/2025**	**22/10/2026**	**21/10/2013**
Analysis Description	**Method**	**Units**				
TPH C10-14	04-020	mg/kg	<10	<10	<20	<20
TPH C15-28	04-020	mg/kg	<50	<50	<100	<100
TPH C29-36	04-020	mg/kg	61	61	<100	<100
Surrogate Recovery	04-020	%	102	98	96	92
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	7.0	<5.0	[NA]	[NA]
1-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
2-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Acenaphthylene	04-022	µg/kg	<15	<5.0	[NA]	[NA]
Acenaphthene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Fluorene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Phenanthrene	04-022	µg/kg	16	21	[NA]	[NA]
Anthracene	04-022	µg/kg	5.0	5.0	[NA]	[NA]
Fluoranthene	04-022	µg/kg	56	63	[NA]	[NA]
Pyrene	04-022	µg/kg	51	54	[NA]	[NA]
Benz(a)anthracene	04-022	µg/kg	24	24	[NA]	[NA]
Chrysene	04-022	µg/kg	26	26	[NA]	[NA]
Benzo(b)&(k)fluoranthene	04-022	µg/kg	59	56	[NA]	[NA]
Benzo(a)pyrene	04-022	µg/kg	32	29	[NA]	[NA]
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	25	27	[NA]	[NA]
Dibenz(a,h)anthracene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Benzo(g,h,i)perylene	04-022	µg/kg	26	25	[NA]	[NA]
Coronene	04-022	µg/kg	<10	<10	[NA]	[NA]
Benzo(e)pyrene	04-022	µg/kg	28	24	[NA]	[NA]
Perylene	04-022	µg/kg	170	180	[NA]	[NA]
Total PAHs (as above)	04-022	µg/kg	530	530	[NA]	[NA]
Surrogate 1 Recovery	04-022	%	87	85	[NA]	[NA]
Surrogate 2 Recovery	04-022	%	96	93	[NA]	[NA]
Surrogate 3 Recovery	04-022	%	101	99	[NA]	[NA]
Date Extracted	04-022	-	29/10/2013	29/10/2013	[NA]	[NA]
Date Analysed	04-022	-	1/11/2013	1/11/2013	[NA]	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/17** **10-6** **22/10/2024**	**/18** **10-6B** **22/10/2025**	**/19** **10-8** **22/10/2026**	**/20** **11-9A** **21/10/2013**
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDE	04-024	µg/kg	4.0	4.0	8.0	7.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	104	101	98	97
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	1/11/2013	1/11/2013	1/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Di-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Tri-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Tetra-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Penta-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Hexa-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/17** **10-6** **22/10/2024**	**/18** **10-6B** **22/10/2025**	**/19** **10-8** **22/10/2026**	**/20** **11-9A** **21/10/2013**
Hepta-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Octa-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Nona-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Deca-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Total PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Surrogate 1 Recovery	04-029	%	97	96	[NA]	[NA]
Surrogate 2 Recovery	04-029	%	100	101	[NA]	[NA]
Date Extracted	04-029	-	29/10/2013	29/10/2013	[NA]	[NA]
Date Analysed	04-029	-	1/11/2013	1/11/2013	[NA]	[NA]
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<0.50	<1.0	<1.0
Dibutyl tin	04-026	µgSn/kg	<0.50	<0.50	<1.0	<1.0
Tributyl tin	04-026	µgSn/kg	<0.50	0.70	<1.0	<1.0
Surrogate 1 Recovery	04-026	%	85	85	91	83
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	890	890	1,420	1,420
Total Kjeldahl Nitrogen	SUB	mg/kg	890	890	1,420	1,420
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.2	1.1	1.5	1.6
Chromium Reducible Suite	SUB		See Comments	See Comments	[NA]	[NA]
Particle Size Distribution	SUB		See Comments	[NA]	See Comments	See Comments

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/21	/22	/23	/24
Client Reference:	-	-	11-9B	11-9C	11-8	11-5
Date Sampled:	-	-	21/10/2013	21/10/2013	21/10/2013	22/10/2013
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	64.6	65.4	60.9	64.7
Trace Elements						
Aluminium	04-001	mg/kg	31,000	31,000	27,000	32,000
Arsenic	04-001	mg/kg	7.6	7.6	7.7	7.7
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	49	49	45	48
Copper	04-001	mg/kg	31	31	29	30
Iron	04-001	mg/kg	53,000	49,000	44,000	48,000
Lead	04-001	mg/kg	12	12	13	12
Mercury	04-002	mg/kg	0.07	0.09	0.10	0.11
Nickel	04-001	mg/kg	38	38	34	38
Phosphorus*	04-001	mg/kg	950	950	910	920
Silver	04-001	mg/kg	0.14	0.13	0.14	0.13
Zinc	04-001	mg/kg	96	96	93	94
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<20.0	<20.0	<20.0	<20.0
TPH C10-14	04-020	mg/kg	<20	<20	<20	<20
TPH C15-28	04-020	mg/kg	<100	<100	<100	<100
TPH C29-36	04-020	mg/kg	<100	<100	<100	<100
Surrogate Recovery	04-020	%	90	100	91	92
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	[NA]	[NA]	9.0	[NA]
1-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
2-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Acenaphthylene	04-022	µg/kg	[NA]	[NA]	<15	[NA]
Acenaphthene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Fluorene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Phenanthrene	04-022	µg/kg	[NA]	[NA]	34	[NA]
Anthracene	04-022	µg/kg	[NA]	[NA]	10	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	- - - **Method**	- - - **Units**	**/21** **11-9B** **21/10/2013**	**/22** **11-9C** **21/10/2013**	**/23** **11-8** **21/10/2013**	**/24** **11-5** **22/10/2013**
Fluoranthene	04-022	µg/kg	[NA]	[NA]	110	[NA]
Pyrene	04-022	µg/kg	[NA]	[NA]	110	[NA]
Benz(a)anthracene	04-022	µg/kg	[NA]	[NA]	50	[NA]
Chrysene	04-022	µg/kg	[NA]	[NA]	52	[NA]
Benzo(b)&(k)fluoranthene	04-022	µg/kg	[NA]	[NA]	110	[NA]
Benzo(a)pyrene	04-022	µg/kg	[NA]	[NA]	69	[NA]
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	[NA]	[NA]	52	[NA]
Dibenz(a,h)anthracene	04-022	µg/kg	[NA]	[NA]	9.0	[NA]
Benzo(g,h,i)perylene	04-022	µg/kg	[NA]	[NA]	49	[NA]
Coronene	04-022	µg/kg	[NA]	[NA]	<10	[NA]
Benzo(e)pyrene	04-022	µg/kg	[NA]	[NA]	50	[NA]
Perylene	04-022	µg/kg	[NA]	[NA]	100	[NA]
Total PAHs (as above)	04-022	µg/kg	[NA]	[NA]	820	[NA]
Surrogate 1 Recovery	04-022	%	[NA]	[NA]	73	[NA]
Surrogate 2 Recovery	04-022	%	[NA]	[NA]	91	[NA]
Surrogate 3 Recovery	04-022	%	[NA]	[NA]	97	[NA]
Date Extracted	04-022	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-022	-	[NA]	[NA]	2/11/2013	[NA]
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDE	04-024	µg/kg	7.0	8.0	7.0	7.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/21** **11-9B** **21/10/2013**	**/22** **11-9C** **21/10/2013**	**/23** **11-8** **21/10/2013**	**/24** **11-5** **22/10/2013**
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	100	97	98	99
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	1/11/2013	2/11/2013	2/11/2013	2/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Di-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tri-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tetra-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Penta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Hexa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Hepta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Octa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Nona-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Deca-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Total PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Surrogate 1 Recovery	04-029	%	[NA]	[NA]	92	[NA]
Surrogate 2 Recovery	04-029	%	[NA]	[NA]	96	[NA]
Date Extracted	04-029	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-029	-	[NA]	[NA]	2/11/2013	[NA]
Organotins						
Monobutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Dibutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Tributyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<1.0
Surrogate 1 Recovery	04-026	%	88	88	92	88
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	**/21**	**/22**	**/23**	**/24**
Client Reference:	-	-	**11-9B**	**11-9C**	**11-8**	**11-5**
Date Sampled:	-	-	**21/10/2013**	**21/10/2013**	**21/10/2013**	**22/10/2013**
Analysis Description	**Method**	**Units**				
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,400	1,460	1,390	1,390
Total Kjeldahl Nitrogen	SUB	mg/kg	1,400	1,460	1,390	1,390
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.5	1.6	1.7	1.5
Chromium Reducible Suite	SUB		[NA]	[NA]	See Comments	[NA]
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Laboratory Reference:	-	-	**/25**	**/26**	**/27**	**/28**
Client Reference:	-	-	**12-1**	**12-2**	**15-1**	**15-2**
Date Sampled:	-	-	**22/10/2013**	**22/10/2013**	**22/10/2013**	**22/10/2013**
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	61.9	64.1	64.3	50.5
Trace Elements						
Aluminium	04-001	mg/kg	28,000	29,000	28,000	20,000
Arsenic	04-001	mg/kg	5.6	6.1	7.6	7.1
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	43	44	45	36
Copper	04-001	mg/kg	27	28	27	23
Iron	04-001	mg/kg	43,000	45,000	45,000	34,000
Lead	04-001	mg/kg	10	11	11	13
Mercury	04-002	mg/kg	0.07	0.07	0.06	0.08
Nickel	04-001	mg/kg	35	36	35	25
Phosphorus*	04-001	mg/kg	860	920	850	710
Silver	04-001	mg/kg	0.10	0.10	0.11	0.11
Zinc	04-001	mg/kg	82	85	84	75
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<20.0	<20.0	<20.0	<10

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/25** **12-1** **22/10/2013**	**/26** **12-2** **22/10/2013**	**/27** **15-1** **22/10/2013**	**/28** **15-2** **22/10/2013**
TPH C10-14	04-020	mg/kg	<20	<20	<20	<10
TPH C15-28	04-020	mg/kg	<100	<100	<100	<50
TPH C29-36	04-020	mg/kg	<100	<100	<100	<50
Surrogate Recovery	04-020	%	94	99	104	100
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	6.0	[NA]	[NA]	9.0
1-Methylnaphthalene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
2-Methylnaphthalene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
Acenaphthylene	04-022	µg/kg	<5.0	[NA]	[NA]	<15
Acenaphthene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
Fluorene	04-022	µg/kg	<5.0	[NA]	[NA]	<5.0
Phenanthrene	04-022	µg/kg	11	[NA]	[NA]	17
Anthracene	04-022	µg/kg	<5.0	[NA]	[NA]	7.0
Fluoranthene	04-022	µg/kg	34	[NA]	[NA]	61
Pyrene	04-022	µg/kg	31	[NA]	[NA]	94
Benz(a)anthracene	04-022	µg/kg	14	[NA]	[NA]	30
Chrysene	04-022	µg/kg	16	[NA]	[NA]	35
Benzo(b)&(k)fluoranthene	04-022	µg/kg	38	[NA]	[NA]	100
Benzo(a)pyrene	04-022	µg/kg	19	[NA]	[NA]	55
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	18	[NA]	[NA]	43
Dibenz(a,h)anthracene	04-022	µg/kg	<5.0	[NA]	[NA]	8.0
Benzo(g,h,i)perylene	04-022	µg/kg	16	[NA]	[NA]	36
Coronene	04-022	µg/kg	<10	[NA]	[NA]	<10
Benzo(e)pyrene	04-022	µg/kg	17	[NA]	[NA]	43
Perylene	04-022	µg/kg	73	[NA]	[NA]	99
Total PAHs (as above)	04-022	µg/kg	290	[NA]	[NA]	640
Surrogate 1 Recovery	04-022	%	74	[NA]	[NA]	78
Surrogate 2 Recovery	04-022	%	89	[NA]	[NA]	93
Surrogate 3 Recovery	04-022	%	95	[NA]	[NA]	98
Date Extracted	04-022	-	29/10/2013	[NA]	[NA]	29/10/2013
Date Analysed	04-022	-	2/11/2013	[NA]	[NA]	2/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/25** **12-1** **22/10/2013**	**/26** **12-2** **22/10/2013**	**/27** **15-1** **22/10/2013**	**/28** **15-2** **22/10/2013**
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDE	04-024	µg/kg	8.0	7.0	7.0	5.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	95	98	101	100
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Di-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Tri-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Tetra-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Penta-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Hexa-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/25** **12-1** **22/10/2013**	**/26** **12-2** **22/10/2013**	**/27** **15-1** **22/10/2013**	**/28** **15-2** **22/10/2013**
Hepta-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Octa-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Nona-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Deca-PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Total PCB congeners	04-029	µg/kg	<5.0	[NA]	[NA]	<5.0
Surrogate 1 Recovery	04-029	%	91	[NA]	[NA]	97
Surrogate 2 Recovery	04-029	%	96	[NA]	[NA]	104
Date Extracted	04-029	-	29/10/2013	[NA]	[NA]	29/10/2013
Date Analysed	04-029	-	2/11/2013	[NA]	[NA]	2/11/2013
Organotins						
Monobutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<0.50
Dibutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	0.80
Tributyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<0.50
Surrogate 1 Recovery	04-026	%	95	86	94	96
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,340	1,270	1,360	730
Total Kjeldahl Nitrogen	SUB	mg/kg	1,340	1,270	1,360	730
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.6	1.4	1.5	1.0
Chromium Reducible Suite	SUB		See Comments	[NA]	[NA]	See Comments
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/29	/30	/31	/32
Client Reference:	-	-	15-3	13-1	13-4A	13-4B
Date Sampled:	-	-	22/10/2013	21/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	24.2	58.5	26.3	29.2
Trace Elements						
Aluminium	04-001	mg/kg	9,200	23,000	11,000	11,000
Arsenic	04-001	mg/kg	6.3	7.6	7.6	6.7
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	21	40	23	24
Copper	04-001	mg/kg	5.7	24	19	18
Iron	04-001	mg/kg	21,000	38,000	23,000	24,000
Lead	04-001	mg/kg	4.3	15	17	19
Mercury	04-002	mg/kg	0.02	0.09	0.03	0.03
Nickel	04-001	mg/kg	12	25	13	14
Phosphorus*	04-001	mg/kg	320	670	360	400
Silver	04-001	mg/kg	<0.1	0.13	<0.1	<0.1
Zinc	04-001	mg/kg	32	83	110	130
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<10	<10	<10
TPH C10-14	04-020	mg/kg	<10	<10	<10	<10
TPH C15-28	04-020	mg/kg	<50	<50	<50	<50
TPH C29-36	04-020	mg/kg	<50	<50	<50	<50
Surrogate Recovery	04-020	%	110	95	107	111
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	<5.0	7.0	[NA]	[NA]
1-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
2-Methylnaphthalene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Acenaphthylene	04-022	µg/kg	<5.0	<15	[NA]	[NA]
Acenaphthene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Fluorene	04-022	µg/kg	<5.0	<5.0	[NA]	[NA]
Phenanthrene	04-022	µg/kg	<5.0	23	[NA]	[NA]
Anthracene	04-022	µg/kg	<5.0	8.0	[NA]	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/29** **15-3** **22/10/2013**	**/30** **13-1** **21/10/2013**	**/31** **13-4A** **21/10/2013**	**/32** **13-4B** **21/10/2013**
Fluoranthene	04-022	µg/kg	<5.0	94	[NA]	[NA]
Pyrene	04-022	µg/kg	<5.0	82	[NA]	[NA]
Benz(a)anthracene	04-022	µg/kg	<5.0	38	[NA]	[NA]
Chrysene	04-022	µg/kg	<5.0	39	[NA]	[NA]
Benzo(b)&(k)fluoranthene	04-022	µg/kg	<10	90	[NA]	[NA]
Benzo(a)pyrene	04-022	µg/kg	<5.0	47	[NA]	[NA]
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	<5.0	42	[NA]	[NA]
Dibenz(a,h)anthracene	04-022	µg/kg	<5.0	7.0	[NA]	[NA]
Benzo(g,h,i)perylene	04-022	µg/kg	<5.0	43	[NA]	[NA]
Coronene	04-022	µg/kg	<10	<10	[NA]	[NA]
Benzo(e)pyrene	04-022	µg/kg	<5.0	37	[NA]	[NA]
Perylene	04-022	µg/kg	16	100	[NA]	[NA]
Total PAHs (as above)	04-022	µg/kg	<100	660	[NA]	[NA]
Surrogate 1 Recovery	04-022	%	64	65	[NA]	[NA]
Surrogate 2 Recovery	04-022	%	92	86	[NA]	[NA]
Surrogate 3 Recovery	04-022	%	98	93	[NA]	[NA]
Date Extracted	04-022	-	29/10/2013	29/10/2013	[NA]	[NA]
Date Analysed	04-022	-	2/11/2013	4/11/2013	[NA]	[NA]
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<1.0	<2	<1.0	<1.0
alpha-BHC	04-024	µg/kg	<1.0	<2	<1.0	<1.0
beta-BHC	04-024	µg/kg	<1.0	<2	<1.0	<1.0
gamma-BHC (Lindane)	04-024	µg/kg	<1.0	<2	<1.0	<1.0
delta-BHC	04-024	µg/kg	<1.0	<2	<1.0	<1.0
cis-Chlordane	04-024	µg/kg	<1.0	<2	<1.0	<1.0
trans-Chlordane	04-024	µg/kg	<1.0	<2	<1.0	<1.0
p,p'-DDD	04-024	µg/kg	<1.0	<2	<1.0	<1.0
p,p'-DDE	04-024	µg/kg	<1.0	4.0	<1.0	<1.0
p,p'-DDT	04-024	µg/kg	<1.0	<2	<1.0	<1.0
Dieldrin	04-024	µg/kg	<1.0	<2	<1.0	<1.0
alpha-Endosulfan	04-024	µg/kg	<5	<10	<5	<5
beta-Endosulfan	04-024	µg/kg	<5	<10	<5	<5
Endosulfan Sulphate	04-024	µg/kg	<1.0	<2	<1.0	<1.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/29** **15-3** **22/10/2013**	**/30** **13-1** **21/10/2013**	**/31** **13-4A** **21/10/2013**	**/32** **13-4B** **21/10/2013**
Endrin	04-024	µg/kg	<5	<10	<5	<5
Endrin ketone	04-024	µg/kg	<5	<10	<5	<5
Endrin aldehyde	04-024	µg/kg	<5	<10	<5	<5
Heptachlor	04-024	µg/kg	<1.0	<2	<1.0	<1.0
Heptachlor epoxide	04-024	µg/kg	<1.0	<2	<1.0	<1.0
Hexachlorobenzene	04-024	µg/kg	<1.0	<2	<1.0	<1.0
Methoxychlor	04-024	µg/kg	<10	<20	<10	<10
Oxychlordane*	04-024	µg/kg	<1.0	<2	<1.0	<1.0
Surrogate Recovery	04-024	%	101	91	99	100
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	2/11/2013	4/11/2013	4/11/2013	4/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Di-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Tri-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Tetra-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Penta-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Hexa-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Hepta-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Octa-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Nona-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Deca-PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Total PCB congeners	04-029	µg/kg	<5.0	<5.0	[NA]	[NA]
Surrogate 1 Recovery	04-029	%	93	85	[NA]	[NA]
Surrogate 2 Recovery	04-029	%	100	90	[NA]	[NA]
Date Extracted	04-029	-	29/10/2013	29/10/2013	[NA]	[NA]
Date Analysed	04-029	-	2/11/2013	4/11/2013	[NA]	[NA]
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<0.50	<0.50	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	0.50	<0.50	<0.50
Tributyl tin	04-026	µgSn/kg	<0.50	<0.50	<0.50	<0.50
Surrogate 1 Recovery	04-026	%	84	89	90	92
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/29	/30	/31	/32
Client Reference:	-	-	15-3	13-1	13-4A	13-4B
Date Sampled:	-	-	22/10/2013	21/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**				
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	270	1,170	380	380
Total Kjeldahl Nitrogen	SUB	mg/kg	270	1,170	380	380
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	0.27	1.5	0.41	0.53
Chromium Reducible Suite	SUB		See Comments	See Comments	[NA]	[NA]
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Laboratory Reference:	-	-	/33	/34	/35	/36
Client Reference:	-	-	13-4C	13-5	13-8	16-1
Date Sampled:	-	-	21/10/2013	21/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	33.7	54.8	50.4	59.8
Trace Elements						
Aluminium	04-001	mg/kg	14,000	25,000	20,000	27,000
Arsenic	04-001	mg/kg	7.7	7.5	6.8	7.2
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	27	45	35	47
Copper	04-001	mg/kg	21	33	16	31
Iron	04-001	mg/kg	26,000	42,000	32,000	44,000
Lead	04-001	mg/kg	27	20	10	14
Mercury	04-002	mg/kg	0.03	0.15	0.07	0.10
Nickel	04-001	mg/kg	15	30	20	34
Phosphorus*	04-001	mg/kg	400	820	580	880
Silver	04-001	mg/kg	<0.1	0.19	<0.1	0.13
Zinc	04-001	mg/kg	160	100	59	93
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<10	<10	<10

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/33** **13-4C** **21/10/2013**	**/34** **13-5** **21/10/2013**	**/35** **13-8** **21/10/2013**	**/36** **16-1** **21/10/2013**
TPH C10-14	04-020	mg/kg	<10	<10	<10	<10
TPH C15-28	04-020	mg/kg	<50	<50	<50	<50
TPH C29-36	04-020	mg/kg	<50	60	<50	52
Surrogate Recovery	04-020	%	98	86	93	97
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Naphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
1-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
2-Methylnaphthalene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Acenaphthylene	04-022	µg/kg	[NA]	[NA]	<15	[NA]
Acenaphthene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Fluorene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Phenanthrene	04-022	µg/kg	[NA]	[NA]	10	[NA]
Anthracene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Fluoranthene	04-022	µg/kg	[NA]	[NA]	30	[NA]
Pyrene	04-022	µg/kg	[NA]	[NA]	31	[NA]
Benz(a)anthracene	04-022	µg/kg	[NA]	[NA]	15	[NA]
Chrysene	04-022	µg/kg	[NA]	[NA]	16	[NA]
Benzo(b)&(k)fluoranthene	04-022	µg/kg	[NA]	[NA]	41	[NA]
Benzo(a)pyrene	04-022	µg/kg	[NA]	[NA]	20	[NA]
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	[NA]	[NA]	21	[NA]
Dibenz(a,h)anthracene	04-022	µg/kg	[NA]	[NA]	<5.0	[NA]
Benzo(g,h,i)perylene	04-022	µg/kg	[NA]	[NA]	21	[NA]
Coronene	04-022	µg/kg	[NA]	[NA]	<10	[NA]
Benzo(e)pyrene	04-022	µg/kg	[NA]	[NA]	17	[NA]
Perylene	04-022	µg/kg	[NA]	[NA]	46	[NA]
Total PAHs (as above)	04-022	µg/kg	[NA]	[NA]	270	[NA]
Surrogate 1 Recovery	04-022	%	[NA]	[NA]	70	[NA]
Surrogate 2 Recovery	04-022	%	[NA]	[NA]	89	[NA]
Surrogate 3 Recovery	04-022	%	[NA]	[NA]	94	[NA]
Date Extracted	04-022	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-022	-	[NA]	[NA]	4/11/2013	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/33** **13-4C** **21/10/2013**	**/34** **13-5** **21/10/2013**	**/35** **13-8** **21/10/2013**	**/36** **16-1** **21/10/2013**
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<1.0	<2	<2	<2
alpha-BHC	04-024	µg/kg	<1.0	<2	<2	<2
beta-BHC	04-024	µg/kg	<1.0	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<1.0	<2	<2	<2
delta-BHC	04-024	µg/kg	<1.0	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<1.0	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<1.0	<2	<2	<2
p,p'-DDD	04-024	µg/kg	<1.0	4.0	<2	<2
p,p'-DDE	04-024	µg/kg	<1.0	7.0	2.0	8.0
p,p'-DDT	04-024	µg/kg	<1.0	<2	<2	<2
Dieldrin	04-024	µg/kg	<1.0	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<5	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<5	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<1.0	<2	<2	<2
Endrin	04-024	µg/kg	<5	<10	<10	<10
Endrin ketone	04-024	µg/kg	<5	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<5	<10	<10	<10
Heptachlor	04-024	µg/kg	<1.0	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<1.0	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<1.0	<2	<2	<2
Methoxychlor	04-024	µg/kg	<10	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<1.0	<2	<2	<2
Surrogate Recovery	04-024	%	95	93	93	97
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Polychlorinated Biphenyls						
Mono-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Di-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tri-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Tetra-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Penta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Hexa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/33** **13-4C** **21/10/2013**	**/34** **13-5** **21/10/2013**	**/35** **13-8** **21/10/2013**	**/36** **16-1** **21/10/2013**
Hepta-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Octa-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Nona-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Deca-PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Total PCB congeners	04-029	µg/kg	[NA]	[NA]	<5.0	[NA]
Surrogate 1 Recovery	04-029	%	[NA]	[NA]	89	[NA]
Surrogate 2 Recovery	04-029	%	[NA]	[NA]	94	[NA]
Date Extracted	04-029	-	[NA]	[NA]	29/10/2013	[NA]
Date Analysed	04-029	-	[NA]	[NA]	4/11/2013	[NA]
Organotins						
Monobutyl tin	04-026	µgSn/kg	<0.50	<0.50	<0.50	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	1.6	<0.50	0.60
Tributyl tin	04-026	µgSn/kg	<0.50	0.70	<0.50	0.60
Surrogate 1 Recovery	04-026	%	95	85	74	76
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	470	1,230	820	1,320
Total Kjeldahl Nitrogen	SUB	mg/kg	470	1,230	820	1,320
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	0.70	1.7	0.92	1..7
Chromium Reducible Suite	SUB		[NA]	[NA]	See Comments	[NA]
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/37** **16-0** **21/10/2013**	**/38** **RF2** **21/10/2013**	**/39** **RF3** **21/10/2013**	**/40** **RF4** **21/10/2013**
Moisture Content						
Moisture Content	04-004	%	61.0	65.2	65.5	55.9
Trace Elements						
Aluminium	04-001	mg/kg	26,000	27,000	30,000	22,000
Arsenic	04-001	mg/kg	7.4	7.5	6.6	6.2
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	<0.1
Chromium	04-001	mg/kg	46	47	50	38
Copper	04-001	mg/kg	31	24	26	18
Iron	04-001	mg/kg	44,000	41,000	43,000	35,000
Lead	04-001	mg/kg	14	16	17	14
Mercury	04-002	mg/kg	0.10	0.09	0.09	0.15
Nickel	04-001	mg/kg	33	26	28	20
Phosphorus*	04-001	mg/kg	880	640	650	510
Silver	04-001	mg/kg	0.13	<0.1	0.10	<0.1
Zinc	04-001	mg/kg	93	85	88	65
BTEX						
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<20.0	<20.0	<20.0	<10
TPH C10-14	04-020	mg/kg	<20	<20	<20	<10
TPH C15-28	04-020	mg/kg	<100	<100	<100	<50
TPH C29-36	04-020	mg/kg	<100	<100	<100	<50
Surrogate Recovery	04-020	%	88	94	88	93
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-BHC	04-024	µg/kg	<2	<2	<2	<2
beta-BHC	04-024	µg/kg	<2	<2	<2	<2
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<2
delta-BHC	04-024	µg/kg	<2	<2	<2	<2
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<2
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/37** **16-0** **21/10/2013**	**/38** **RF2** **21/10/2013**	**/39** **RF3** **21/10/2013**	**/40** **RF4** **21/10/2013**
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<2
p,p'-DDE	04-024	µg/kg	7.0	3.0	4.0	2.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<2
Dieldrin	04-024	µg/kg	<2	<2	<2	<2
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<10
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<2
Endrin	04-024	µg/kg	<10	<10	<10	<10
Endrin ketone	04-024	µg/kg	<10	<10	<10	<10
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<10
Heptachlor	04-024	µg/kg	<2	<2	<2	<2
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<2
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<2
Methoxychlor	04-024	µg/kg	<20	<20	<20	<20
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<2
Surrogate Recovery	04-024	%	98	83	91	94
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Polychlorinated Biphenyls						
Organotins						
Monobutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<0.50
Dibutyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<0.50
Tributyl tin	04-026	µgSn/kg	<1.0	<1.0	<1.0	<0.50
Surrogate 1 Recovery	04-026	%	92	80	91	87
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	1,340	1,280	1,290	930
Total Kjeldahl Nitrogen	SUB	mg/kg	1,340	1,280	1,290	930
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	SUB	%	1.6	1.4	1.4	0.98
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	See Comments

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/41	/42	/43	/44
Client Reference:	-	-	RF6	RF7	13-9	Trip Blank 211013
Date Sampled:	-	-	21/10/2013	21/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**				
Moisture Content						
Moisture Content	04-004	%	55.1	63.7	61.4	7.40
Trace Elements						
Aluminium	04-001	mg/kg	21,000	31,000	23,000	[NA]
Arsenic	04-001	mg/kg	7.0	6.8	9.6	[NA]
Cadmium	04-001	mg/kg	<0.1	<0.1	<0.1	[NA]
Chromium	04-001	mg/kg	40	50	36	[NA]
Copper	04-001	mg/kg	19	34	15	[NA]
Iron	04-001	mg/kg	36,000	46,000	35,000	[NA]
Lead	04-001	mg/kg	13	18	10	[NA]
Mercury	04-002	mg/kg	0.08	0.11	0.07	[NA]
Nickel	04-001	mg/kg	23	35	19	[NA]
Phosphorus*	04-001	mg/kg	590	770	520	[NA]
Silver	04-001	mg/kg	<0.1	0.17	<0.1	[NA]
Zinc	04-001	mg/kg	71	100	55	[NA]
BTEX						
Benzene	04-021	mg/kg	[NA]	[NA]	[NA]	<0.20
Toluene	04-021	mg/kg	[NA]	[NA]	[NA]	<0.20
Ethyl Benzene	04-021	mg/kg	[NA]	[NA]	[NA]	<0.20
m+p xylenes	04-021	mg/kg	[NA]	[NA]	[NA]	<0.40
o-xylene	04-021	mg/kg	[NA]	[NA]	[NA]	<0.20
Total BTEX	04-021	mg/kg	[NA]	[NA]	[NA]	<1.2
Surrogate 1 Recovery	04-021	%	[NA]	[NA]	[NA]	107
Surrogate 2 Recovery	04-021	%	[NA]	[NA]	[NA]	87
Surrogate 3 Recovery	04-021	%	[NA]	[NA]	[NA]	84
Date Extracted	04-021	-	[NA]	[NA]	[NA]	28/10/2013
Date Analysed	04-021	-	[NA]	[NA]	[NA]	4/11/2013
Total Petroleum Hydrocarbons						
TPH C6-C9	04-021	mg/kg	<10	<20.0	<20.0	<10
TPH C10-14	04-020	mg/kg	<10	<20	<20	[NA]
TPH C15-28	04-020	mg/kg	<50	<100	<100	[NA]
TPH C29-36	04-020	mg/kg	<50	<100	<100	[NA]

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	**/41**	**/42**	**/43**	**/44**
Client Reference:	-	-	**RF6**	**RF7**	**13-9**	**Trip Blank 211013**
Date Sampled:	-	-	**21/10/2013**	**21/10/2013**	**21/10/2013**	**21/10/2013**
Analysis Description	**Method**	**Units**				
Surrogate Recovery	04-020	%	94	97	93	68
Date Extracted	04-020	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons						
Organochlorine Pesticides						
Aldrin	04-024	µg/kg	<2	<2	<2	<1.0
alpha-BHC	04-024	µg/kg	<2	<2	<2	<1.0
beta-BHC	04-024	µg/kg	<2	<2	<2	<1.0
gamma-BHC (Lindane)	04-024	µg/kg	<2	<2	<2	<1.0
delta-BHC	04-024	µg/kg	<2	<2	<2	<1.0
cis-Chlordane	04-024	µg/kg	<2	<2	<2	<1.0
trans-Chlordane	04-024	µg/kg	<2	<2	<2	<1.0
p,p'-DDD	04-024	µg/kg	<2	<2	<2	<1.0
p,p'-DDE	04-024	µg/kg	4.0	12	<2	<1.0
p,p'-DDT	04-024	µg/kg	<2	<2	<2	<1.0
Dieldrin	04-024	µg/kg	<2	<2	<2	<1.0
alpha-Endosulfan	04-024	µg/kg	<10	<10	<10	<5
beta-Endosulfan	04-024	µg/kg	<10	<10	<10	<5
Endosulfan Sulphate	04-024	µg/kg	<2	<2	<2	<1.0
Endrin	04-024	µg/kg	<10	<10	<10	<5
Endrin ketone	04-024	µg/kg	<10	<10	<10	<5
Endrin aldehyde	04-024	µg/kg	<10	<10	<10	<5
Heptachlor	04-024	µg/kg	<2	<2	<2	<1.0
Heptachlor epoxide	04-024	µg/kg	<2	<2	<2	<1.0
Hexachlorobenzene	04-024	µg/kg	<2	<2	<2	<1.0
Methoxychlor	04-024	µg/kg	<20	<20	<20	<10
Oxychlordane*	04-024	µg/kg	<2	<2	<2	<1.0
Surrogate Recovery	04-024	%	98	98	98	65
Date Extracted	04-024	-	29/10/2013	29/10/2013	29/10/2013	29/10/2013
Date Analysed	04-024	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Polychlorinated Biphenyls						
Organotins						

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference:	-	-	/41	/42	/43	/44
Client Reference:	-	-	RF6	RF7	13-9	Trip Blank 211013
Date Sampled:	-	-	21/10/2013	21/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**				
Monobutyl tin	04-026	µgSn/kg	<0.50	<1.0	<1.0	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	1.2	<1.0	<0.50
Tributyl tin	04-026	µgSn/kg	<0.50	<1.0	<1.0	<0.50
Surrogate 1 Recovery	04-026	%	79	84	66	100
Date Extracted	04-026	-	4/11/2013	4/11/2013	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Subcontract Analysis						
Total Nitrogen	SUB	mg/kg	880	1,280	1,060	[NA]
Total Kjeldahl Nitrogen	SUB	mg/kg	880	1,280	1,060	[NA]
Nitrate as N	SUB	mg/kg	<0.1	<0.1	<0.1	[NA]
Nitrite as N	SUB	mg/kg	<0.1	<0.1	<0.1	[NA]
Total Organic Carbon	SUB	%	0.99	1.6	1.2	[NA]
Particle Size Distribution	SUB		See Comments	See Comments	See Comments	[NA]

Laboratory Reference:	-	-	/45	/46
Client Reference:	-	-	Trip Blank 221013	Trip Blank 231013
Date Sampled:	-	-	22/10/2013	23/10/2013
Analysis Description	**Method**	**Units**		
Moisture Content				
Moisture Content	04-004	%	16.2	0.1
Trace Elements				
BTEX				
Benzene	04-021	mg/kg	<0.20	<0.20
Toluene	04-021	mg/kg	<0.20	<0.20
Ethyl Benzene	04-021	mg/kg	<0.20	<0.20
m+p xylenes	04-021	mg/kg	<0.40	<0.40
o-xylene	04-021	mg/kg	<0.20	<0.20
Total BTEX	04-021	mg/kg	<1.2	<1.2
Surrogate 1 Recovery	04-021	%	119	109
Surrogate 2 Recovery	04-021	%	97	92

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/45** **Trip Blank** **221013** **22/10/2013**	**/46** **Trip Blank** **231013** **23/10/2013**
Surrogate 3 Recovery	04-021	%	93	87
Date Extracted	04-021	-	28/10/2013	28/10/2013
Date Analysed	04-021	-	4/11/2013	4/11/2013
Total Petroleum Hydrocarbons				
TPH C6-C9	04-021	mg/kg	<10	<10
Surrogate Recovery	04-020	%	102	108
Date Extracted	04-020	-	29/10/2013	29/10/2013
Date Analysed	04-020	-	2/11/2013	2/11/2013
Poly Aromatic Hydrocarbons				
Organochlorine Pesticides				
Aldrin	04-024	µg/kg	<1.0	<1.0
alpha-BHC	04-024	µg/kg	<1.0	<1.0
beta-BHC	04-024	µg/kg	<1.0	<1.0
gamma-BHC (Lindane)	04-024	µg/kg	<1.0	<1.0
delta-BHC	04-024	µg/kg	<1.0	<1.0
cis-Chlordane	04-024	µg/kg	<1.0	<1.0
trans-Chlordane	04-024	µg/kg	<1.0	<1.0
p,p'-DDD	04-024	µg/kg	<1.0	<1.0
p,p'-DDE	04-024	µg/kg	<1.0	<1.0
p,p'-DDT	04-024	µg/kg	<1.0	<1.0
Dieldrin	04-024	µg/kg	<1.0	<1.0
alpha-Endosulfan	04-024	µg/kg	<5	<5
beta-Endosulfan	04-024	µg/kg	<5	<5
Endosulfan Sulphate	04-024	µg/kg	<1.0	<1.0
Endrin	04-024	µg/kg	<5	<5
Endrin ketone	04-024	µg/kg	<5	<5
Endrin aldehyde	04-024	µg/kg	<5	<5
Heptachlor	04-024	µg/kg	<1.0	<1.0
Heptachlor epoxide	04-024	µg/kg	<1.0	<1.0
Hexachlorobenzene	04-024	µg/kg	<1.0	<1.0
Methoxychlor	04-024	µg/kg	<10	<10
Oxychlordane*	04-024	µg/kg	<1.0	<1.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/45** **Trip Blank** **221013** **22/10/2013**	**/46** **Trip Blank** **231013** **23/10/2013**
Surrogate Recovery	04-024	%	100	94
Date Extracted	04-024	-	29/10/2013	29/10/2013
Date Analysed	04-024	-	4/11/2013	4/11/2013
Polychlorinated Biphenyls				
Organotins				
Monobutyl tin	04-026	µgSn/kg	<0.50	<0.50
Dibutyl tin	04-026	µgSn/kg	<0.50	<0.50
Tributyl tin	04-026	µgSn/kg	<0.50	<0.50
Surrogate 1 Recovery	04-026	%	112	88
Date Extracted	04-026	-	4/11/2013	4/11/2013
Date Analysed	04-026	-	5/11/2013	5/11/2013
Subcontract Analysis				

Method	Method Description
04-004	Moisture by gravimetric, %
04-001	Metals by ICP-OES, mg/kg
04-002	Mercury by CVAAS, mg/kg
04-021	TRH C6-9 & BTEX by P&T GCMS, mg/kg
04-020	TRH by GC-FID, mg/kg
04-022	PAHs & Phenols by GCMS
04-024	OC & OP Pesticides by GCMS
04-029	PCBS (as congeners) by GCMS, µg/kg
04-026	Organotins by GCMS, µgSn/kg
SUB	Subcontracted Analyses

Result Comments
[<] Less than
[INS] Insufficient sample for this test
[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.
Solid sample results are reported on a dry weight basis.
MBT spike recovery is biased low due to matrix effect.
Selected organic LORs raised due to high moisture content in selected samples.
Selected organochlorine pesticide LORs raised due to matrix interferences.
Analysis was subcontracted to Sydney Analytical Laboratories (NATA Number 1884); reference SAL report number SAL24842
CRS analysis was subcontracted to Envirolab Services (NATA Number 2901); see attached report.
PSD was subcontracted to Microanalysis see attached report.
This report supersedes Report A13/5156-[R00].pdf. - Al, Fe and Ag added to report.

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aluminium	mg/kg	<5	A13/5156-A-1	3200 || 3000 || RPD: 6	A13/5156-A-1	107%
Arsenic	mg/kg	<0.4	A13/5156-A-1	1.8 || 1.7 || RPD: 6	A13/5156-A-1	101%
Cadmium	mg/kg	<0.1	A13/5156-A-1	<0.1 || <0.1	A13/5156-A-1	99%
Chromium	mg/kg	<0.1	A13/5156-A-1	9.1 || 8.9 || RPD: 2	A13/5156-A-1	97%
Copper	mg/kg	<0.1	A13/5156-A-1	3.4 || 3.2 || RPD: 6	A13/5156-A-1	100%
Iron	mg/kg	<5	A13/5156-A-1	10000 || 9800 || RPD: 2	A13/5156-A-1	104%
Lead	mg/kg	<0.5	A13/5156-A-1	36 || 41 || RPD: 13	A13/5156-A-1	99%
Mercury	mg/kg	<0.01	A13/5156-A-1	0.01 || 0.01 || RPD: 0	A13/5156-A-1	100%
Nickel	mg/kg	<0.1	A13/5156-A-1	6.7 || 6.7 || RPD: 0	A13/5156-A-1	94%
Phosphorus*	mg/kg	<1	A13/5156-A-1	210 || 190 || RPD: 10	A13/5156-A-1	96%
Silver	mg/kg	<0.1	A13/5156-A-1	<0.1 || <0.1	A13/5156-A-1	98%
Zinc	mg/kg	<0.5	A13/5156-A-1	43 || 43 || RPD: 0	A13/5156-A-1	85%

TEST	UNITS	Blank
Benzene	mg/kg	<0.20
Toluene	mg/kg	<0.20
Ethyl Benzene	mg/kg	<0.20
m+p xylenes	mg/kg	<0.40
o-xylene	mg/kg	<0.20
Total BTEX	mg/kg	<1.2
Surrogate 1 Recovery	%	99
Surrogate 2 Recovery	%	78
Surrogate 3 Recovery	%	81

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
TPH C6-C9	mg/kg	<10	A13/5156-A-1	<10 || <10	A13/5156-A-1	88%
TPH C10-14	mg/kg	<10	A13/5156-A-1	<10 || <10	A13/5156-A-1	107%
TPH C15-28	mg/kg	<50	A13/5156-A-1	<50 || <50	A13/5156-A-1	111%
TPH C29-36	mg/kg	<50	A13/5156-A-1	<50 || <50	A13/5156-A-1	112%
Surrogate Recovery	%	111	A13/5156-A-1	99 || 107 || RPD: 8	A13/5156-A-1	110%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Naphthalene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	79%
1-Methylnaphthalene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	109%
2-Methylnaphthalene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	112%
Acenaphthylene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	113%
Acenaphthene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	112%
Fluorene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	115%
Phenanthrene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	99%
Anthracene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	112%
Fluoranthene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	127%
Pyrene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	118%
Benz(a)anthracene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	109%
Chrysene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	119%
Benzo(b)&(k)fluoranthene	µg/kg	<10	[NT]	[NT]	A13/5156-A-12	107%
Benzo(a)pyrene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	106%
Indeno(1,2,3-cd)pyrene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	103%
Dibenz(a,h)anthracene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	102%
Benzo(g,h,i)perylene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	98%
Coronene	µg/kg	<10	[NT]	[NT]	A13/5156-A-12	112%
Benzo(e)pyrene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	108%
Perylene	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	114%
Total PAHs (as above)	µg/kg	<100	[NT]	[NT]	A13/5156-A-12	[NA]
Surrogate 1 Recovery	%	87	[NT]	[NT]	A13/5156-A-12	82%
Surrogate 2 Recovery	%	97	[NT]	[NT]	A13/5156-A-12	98%
Surrogate 3 Recovery	%	97	[NT]	[NT]	A13/5156-A-12	100%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aldrin	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	104%
alpha-BHC	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	110%
beta-BHC	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	128%
gamma-BHC (Lindane)	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	121%
delta-BHC	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	141%
cis-Chlordane	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	117%
trans-Chlordane	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	121%
p,p'-DDD	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	115%
p,p'-DDE	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	121%
p,p'-DDT	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	106%
Dieldrin	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	123%
alpha-Endosulfan	µg/kg	<1.0	A13/5156-A-1	<5‖<5	A13/5156-A-12	116%
beta-Endosulfan	µg/kg	<1.0	A13/5156-A-1	<5‖<5	A13/5156-A-12	117%
Endosulfan Sulphate	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	120%
Endrin	µg/kg	<1.0	A13/5156-A-1	<1.0‖<5	A13/5156-A-12	121%
Endrin ketone	µg/kg	<1.0	A13/5156-A-1	<5‖<5	A13/5156-A-12	113%
Endrin aldehyde	µg/kg	<1.0	A13/5156-A-1	<1.0‖<5	A13/5156-A-12	98%
Heptachlor	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	116%
Heptachlor epoxide	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	122%
Hexachlorobenzene	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	113%
Methoxychlor	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	95%
Oxychlordane*	µg/kg	<1.0	A13/5156-A-1	<1.0‖<1.0	A13/5156-A-12	123%
Surrogate Recovery	%	94	A13/5156-A-1	92‖93‖RPD: 1	A13/5156-A-12	99%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Mono-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	103%
Di-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	113%
Tri-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	120%
Tetra-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	117%
Penta-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	108%
Hexa-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	108%
Hepta-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	108%
Octa-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	114%
Nona-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	99%
Deca-PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	101%
Total PCB congeners	µg/kg	<5.0	[NT]	[NT]	A13/5156-A-12	109%
Surrogate 1 Recovery	%	93	[NT]	[NT]	A13/5156-A-12	97%
Surrogate 2 Recovery	%	98	[NT]	[NT]	A13/5156-A-12	100%

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Monobutyl tin	µgSn/kg	<0.50	A13/5156-A-1	<0.50‖<0.50	A13/5156-A-1	110%
Dibutyl tin	µgSn/kg	<0.50	A13/5156-A-1	<0.50‖<0.50	A13/5156-A-1	81%
Tributyl tin	µgSn/kg	<0.50	A13/5156-A-1	<0.50‖<0.50	A13/5156-A-1	106%
Surrogate 1 Recovery	%	96	A13/5156-A-1	108‖102‖RPD: 6	A13/5156-A-1	98%

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results
Total Nitrogen	mg/kg	<20	A13/5156-A-10	1480‖1460‖RPD: 1
Total Organic Carbon	%	<0.01	A13/5156-A-10	1.7‖1.7‖RPD: 0

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aluminium	mg/kg	<5	A13/5156-A-11	31000‖31000‖RPD: 0	A13/5156-A-21	100%
Arsenic	mg/kg	<0.4	A13/5156-A-11	5.9‖6.2‖RPD: 5	A13/5156-A-21	98%
Cadmium	mg/kg	<0.1	A13/5156-A-11	<0.1‖<0.1	A13/5156-A-21	104%
Chromium	mg/kg	<0.1	A13/5156-A-11	51‖51‖RPD: 0	A13/5156-A-21	94%
Copper	mg/kg	<0.1	A13/5156-A-11	39‖39‖RPD: 0	A13/5156-A-21	100%
Iron	mg/kg	<5	A13/5156-A-11	51000‖52000‖RPD: 2	A13/5156-A-21	86%
Lead	mg/kg	<0.5	A13/5156-A-11	11‖11‖RPD: 0	A13/5156-A-21	82%
Mercury	mg/kg	<0.01	A13/5156-A-11	0.07‖0.07‖RPD: 0	A13/5156-A-21	92%
Nickel	mg/kg	<0.1	A13/5156-A-11	46‖46‖RPD: 0	A13/5156-A-21	87%
Phosphorus*	mg/kg	<1	A13/5156-A-11	1200‖1100‖RPD: 9	A13/5156-A-21	108%
Silver	mg/kg	<0.1	A13/5156-A-11	0.13‖0.14‖RPD: 7	A13/5156-A-21	104%
Zinc	mg/kg	<0.5	A13/5156-A-11	110‖100‖RPD: 10	A13/5156-A-21	87%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]

Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
TPH C6-C9	mg/kg	<10	A13/5156-A-12	<20.0 || [NT]	A13/5156-A-21	76%
TPH C10-14	mg/kg	<10	A13/5156-A-12	<20 || <20	A13/5156-A-21	112%
TPH C15-28	mg/kg	<50	A13/5156-A-12	<100 || <100	A13/5156-A-21	112%
TPH C29-36	mg/kg	<50	A13/5156-A-12	<100 || <100	A13/5156-A-21	108%
Surrogate Recovery	%	120	A13/5156-A-12	97 || 92 || RPD: 5	A13/5156-A-21	96%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Naphthalene	µg/kg	<5.0	A13/5156-A-12	6.0 || 7.0 || RPD: 15
1-Methylnaphthalene	µg/kg	<5.0	A13/5156-A-12	<5.0 || <5.0
2-Methylnaphthalene	µg/kg	<5.0	A13/5156-A-12	<5.0 || <5.0
Acenaphthylene	µg/kg	<5.0	A13/5156-A-12	<15 || <15
Acenaphthene	µg/kg	<5.0	A13/5156-A-12	5.0 || 6.0 || RPD: 18
Fluorene	µg/kg	<5.0	A13/5156-A-12	5.0 || 5.0 || RPD: 0
Phenanthrene	µg/kg	<5.0	A13/5156-A-12	14 || 12 || RPD: 15
Anthracene	µg/kg	<5.0	A13/5156-A-12	6.0 || <5.0
Fluoranthene	µg/kg	<5.0	A13/5156-A-12	58 || 38 || RPD: 42
Pyrene	µg/kg	<5.0	A13/5156-A-12	54 || 37 || RPD: 37
Benz(a)anthracene	µg/kg	<5.0	A13/5156-A-12	22 || 17 || RPD: 26
Chrysene	µg/kg	<5.0	A13/5156-A-12	24 || 19 || RPD: 23
Benzo(b)&(k)fluoranthene	µg/kg	<10	A13/5156-A-12	57 || 49 || RPD: 15
Benzo(a)pyrene	µg/kg	<5.0	A13/5156-A-12	31 || 23 || RPD: 30
Indeno(1,2,3-cd)pyrene	µg/kg	<5.0	A13/5156-A-12	27 || 22 || RPD: 20
Dibenz(a,h)anthracene	µg/kg	<5.0	A13/5156-A-12	<5.0 || <5.0
Benzo(g,h,i)perylene	µg/kg	<5.0	A13/5156-A-12	23 || 21 || RPD: 9
Coronene	µg/kg	<10	A13/5156-A-12	<10 || <10
Benzo(e)pyrene	µg/kg	<5.0	A13/5156-A-12	26 || 22 || RPD: 17
Perylene	µg/kg	<5.0	A13/5156-A-12	95 || 88 || RPD: 8
Total PAHs (as above)	µg/kg	<100	A13/5156-A-12	450 || 370 || RPD: 20
Surrogate 1 Recovery	%	72	A13/5156-A-12	79 || 87 || RPD: 10
Surrogate 2 Recovery	%	93	A13/5156-A-12	89 || 93 || RPD: 4
Surrogate 3 Recovery	%	103	A13/5156-A-12	96 || 94 || RPD: 2

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aldrin	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	104%
alpha-BHC	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	106%
beta-BHC	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	116%
gamma-BHC (Lindane)	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	110%
delta-BHC	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	119%
cis-Chlordane	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	105%
trans-Chlordane	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	108%
p,p'-DDD	µg/kg	<1.0	A13/5156-A-12	4.0 || 4.0 || RPD: 0	A13/5156-A-21	114%
p,p'-DDE	µg/kg	<1.0	A13/5156-A-12	9.0 || 7.0 || RPD: 25	A13/5156-A-21	108%
p,p'-DDT	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	86%
Dieldrin	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	112%
alpha-Endosulfan	µg/kg	<1.0	A13/5156-A-12	<10 || <10	A13/5156-A-21	104%
beta-Endosulfan	µg/kg	<1.0	A13/5156-A-12	<10 || <10	A13/5156-A-21	115%
Endosulfan Sulphate	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	114%
Endrin	µg/kg	<1.0	A13/5156-A-12	<10 || <10	A13/5156-A-21	108%
Endrin ketone	µg/kg	<1.0	A13/5156-A-12	<10 || <10	A13/5156-A-21	102%
Endrin aldehyde	µg/kg	<1.0	A13/5156-A-12	<10 || <10	A13/5156-A-21	95%
Heptachlor	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	98%
Heptachlor epoxide	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	107%
Hexachlorobenzene	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	105%
Methoxychlor	µg/kg	<1.0	A13/5156-A-12	<20 || <20	A13/5156-A-21	81%
Oxychlordane*	µg/kg	<1.0	A13/5156-A-12	<2 || <2	A13/5156-A-21	112%
Surrogate Recovery	%	97	A13/5156-A-12	96 || 95 || RPD: 1	A13/5156-A-21	93%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Mono-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Di-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Tri-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Tetra-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Penta-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Hexa-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Hepta-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Octa-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Nona-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Deca-PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Total PCB congeners	µg/kg	<5.0	A13/5156-A-12	<5.0‖<5.0
Surrogate 1 Recovery	%	98	A13/5156-A-12	90‖94‖RPD:4
Surrogate 2 Recovery	%	100	A13/5156-A-12	96‖99‖RPD:3

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Monobutyl tin	µgSn/kg	<0.50	A13/5156-A-11	<1.0‖<1.0	A13/5156-A-21	#
Dibutyl tin	µgSn/kg	<0.50	A13/5156-A-11	<1.0‖<1.0	A13/5156-A-21	83%
Tributyl tin	µgSn/kg	<0.50	A13/5156-A-11	<1.0‖<1.0	A13/5156-A-21	95%
Surrogate 1 Recovery	%	112	A13/5156-A-11	89‖75‖RPD:17	A13/5156-A-21	95%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Total Nitrogen	mg/kg	<20	A13/5156-A-20	1420‖1440‖RPD:1
Total Organic Carbon	%	<0.01	A13/5156-A-20	1.6‖1.5‖RPD:6

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aluminium	mg/kg	<5	A13/5156-A-21	31000‖31000‖RPD:0	A13/5156-A-41	76%
Arsenic	mg/kg	<0.4	A13/5156-A-21	7.6‖7.6‖RPD:0	A13/5156-A-41	98%
Cadmium	mg/kg	<0.1	A13/5156-A-21	<0.1‖<0.1	A13/5156-A-41	103%
Chromium	mg/kg	<0.1	A13/5156-A-21	49‖49‖RPD:0	A13/5156-A-41	94%
Copper	mg/kg	<0.1	A13/5156-A-21	31‖31‖RPD:0	A13/5156-A-41	103%
Iron	mg/kg	<5	A13/5156-A-21	53000‖50000‖RPD:6	A13/5156-A-41	88%
Lead	mg/kg	<0.5	A13/5156-A-21	12‖12‖RPD:0	A13/5156-A-41	82%
Mercury	mg/kg	NT	A13/5156-A-21	0.07‖0.07‖RPD:0	A13/5156-A-41	101%
Nickel	mg/kg	<0.1	A13/5156-A-21	38‖38‖RPD:0	A13/5156-A-41	86%
Phosphorus*	mg/kg	<1	A13/5156-A-21	950‖950‖RPD:0	A13/5156-A-41	100%
Silver	mg/kg	<0.1	A13/5156-A-21	0.14‖0.14‖RPD:0	A13/5156-A-41	104%
Zinc	mg/kg	<0.5	A13/5156-A-21	96‖96‖RPD:0	A13/5156-A-41	85%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
TPH C6-C9	mg/kg	<10	A13/5156-A-21	<20.0 || <20.0	A13/5156-A-41	76%
TPH C10-14	mg/kg	<10	A13/5156-A-21	<20 || <20	A13/5156-A-41	125%
TPH C15-28	mg/kg	<50	A13/5156-A-21	<100 || <100	A13/5156-A-41	124%
TPH C29-36	mg/kg	<50	A13/5156-A-21	<100 || <100	A13/5156-A-41	116%
Surrogate Recovery	%	95	A13/5156-A-21	90 || 106 || RPD: 16	A13/5156-A-41	117%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Naphthalene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	74%
1-Methylnaphthalene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	99%
2-Methylnaphthalene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	97%
Acenaphthylene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	104%
Acenaphthene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	103%
Fluorene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	108%
Phenanthrene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	106%
Anthracene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	104%
Fluoranthene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	116%
Pyrene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	105%
Benz(a)anthracene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	106%
Chrysene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	105%
Benzo(b)&(k)fluoranthene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	109%
Benzo(a)pyrene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	104%
Indeno(1,2,3-cd)pyrene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	106%
Dibenz(a,h)anthracene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	99%
Benzo(g,h,i)perylene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	103%
Coronene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	113%
Benzo(e)pyrene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	109%
Perylene	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	128%
Total PAHs (as above)	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	[NA]
Surrogate 1 Recovery	%	NT	[NT]	[NT]	A13/5156-A-30	82%
Surrogate 2 Recovery	%	NT	[NT]	[NT]	A13/5156-A-30	95%
Surrogate 3 Recovery	%	NT	[NT]	[NT]	A13/5156-A-30	98%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aldrin	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	102%
alpha-BHC	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	107%
beta-BHC	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	124%
gamma-BHC (Lindane)	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	118%
delta-BHC	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	115%
cis-Chlordane	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	113%
trans-Chlordane	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	116%
p,p'-DDD	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	121%
p,p'-DDE	µg/kg	<1.0	A13/5156-A-21	7.0 || 6.0 || RPD: 15	A13/5156-A-30	112%
p,p'-DDT	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	61%
Dieldrin	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	110%
alpha-Endosulfan	µg/kg	<1.0	A13/5156-A-21	<10 || <10	A13/5156-A-30	120%
beta-Endosulfan	µg/kg	<1.0	A13/5156-A-21	<10 || <10	A13/5156-A-30	122%
Endosulfan Sulphate	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	113%
Endrin	µg/kg	<1.0	A13/5156-A-21	<10 || <10	A13/5156-A-30	118%
Endrin ketone	µg/kg	<1.0	A13/5156-A-21	<10 || <10	A13/5156-A-30	104%
Endrin aldehyde	µg/kg	<1.0	A13/5156-A-21	<10 || <10	A13/5156-A-30	94%
Heptachlor	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	113%
Heptachlor epoxide	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	124%
Hexachlorobenzene	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	106%
Methoxychlor	µg/kg	<1.0	A13/5156-A-21	<20 || <20	A13/5156-A-30	70%
Oxychlordane*	µg/kg	<1.0	A13/5156-A-21	<2 || <2	A13/5156-A-30	129%
Surrogate Recovery	%	66	A13/5156-A-21	100 || 98 || RPD: 2	A13/5156-A-30	95%

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Mono-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	93%
Di-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	109%
Tri-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	109%
Tetra-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	109%
Penta-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	106%
Hexa-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	107%
Hepta-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	108%
Octa-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	116%
Nona-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	100%
Deca-PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	102%
Total PCB congeners	µg/kg	NT	[NT]	[NT]	A13/5156-A-30	106%
Surrogate 1 Recovery	%	NT	[NT]	[NT]	A13/5156-A-30	96%
Surrogate 2 Recovery	%	NT	[NT]	[NT]	A13/5156-A-30	96%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Monobutyl tin	µgSn/kg	<0.50	A13/5156-A-21	<1.0||<1.0	A13/5156-A-41	#
Dibutyl tin	µgSn/kg	<0.50	A13/5156-A-21	<1.0||<1.0	A13/5156-A-41	78%
Tributyl tin	µgSn/kg	<0.50	A13/5156-A-21	<1.0||<1.0	A13/5156-A-41	92%
Surrogate 1 Recovery	%	108	A13/5156-A-21	88||87||RPD: 1	A13/5156-A-41	96%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Total Nitrogen	mg/kg	<20	A13/5156-A-30	1170||1160||RPD: 1
Total Organic Carbon	%	<0.01	A13/5156-A-30	1.5||1.5||RPD: 0

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Aluminium	mg/kg	[NT]	A13/5156-A-31	11000||10000||RPD: 10
Arsenic	mg/kg	[NT]	A13/5156-A-31	7.6||6.9||RPD: 10
Cadmium	mg/kg	[NT]	A13/5156-A-31	<0.1||<0.1
Chromium	mg/kg	[NT]	A13/5156-A-31	23||22||RPD: 4
Copper	mg/kg	[NT]	A13/5156-A-31	19||17||RPD: 11
Iron	mg/kg	[NT]	A13/5156-A-31	23000||22000||RPD: 4
Lead	mg/kg	[NT]	A13/5156-A-31	17||17||RPD: 0
Mercury	mg/kg	[NT]	A13/5156-A-31	0.03||0.04||RPD: 29
Nickel	mg/kg	[NT]	A13/5156-A-31	13||13||RPD: 0
Phosphorus*	mg/kg	[NT]	A13/5156-A-31	360||370||RPD: 3
Silver	mg/kg	[NT]	A13/5156-A-31	<0.1||<0.1
Zinc	mg/kg	[NT]	A13/5156-A-31	110||120||RPD: 9

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Benzene	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	108%
Toluene	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	103%
Ethyl Benzene	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	95%
m+p xylenes	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	100%
o-xylene	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	97%
Total BTEX	mg/kg	[NT]	[NT]	[NT]	A13/5156-A-44	[NA]
Surrogate 1 Recovery	%	[NT]	[NT]	[NT]	A13/5156-A-44	113%
Surrogate 2 Recovery	%	[NT]	[NT]	[NT]	A13/5156-A-44	99%
Surrogate 3 Recovery	%	[NT]	[NT]	[NT]	A13/5156-A-44	104%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
TPH C6-C9	mg/kg	[NT]	A13/5156-A-30	<10 || [NT]
TPH C10-14	mg/kg	[NT]	A13/5156-A-30	<10 || <10
TPH C15-28	mg/kg	[NT]	A13/5156-A-30	<50 || <50
TPH C29-36	mg/kg	[NT]	A13/5156-A-30	<50 || 51
Surrogate Recovery	%	[NT]	A13/5156-A-30	95 || 98 || RPD: 3

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Naphthalene	µg/kg	[NT]	A13/5156-A-30	7.0 || 10 || RPD: 35
1-Methylnaphthalene	µg/kg	[NT]	A13/5156-A-30	<5.0 || <5.0
2-Methylnaphthalene	µg/kg	[NT]	A13/5156-A-30	<5.0 || 6.0
Acenaphthylene	µg/kg	[NT]	A13/5156-A-30	<15 || <15
Acenaphthene	µg/kg	[NT]	A13/5156-A-30	<5.0 || <5.0
Fluorene	µg/kg	[NT]	A13/5156-A-30	<5.0 || 5.0
Phenanthrene	µg/kg	[NT]	A13/5156-A-30	23 || 31 || RPD: 30
Anthracene	µg/kg	[NT]	A13/5156-A-30	8.0 || 11 || RPD: 32
Fluoranthene	µg/kg	[NT]	A13/5156-A-30	94 || 140 || RPD: 39
Pyrene	µg/kg	[NT]	A13/5156-A-30	82 || 110 || RPD: 29
Benz(a)anthracene	µg/kg	[NT]	A13/5156-A-30	38 || 52 || RPD: 31
Chrysene	µg/kg	[NT]	A13/5156-A-30	39 || 50 || RPD: 25
Benzo(b)&(k)fluoranthene	µg/kg	[NT]	A13/5156-A-30	90 || 110 || RPD: 20
Benzo(a)pyrene	µg/kg	[NT]	A13/5156-A-30	47 || 60 || RPD: 24
Indeno(1,2,3-cd)pyrene	µg/kg	[NT]	A13/5156-A-30	42 || 52 || RPD: 21
Dibenz(a,h)anthracene	µg/kg	[NT]	A13/5156-A-30	7.0 || 8.0 || RPD: 13
Benzo(g,h,i)perylene	µg/kg	[NT]	A13/5156-A-30	43 || 51 || RPD: 17
Coronene	µg/kg	[NT]	A13/5156-A-30	<10 || <10
Benzo(e)pyrene	µg/kg	[NT]	A13/5156-A-30	37 || 45 || RPD: 20
Perylene	µg/kg	[NT]	A13/5156-A-30	100 || 99 || RPD: 1
Total PAHs (as above)	µg/kg	[NT]	A13/5156-A-30	660 || 840 || RPD: 24
Surrogate 1 Recovery	%	[NT]	A13/5156-A-30	65 || 70 || RPD: 7
Surrogate 2 Recovery	%	[NT]	A13/5156-A-30	86 || 90 || RPD: 5
Surrogate 3 Recovery	%	[NT]	A13/5156-A-30	93 || 97 || RPD: 4

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Aldrin	µg/kg	[NT]	A13/5156-A-30	<2 || <2
alpha-BHC	µg/kg	[NT]	A13/5156-A-30	<2 || <2
beta-BHC	µg/kg	[NT]	A13/5156-A-30	<2 || <2
gamma-BHC (Lindane)	µg/kg	[NT]	A13/5156-A-30	<2 || <2
delta-BHC	µg/kg	[NT]	A13/5156-A-30	<2 || <2
cis-Chlordane	µg/kg	[NT]	A13/5156-A-30	<2 || <2
trans-Chlordane	µg/kg	[NT]	A13/5156-A-30	<2 || <2
p,p'-DDD	µg/kg	[NT]	A13/5156-A-30	<2 || <2
p,p'-DDE	µg/kg	[NT]	A13/5156-A-30	4.0 || 5.0 || RPD: 22
p,p'-DDT	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Dieldrin	µg/kg	[NT]	A13/5156-A-30	<2 || <2
alpha-Endosulfan	µg/kg	[NT]	A13/5156-A-30	<10 || <10
beta-Endosulfan	µg/kg	[NT]	A13/5156-A-30	<10 || <10
Endosulfan Sulphate	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Endrin	µg/kg	[NT]	A13/5156-A-30	<10 || <10
Endrin ketone	µg/kg	[NT]	A13/5156-A-30	<10 || <10
Endrin aldehyde	µg/kg	[NT]	A13/5156-A-30	<10 || <10
Heptachlor	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Heptachlor epoxide	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Hexachlorobenzene	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Methoxychlor	µg/kg	[NT]	A13/5156-A-30	<20 || <20
Oxychlordane*	µg/kg	[NT]	A13/5156-A-30	<2 || <2
Surrogate Recovery	%	[NT]	A13/5156-A-30	91 || 94 || RPD: 3

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Mono-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Di-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Tri-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Tetra-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Penta-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Hexa-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Hepta-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Octa-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Nona-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Deca-PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Total PCB congeners	µg/kg	[NT]	A13/5156-A-30	<5.0||<5.0
Surrogate 1 Recovery	%	[NT]	A13/5156-A-30	85||89||RPD: 5
Surrogate 2 Recovery	%	[NT]	A13/5156-A-30	90||95||RPD: 5

TEST	Units	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Monobutyl tin	µgSn/kg	[NT]	A13/5156-A-31	<0.50||<0.50	External	110%
Dibutyl tin	µgSn/kg	[NT]	A13/5156-A-31	<0.50||<0.50	External	94%
Tributyl tin	µgSn/kg	[NT]	A13/5156-A-31	<0.50||<0.50	External	103%
Surrogate 1 Recovery	%	[NT]	A13/5156-A-31	90||83||RPD: 8	External	109%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Total Nitrogen	mg/kg	[NT]	A13/5156-A-40	930||920||RPD: 1
Total Organic Carbon	%	[NT]	A13/5156-A-40	0.98||1.0||RPD: 2

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Aluminium	mg/kg	[NT]	A13/5156-A-41	21000||20000||RPD: 5
Arsenic	mg/kg	[NT]	A13/5156-A-41	7.0||7.2||RPD: 3
Cadmium	mg/kg	[NT]	A13/5156-A-41	<0.1||<0.1
Chromium	mg/kg	[NT]	A13/5156-A-41	40||39||RPD: 3
Copper	mg/kg	[NT]	A13/5156-A-41	19||19||RPD: 0
Iron	mg/kg	[NT]	A13/5156-A-41	36000||33000||RPD: 9
Lead	mg/kg	[NT]	A13/5156-A-41	13||13||RPD: 0
Mercury	mg/kg	[NT]	A13/5156-A-41	0.08||0.08||RPD: 0
Nickel	mg/kg	[NT]	A13/5156-A-41	23||23||RPD: 0
Phosphorus*	mg/kg	[NT]	A13/5156-A-41	590||590||RPD: 0
Silver	mg/kg	[NT]	A13/5156-A-41	<0.1||<0.1
Zinc	mg/kg	[NT]	A13/5156-A-41	71||71||RPD: 0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
TPH C6-C9	mg/kg	[NT]	A13/5156-A-41	<10 || <10
TPH C10-14	mg/kg	[NT]	A13/5156-A-41	<10 || <10
TPH C15-28	mg/kg	[NT]	A13/5156-A-41	<50 || <50
TPH C29-36	mg/kg	[NT]	A13/5156-A-41	<50 || <50
Surrogate Recovery	%	[NT]	A13/5156-A-41	94 || 89 || RPD: 5

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Aldrin	µg/kg	[NT]	A13/5156-A-41	<2 || <2
alpha-BHC	µg/kg	[NT]	A13/5156-A-41	<2 || <2
beta-BHC	µg/kg	[NT]	A13/5156-A-41	<2 || <2
gamma-BHC (Lindane)	µg/kg	[NT]	A13/5156-A-41	<2 || <2
delta-BHC	µg/kg	[NT]	A13/5156-A-41	<2 || <2
cis-Chlordane	µg/kg	[NT]	A13/5156-A-41	<2 || <2
trans-Chlordane	µg/kg	[NT]	A13/5156-A-41	<2 || <2
p,p'-DDD	µg/kg	[NT]	A13/5156-A-41	<2 || <2
p,p'-DDE	µg/kg	[NT]	A13/5156-A-41	4.0 || 4.0 || RPD: 0
p,p'-DDT	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Dieldrin	µg/kg	[NT]	A13/5156-A-41	<2 || <2
alpha-Endosulfan	µg/kg	[NT]	A13/5156-A-41	<10 || <10
beta-Endosulfan	µg/kg	[NT]	A13/5156-A-41	<10 || <10
Endosulfan Sulphate	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Endrin	µg/kg	[NT]	A13/5156-A-41	<10 || <10
Endrin ketone	µg/kg	[NT]	A13/5156-A-41	<10 || <10
Endrin aldehyde	µg/kg	[NT]	A13/5156-A-41	<10 || <10
Heptachlor	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Heptachlor epoxide	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Hexachlorobenzene	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Methoxychlor	µg/kg	[NT]	A13/5156-A-41	<20 || <20
Oxychlordane*	µg/kg	[NT]	A13/5156-A-41	<2 || <2
Surrogate Recovery	%	[NT]	A13/5156-A-41	98 || 95 || RPD: 3

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-A [R01]
Project Reference: B20259 Sediment Analysis

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Monobutyl tin	µgSn/kg	[NT]	A13/5156-A-41	<0.50 || <0.50
Dibutyl tin	µgSn/kg	[NT]	A13/5156-A-41	<0.50 || <0.50
Tributyl tin	µgSn/kg	[NT]	A13/5156-A-41	<0.50 || <0.50
Surrogate 1 Recovery	%	[NT]	A13/5156-A-41	79 || 83 || RPD: 5

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
TPH C6-C9	mg/kg	[NT]	A13/5156-A-11	<20.0 || <20.0
TPH C10-14	mg/kg	[NT]	A13/5156-A-11	<20 || [NT]
TPH C15-28	mg/kg	[NT]	A13/5156-A-11	<100 || [NT]
TPH C29-36	mg/kg	[NT]	A13/5156-A-11	<100 || [NT]
Surrogate Recovery	%	[NT]	A13/5156-A-11	91 || 100 || RPD: 9

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
TPH C6-C9	mg/kg	[NT]	A13/5156-A-31	<10 || <10
TPH C10-14	mg/kg	[NT]	A13/5156-A-31	<10 || [NT]
TPH C15-28	mg/kg	[NT]	A13/5156-A-31	<50 || [NT]
TPH C29-36	mg/kg	[NT]	A13/5156-A-31	<50 || [NT]
Surrogate Recovery	%	[NT]	A13/5156-A-31	107 || 103 || RPD: 4

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Benzene	mg/kg	[NT]	A13/5156-A-44	<0.20 || <0.20
Toluene	mg/kg	[NT]	A13/5156-A-44	<0.20 || <0.20
Ethyl Benzene	mg/kg	[NT]	A13/5156-A-44	<0.20 || <0.20
m+p xylenes	mg/kg	[NT]	A13/5156-A-44	<0.40 || <0.40
o-xylene	mg/kg	[NT]	A13/5156-A-44	<0.20 || <0.20
Total BTEX	mg/kg	[NT]	A13/5156-A-44	<1.2 || <1.2
Surrogate 1 Recovery	%	[NT]	A13/5156-A-44	107 || 101 || RPD: 6
Surrogate 2 Recovery	%	[NT]	A13/5156-A-44	87 || 84 || RPD: 4
Surrogate 3 Recovery	%	[NT]	A13/5156-A-44	84 || 79 || RPD: 6

Comments:
RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants
Acceptable replicate reproducibility limit or RPD: Results < 10 times LOR: no limits
Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits: Trace elements 70-130%
Organic analyses 50-150%
SVOC & speciated phenols 10-140%
Surrogates 10-140%
When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 99563

Client:

Advanced Analytical Aust. Pty Ltd
11 Julius Ave
North Ryde
NSW 2113

Attention: Trent Biggin

Sample log in details:

Your Reference:	**A13/5156A**		
No. of samples:	15 Soils		
Date samples received / completed instructions received	25/10/2013	/	25/10/2013

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	1/11/13	/	1/11/13
Date of Preliminary Report:	Not issued		

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Chromium Suite						
Our Reference:	UNITS	99563-1	99563-2	99563-3	99563-4	99563-5
Your Reference	----------	A13/5156A/5	A13/5156A/6	A13/5156A/7	A13/5156A/8	A13/5156A/9
Sample ID	----------	5-0	5-1A	5-1B	5-1C	6-3
Date Sampled		23/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
pH kcl	pH units	7.9	7.9	7.8	7.7	8.0
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	0.07	0.16	0.07	0.08	0.06
a-Chromium Reducible Sulfur	moles H^+/t	45	100	45	52	36
S_{KCl}	%w/w S	0.22	0.26	0.24	0.23	0.24
ANC_{BT}	% $CaCO_3$	0.94	2.0	2.3	1.9	2.5
s-ANC_{BT}	%w/w S	0.30	0.65	0.73	0.62	0.80
s-Net Acidity	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	<10	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	<10	<10	<10	<10
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75

Chromium Suite						
Our Reference:	UNITS	99563-6	99563-7	99563-8	99563-9	99563-10
Your Reference	----------	A13/5156A/12	A13/5156A/15	A13/5156A/17	A13/5156A/18	A13/5156A/23
Sample ID	----------	7-1	9-1	10-6	10-6B	11-8
Date Sampled		22/10/2013	22/10/2013	22/10/2013	22/10/2013	21/10/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
pH kcl	pH units	8.0	8.6	8.6	8.6	8.4
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	0.09	0.04	0.16	0.15	0.09
a-Chromium Reducible Sulfur	moles H^+/t	59	23	98	96	54
S_{KCl}	%w/w S	0.22	0.086	0.18	0.17	0.16
ANC_{BT}	% $CaCO_3$	3.1	2.8	4.6	3.7	3.3
s-ANC_{BT}	%w/w S	0.98	0.90	1.5	1.2	1.1
s-Net Acidity	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	<10	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	<10	<10	<10	<10
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75

Chromium Suite						
Our Reference:	UNITS	99563-11	99563-12	99563-13	99563-14	99563-15
Your Reference	----------	A13/5156A/25	A13/5156A/28	A13/5156A/29	A13/5156A/30	A13/5156A/35
Sample ID	----------	12-1	15-2	15-3	13-1	13-8
Date Sampled		22/10/2013	22/10/2013	22/10/2013	21/10/2013	21/10/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
pH $_{kcl}$	pH units	8.1	8.6	9.1	8.5	8.9
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	0.05	0.06	0.03	0.09	0.10
a-Chromium Reducible Sulfur	moles H^+/t	32	36	22	59	65
S_{KCl}	%w/w S	0.22	0.11	0.051	0.18	0.13
ANC_{BT}	% $CaCO_3$	2.0	3.4	1.9	3.4	6.8
s-ANC_{BT}	%w/w S	0.65	1.1	0.62	1.1	2.2
s-Net Acidity	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	<10	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	<10	<10	<10	<10
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

Client Reference: A13/5156A

QUALITY CONTROL Chromium Suite	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
pH kcl	pH units		Inorg-068	[NT]	99563-1	7.9 || 8.0 || RPD: 1	LCS-1	96%
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	99563-1	<0.01 || <0.01	[NR]	[NR]
TAA pH 6.5	moles H^+/t	5	Inorg-068	<5	99563-1	<5 || <5	LCS-1	120%
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	99563-1	0.07 || 0.07 || RPD: 0	LCS-1	97%
a-Chromium Reducible Sulfur	moles H^+/t	3	Inorg-068	<3	99563-1	45 || 47 || RPD: 4	[NR]	[NR]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NR]	[NR]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	99563-1	0.22 || 0.21 || RPD: 5	LCS-1	104%
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NR]	[NR]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	99563-1	0.94 || 1.8 || RPD: 63	[NR]	[NR]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	99563-1	0.30 || 0.57 || RPD: 62	[NR]	[NR]
s-Net Acidity	%w/w S	0.01	Inorg-068	<0.01	99563-1	<0.01 || <0.01	[NR]	[NR]
a-Net Acidity	moles H^+/t	10	Inorg-068	<10	99563-1	<10 || <10	[NR]	[NR]
Liming rate	kg $CaCO_3$/t	0.75	Inorg-068	<0.75	99563-1	<0.75 || <0.75	[NR]	[NR]
a-Net Acidity without ANCE	moles H^+/t	10	Inorg-068	<10	99563-1	<10 || <10	[NR]	[NR]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-068	<0.75	99563-1	<0.75 || <0.75	[NR]	[NR]

QUALITY CONTROL Chromium Suite	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
pH kcl	pH units	99563-11	8.1 || 8.0 || RPD: 1
s-TAA pH 6.5	%w/w S	99563-11	<0.01 || <0.01
TAA pH 6.5	moles H^+/t	99563-11	<5 || <5
Chromium Reducible Sulfur	%w/w	99563-11	0.05 || 0.05 || RPD: 0
a-Chromium Reducible Sulfur	moles H^+/t	99563-11	32 || 32 || RPD: 0
S_{HCl}	%w/w S	[NT]	[NT]
S_{KCl}	%w/w S	99563-11	0.22 || 0.22 || RPD: 0
S_{NAS}	%w/w S	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	99563-11	2.0 || 2.2 || RPD: 10
s-ANC_{BT}	%w/w S	99563-11	0.65 || 0.70 || RPD: 7
s-Net Acidity	%w/w S	99563-11	<0.01 || <0.01

Client Reference: A13/5156A

QUALITY CONTROL Chromium Suite	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
a-Net Acidity	moles H^+/t	99563-11	<10 || <10
Liming rate	kg $CaCO_3$/t	99563-11	<0.75 || <0.75
a-Net Acidity without ANCE	moles H^+/t	99563-11	<10 || <10
Liming rate without ANCE	kg $CaCO_3$/t	99563-11	<0.75 || <0.75

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

REPORT OF ANALYSIS

Laboratory Reference: A13/5156-C [R00]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

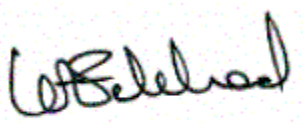
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment Analysis - Radionuclides
Sample Type: Sediment
No. of Samples: 46
Date Received: 18/10/2013
Date Completed: 2/12/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

ilac-MRA NATA Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-C [R00]
Project Reference: B20259 Sediment Analysis - Radionuclides

Laboratory Reference:	-	-	/5	/6	/7	/8
Client Reference:	-	-	5-0	5-1A	5-1B	5-1C
Date Sampled:	-	-	23/10/2013	22/10/2013	22/10/2014	22/10/2015
Analysis Description	**Method**	**Units**				
Subcontract Analysis						
Gross Alpha	SUB	mBq/g	<60	<60	<60	<60
Gross Beta	SUB	mBq/g	<135	<135	<135	<135

Laboratory Reference:	-	-	/9	/12	/15	/17
Client Reference:	-	-	6-3	7-1	9-1	10-6
Date Sampled:	-	-	22/10/2016	22/10/2019	22/10/2022	22/10/2024
Analysis Description	**Method**	**Units**				
Subcontract Analysis						
Gross Alpha	SUB	mBq/g	<60	<60	<60	<60
Gross Beta	SUB	mBq/g	<135	<135	<135	<135

Laboratory Reference:	-	-	/18	/23	/25	/28
Client Reference:	-	-	10-6B	11-8	12-1	15-2
Date Sampled:	-	-	22/10/2025	21/10/2013	22/10/2013	22/10/2013
Analysis Description	**Method**	**Units**				
Subcontract Analysis						
Gross Alpha	SUB	mBq/g	<60	<60	<60	<60
Gross Beta	SUB	mBq/g	<135	<135	<135	<135

Laboratory Reference:	-	-	/29	/30	/35
Client Reference:	-	-	15-3	13-1	13-8
Date Sampled:	-	-	22/10/2013	21/10/2013	21/10/2013
Analysis Description	**Method**	**Units**			
Subcontract Analysis					
Gross Alpha	SUB	mBq/g	<60	<60	<60
Gross Beta	SUB	mBq/g	<135	<135	<135

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-C [R00]
Project Reference: B20259 Sediment Analysis - Radionuclides

Method	Method Description
SUB	Subcontracted Analyses

Result Comments
[<] Less than
[INS] Insufficient sample for this test
[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.
MBT spike recovery is biased low due to matrix effect.

Selected organic LORs raised due to high moisture content in selected samples.
Selected organochlorine pesticide LORs raised due to matrix interferences.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-C [R00]
Project Reference: B20259 Sediment Analysis - Radionuclides

QUALITY ASSURANCE REPORT

Comments:

RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants

Acceptable replicate reproducibility limit or RPD:	Results < 10 times LOR: no limits
	Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits:	Trace elements 70-130%
	Organic analyses 50-150%
	SVOC & speciated phenols 10-140%
	Surrogates 10-140%

When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

REPORT OF ANALYSIS

Laboratory Reference: A13/5156-B [R00]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

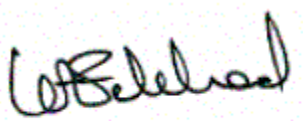
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment analysis - Elutriate
Sample Type: Sediment Elutriate
No. of Samples: 51
Date Received: 18/10/2013
Date Completed: 26/11/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-B [R00]
Project Reference: B20259 Sediment analysis - Elutriate

Laboratory Reference:	-	-	**/3**	**/9**	**/10**	**/12**
Client Reference:	-	-	**4-4**	**6-3**	**6-2A**	**7-1**
Date Sampled:	-	-	**23/10/2013**	**22/10/2016**	**22/10/2017**	**22/10/2019**
Analysis Description	**Method**	**Units**				
Elutriate - Metals						
Nickel	04-015	µg/L	<3.0	<3.0	<3.0	<3.0

Laboratory Reference:	-	-	**/13**	**/16**	**/19**	**/20**
Client Reference:	-	-	**8-1**	**10-5**	**10-8**	**11-9A**
Date Sampled:	-	-	**22/10/2020**	**22/10/2023**	**22/10/2026**	**21/10/2013**
Analysis Description	**Method**	**Units**				
Elutriate - Metals						
Nickel	04-015	µg/L	<3.0	<3.0	<3.0	<3.0

Laboratory Reference:	-	-	**/24**	**/26**	**/27**	**/30**
Client Reference:	-	-	**11-5**	**12-2**	**15-1**	**13-1**
Date Sampled:	-	-	**22/10/2013**	**22/10/2013**	**22/10/2013**	**21/10/2013**
Analysis Description	**Method**	**Units**				
Elutriate - Metals						
Nickel	04-015	µg/L	<3.0	<3.0	<3.0	<3.0

Laboratory Reference:	-	-	**/34**	**/35**	**/47**	**/48**
Client Reference:	-	-	**13-5**	**13-8**	**6-2A (Duplicate)**	**10-8 (Duplicate)**
Date Sampled:	-	-	**21/10/2013**	**21/10/2013**	**22/10/2018**	**22/10/2026**
Analysis Description	**Method**	**Units**				
Elutriate - Metals						
Nickel	04-015	µg/L	<3.0	<3.0	<3.0	<3.0

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-B [R00]

Project Reference: B20259 Sediment analysis - Elutriate

Laboratory Reference:	-	-	**/49**	**/50**	**/51**
Client Reference:	-	-	**11-5 (Duplicate)**	**13-5 (Duplicate)**	**Elutriate Blank**
Date Sampled:	-	-	**22/10/2026**	**21/10/2013**	**NA**
Analysis Description	**Method**	**Units**			
Elutriate - Metals					
Nickel	04-015	µg/L	<3.0	<3.0	<3.0
Zinc	04-015	µg/L	[NA]	[NA]	<5.0

Method	Method Description
04-015	Low level metals in waters by ICPMS, µg/L

Result Comments

[<] Less than

[INS] Insufficient sample for this test

[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-B [R00]
Project Reference: B20259 Sediment analysis - Elutriate

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Nickel	µg/L	<3.0	A13/5156-B-3	<3.0||<3.0	A13/5156-B-3	91%
Zinc	µg/L	<5.0	[NT]	[NT]	A13/5156-B-3	99%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Nickel	µg/L	[NT]	A13/5156-B-30	<3.0||<3.0
Zinc	µg/L	[NT]	[NT]	[NT]

Comments:
RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants
Acceptable replicate reproducibility limit or RPD: Results < 10 times LOR: no limits
Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits: Trace elements 70-130%
Organic analyses 50-150%
SVOC & speciated phenols 10-140%
Surrogates 10-140%
When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

REPORT OF ANALYSIS

Laboratory Reference: A13/5156-D [R00]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

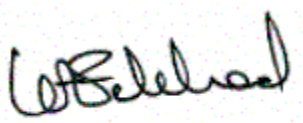
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment analysis - DAE
Sample Type: Sediment
No. of Samples: 50
Date Received: 18/10/2013
Date Completed: 26/11/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-D [R00]
Project Reference: B20259 Sediment analysis - DAE

Laboratory Reference:	-	-	**/3**	**/9**	**/10**	**/12**
Client Reference:	-	-	**4-4**	**6-3**	**6-2A**	**7-1**
Date Sampled:	-	-	**23/10/2013**	**22/10/2016**	**22/10/2017**	**22/10/2019**
Analysis Description	**Method**	**Units**				
Dilute Acid Extraction - Metal						
Nickel	04-001	mg/kg	10	13	17	16

Laboratory Reference:	-	-	**/13**	**/16**	**/19**	**/20**
Client Reference:	-	-	**8-1**	**10-5**	**10-8**	**11-9A**
Date Sampled:	-	-	**22/10/2020**	**22/10/2023**	**22/10/2026**	**21/10/2013**
Analysis Description	**Method**	**Units**				
Dilute Acid Extraction - Metal						
Nickel	04-001	mg/kg	16	13	12	12

Laboratory Reference:	-	-	**/24**	**/26**	**/27**	**/30**
Client Reference:	-	-	**11-5**	**12-2**	**15-1**	**13-1**
Date Sampled:	-	-	**22/10/2013**	**22/10/2013**	**22/10/2013**	**21/10/2013**
Analysis Description	**Method**	**Units**				
Dilute Acid Extraction - Metal						
Nickel	04-001	mg/kg	12	13	11	8.7

Laboratory Reference:	-	-	**/34**	**/35**	**/47**	**/48**
Client Reference:	-	-	**13-5**	**13-8**	**6-2A (Duplicate)**	**10-8 (Duplicate)**
Date Sampled:	-	-	**21/10/2013**	**21/10/2013**	**22/10/2018**	**22/10/2026**
Analysis Description	**Method**	**Units**				
Dilute Acid Extraction - Metal						
Nickel	04-001	mg/kg	12	6.4	17	12

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-D [R00]
Project Reference: B20259 Sediment analysis - DAE

Laboratory Reference:	-	-	**/49**	**/50**
Client Reference:	-	-	**11-5 (Duplicate)**	**13-5 (Duplicate)**
Date Sampled:	-	-	**22/10/2026**	**21/10/2013**
Analysis Description	**Method**	**Units**		
Dilute Acid Extraction - Metal				
Nickel	04-001	mg/kg	11	12

Method	Method Description
04-001	Metals by ICP-OES, mg/kg

Result Comments
[<] Less than
[INS] Insufficient sample for this test
[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5156-D [R00]
Project Reference: B20259 Sediment analysis - DAE

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Nickel	mg/kg	<0.1	A13/5156-D-3	10 || 10 || RPD: 0	A13/5156-D-3	109%

TEST	Units	Blank	Duplicate Sm#	Duplicate Results
Nickel	mg/kg	[NT]	A13/5156-D-35	6.4 || 6.3 || RPD: 2

Comments:
RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants
Acceptable replicate reproducibility limit or RPD: Results < 10 times LOR: no limits
Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits: Trace elements 70-130%
Organic analyses 50-150%
SVOC & speciated phenols 10-140%
Surrogates 10-140%
When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

REPORT OF ANALYSIS

Laboratory Reference: A13/5333-A [R02]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

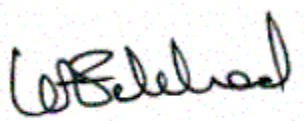
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment Analysis - Elutriate
Sample Type: Sediment
No. of Samples: 15
Date Received: 31/10/2013
Date Completed: 13/11/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/1** **11-8A** **31/10/2013**	**/2** **11-8B** **31/10/2013**	**/3** **12-1** **31/10/2013**	**/4** **11-9A** **31/10/2013**
Elutriate - Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	85	64	75	66
Date Extracted	04-061	-	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Date Analysed	04-061	-	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Elutriate - OCP						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	89	91	95	93
Date Extracted	04-072	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Date Analysed	04-072	-	7/11/2013	7/11/2013	7/11/2013	7/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/5** **11-9B** **31/10/2013**	**/6** **10-8** **31/10/2013**	**/7** **10-6** **31/10/2013**	**/8** **10-5** **31/10/2013**
Elutriate - Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	86	70	92	90
Date Extracted	04-061	-	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Date Analysed	04-061	-	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Elutriate - OCP						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	98	98	92	96
Date Extracted	04-072	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Date Analysed	04-072	-	7/11/2013	7/11/2013	7/11/2013	7/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/9** **4-0** **31/10/2013**	**/10** **5-0A** **31/10/2013**	**/11** **5-0B** **31/10/2013**	**/12** **6-2** **31/10/2013**
Elutriate - Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	99	86	79	80
Date Extracted	04-061	-	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Date Analysed	04-061	-	6/11/2013	6/11/2013	7/11/2013	7/11/2013
Elutriate - OCP						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	66	89	100	92
Date Extracted	04-072	-	5/11/2013	5/11/2013	5/11/2013	5/11/2013
Date Analysed	04-072	-	7/11/2013	7/11/2013	7/11/2013	7/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/13** **7-1** **31/10/2013**	**/14** **8-3** **31/10/2013**	**/15** **Elutriate Blank** **31/10/2013**
Elutriate - Organotins					
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	64	85	102
Date Extracted	04-061	-	6/11/2013	6/11/2013	6/11/2013
Date Analysed	04-061	-	7/11/2013	7/11/2013	7/11/2013
Elutriate - OCP					
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	98	96	105
Date Extracted	04-072	-	5/11/2013	5/11/2013	5/11/2013
Date Analysed	04-072	-	7/11/2013	7/11/2013	7/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

Method	Method Description
04-061	Tributyltin in saline waters by GCMS, µgSn/L
04-072	Pesticides in waters by GCMS, µg/L

Result Comments
[<] Less than
[INS] Insufficient sample for this test
[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.
Elutriate extraction has been performed according to the National Assessment Guidelines for Dredging (2009): Sediment sample is shaken with 4 times the volume of seawater from the disposal site at room temperature for 30 minutes, then allowed to settle for 1 hour. The supernatant is then centrifuged or filtered (0.45um) prior to analysis.
OC pesticide analysis was performed on the elutriate water using ultra-trace techniques and results have been reported to the lowest achievable limit.
This report supersedes Report A13-5333-A-[R01].pdf.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-A [R02]
Project Reference: B20259 Sediment Analysis - Elutriate

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Tributyl tin	µgSn/L	<0.005	[NT]	[NT]	External	90%
Surrogate 1 Recovery	%	106	[NT]	[NT]	External	104%

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aldrin	µg/L	<0.03	[NT]	[NT]	External	96%
alpha-BHC	µg/L	<0.03	[NT]	[NT]	External	99%
beta-BHC	µg/L	<0.03	[NT]	[NT]	External	104%
gamma-BHC (Lindane)	µg/L	<0.03	[NT]	[NT]	External	105%
delta-BHC	µg/L	<0.03	[NT]	[NT]	External	103%
cis-Chlordane	µg/L	<0.03	[NT]	[NT]	External	104%
trans-Chlordane	µg/L	<0.03	[NT]	[NT]	External	101%
p,p'-DDD	µg/L	<0.03	[NT]	[NT]	External	92%
p,p'-DDE	µg/L	<0.03	[NT]	[NT]	External	108%
p,p'-DDT	µg/L	<0.03	[NT]	[NT]	External	101%
Dieldrin	µg/L	<0.03	[NT]	[NT]	External	110%
alpha-Endosulfan	µg/L	<0.03	[NT]	[NT]	External	109%
beta-Endosulfan	µg/L	<0.03	[NT]	[NT]	External	102%
Endosulfan Sulphate	µg/L	<0.03	[NT]	[NT]	External	96%
Endrin	µg/L	<0.03	[NT]	[NT]	External	105%
Endrin ketone	µg/L	<0.03	[NT]	[NT]	External	91%
Endrin aldehyde	µg/L	<0.1	[NT]	[NT]	External	87%
Heptachlor	µg/L	<0.03	[NT]	[NT]	External	103%
Heptachlor epoxide	µg/L	<0.03	[NT]	[NT]	External	104%
Hexachlorobenzene	µg/L	<0.03	[NT]	[NT]	External	100%
Methoxychlor	µg/L	<0.1	[NT]	[NT]	External	99%
Mirex	µg/L	<0.03	[NT]	[NT]	External	105%
Surrogate Recovery	%	64	[NT]	[NT]	External	88%

Comments:
RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants
Acceptable replicate reproducibility limit or RPD: Results < 10 times LOR: no limits
Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits: Trace elements 70-130%
Organic analyses 50-150%
SVOC & speciated phenols 10-140%
Surrogates 10-140%
When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

REPORT OF ANALYSIS

Laboratory Reference: A13/5333-B [R01]

Client: BMT WBM Pty Ltd
Level 8, 200 Creek Street
Brisbane QLD 4000

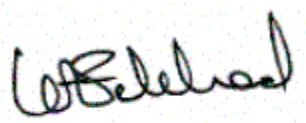
Contact: Markus Billerbeck

Order No: B20259
Project: B20259 Sediment Analysis - Porewater
Sample Type: Sediment
No. of Samples: 14
Date Received: 31/10/2013
Date Completed: 13/11/2013

Laboratory Contact Details:

Client Services Manager: Trent Biggin
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this reference number.
Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Accreditation No.15109

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]
Project Reference: B20259 Sediment Analysis - Porewater

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/1** **11-8A** **31/10/2013**	**/2** **11-8B** **31/10/2013**	**/3** **12-1** **31/10/2013**	**/4** **11-9A** **31/10/2013**
Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	95	72	100	107
Date Extracted	04-061	-	12/11/2013	12/11/2013	12/11/2013	12/11/2013
Date Analysed	04-061	-	12/11/2013	12/11/2013	12/11/2013	12/11/2013
Organochlorine Pesticides						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	98	80	92	104
Date Extracted	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013
Date Analysed	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]
Project Reference: B20259 Sediment Analysis - Porewater

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/5** **11-9B** **31/10/2013**	**/6** **10-8** **31/10/2013**	**/7** **10-6** **31/10/2013**	**/8** **10-5** **31/10/2013**
Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	109	96	94	102
Date Extracted	04-061	-	12/11/2013	12/11/2013	12/11/2013	12/11/2013
Date Analysed	04-061	-	12/11/2013	13/11/2013	13/11/2013	12/11/2013
Organochlorine Pesticides						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	98	104	105	98
Date Extracted	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013
Date Analysed	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]
Project Reference: B20259 Sediment Analysis - Porewater

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/9** **4-0** **31/10/2013**	**/10** **5-0A** **31/10/2013**	**/11** **5-0B** **31/10/2013**	**/12** **6-2** **31/10/2013**
Organotins						
Tributyl tin	04-061	µgSn/L	<0.005	<0.005	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	76	85	75	113
Date Extracted	04-061	-	12/11/2013	12/11/2013	12/11/2013	12/11/2013
Date Analysed	04-061	-	12/11/2013	12/11/2013	12/11/2013	12/11/2013
Organochlorine Pesticides						
Aldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03	<0.03	<0.03
Surrogate Recovery	04-072	%	93	99	98	103
Date Extracted	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013
Date Analysed	04-072	-	8/11/2013	8/11/2013	8/11/2013	8/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]
Project Reference: B20259 Sediment Analysis - Porewater

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	**-** **-** **-** **Method**	**-** **-** **-** **Units**	**/13** **7-1** **31/10/2013**	**/14** **8-3** **31/10/2013**
Organotins				
Tributyl tin	04-061	µgSn/L	<0.005	<0.005
Surrogate 1 Recovery	04-061	%	93	95
Date Extracted	04-061	-	12/11/2013	12/11/2013
Date Analysed	04-061	-	12/11/2013	12/11/2013
Organochlorine Pesticides				
Aldrin	04-072	µg/L	<0.03	<0.03
alpha-BHC	04-072	µg/L	<0.03	<0.03
beta-BHC	04-072	µg/L	<0.03	<0.03
gamma-BHC (Lindane)	04-072	µg/L	<0.03	<0.03
delta-BHC	04-072	µg/L	<0.03	<0.03
cis-Chlordane	04-072	µg/L	<0.03	<0.03
trans-Chlordane	04-072	µg/L	<0.03	<0.03
p,p'-DDD	04-072	µg/L	<0.03	<0.03
p,p'-DDE	04-072	µg/L	<0.03	<0.03
p,p'-DDT	04-072	µg/L	<0.03	<0.03
Dieldrin	04-072	µg/L	<0.03	<0.03
alpha-Endosulfan	04-072	µg/L	<0.03	<0.03
beta-Endosulfan	04-072	µg/L	<0.03	<0.03
Endosulfan Sulphate	04-072	µg/L	<0.03	<0.03
Endrin	04-072	µg/L	<0.03	<0.03
Endrin ketone	04-072	µg/L	<0.03	<0.03
Endrin aldehyde	04-072	µg/L	<0.1	<0.1
Heptachlor	04-072	µg/L	<0.03	<0.03
Heptachlor epoxide	04-072	µg/L	<0.03	<0.03
Hexachlorobenzene	04-072	µg/L	<0.03	<0.03
Methoxychlor	04-072	µg/L	<0.1	<0.1
Mirex	04-072	µg/L	<0.03	<0.03
Surrogate Recovery	04-072	%	94	106
Date Extracted	04-072	-	8/11/2013	8/11/2013
Date Analysed	04-072	-	8/11/2013	8/11/2013

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]

Project Reference: B20259 Sediment Analysis - Porewater

Method	Method Description
04-061	Tributyltin in saline waters by GCMS, µgSn/L
04-072	Pesticides in waters by GCMS, µg/L

Result Comments

[<] Less than

[INS] Insufficient sample for this test

[NA] Test not required

*Analyte is not covered by NATA scope of accreditation.

The sample was squeezed using positive air pressure through a membrane filter with a 1um filter disc attached. Decontamination of the membrane, filter and squeezing unit occurs prior to starting using a combination of washings of deionised water, 10% nitric acid and methanol.

OC pesticide analysis was performed on the porewater using ultra-trace techniques and results have been reported to the lowest achievable limit.

This report supersedes Report A13-5333-B-[R00].pdf.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia

Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Batch Number: A13/5333-B [R01]
Project Reference: B20259 Sediment Analysis - Porewater

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Tributyl tin	µgSn/L	<0.005	[NT]	[NT]	External	78%
Surrogate 1 Recovery	%	141	[NT]	[NT]	External	115%

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Aldrin	µg/L	<0.03	[NT]	[NT]	External	85%
alpha-BHC	µg/L	<0.03	[NT]	[NT]	External	92%
beta-BHC	µg/L	<0.03	[NT]	[NT]	External	90%
gamma-BHC (Lindane)	µg/L	<0.03	[NT]	[NT]	External	91%
delta-BHC	µg/L	<0.03	[NT]	[NT]	External	91%
cis-Chlordane	µg/L	<0.03	[NT]	[NT]	External	94%
trans-Chlordane	µg/L	<0.03	[NT]	[NT]	External	93%
p,p'-DDD	µg/L	<0.03	[NT]	[NT]	External	86%
p,p'-DDE	µg/L	<0.03	[NT]	[NT]	External	97%
p,p'-DDT	µg/L	<0.03	[NT]	[NT]	External	97%
Dieldrin	µg/L	<0.03	[NT]	[NT]	External	99%
alpha-Endosulfan	µg/L	<0.03	[NT]	[NT]	External	98%
beta-Endosulfan	µg/L	<0.03	[NT]	[NT]	External	96%
Endosulfan Sulphate	µg/L	<0.03	[NT]	[NT]	External	89%
Endrin	µg/L	<0.03	[NT]	[NT]	External	96%
Endrin ketone	µg/L	<0.03	[NT]	[NT]	External	88%
Endrin aldehyde	µg/L	<0.1	[NT]	[NT]	External	106%
Heptachlor	µg/L	<0.03	[NT]	[NT]	External	94%
Heptachlor epoxide	µg/L	<0.03	[NT]	[NT]	External	96%
Hexachlorobenzene	µg/L	<0.03	[NT]	[NT]	External	90%
Methoxychlor	µg/L	<0.1	[NT]	[NT]	External	96%
Mirex	µg/L	<0.03	[NT]	[NT]	External	96%
Surrogate Recovery	%	95	[NT]	[NT]	External	88%

Comments:
RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants
Acceptable replicate reproducibility limit or RPD: Results < 10 times LOR: no limits
Results >10 times LOR: 0% - 50%
Acceptable matrix spike & LCS recovery limits: Trace elements 70-130%
Organic analyses 50-150%
SVOC & speciated phenols 10-140%
Surrogates 10-140%
When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

Advanced Analytical Australia Pty Ltd
ABN 20 105 644 979
11 Julius Avenue
North Ryde NSW 2113 Australia
Ph: + 61 2 9888 9077
Fax: + 61 2 9888 9577
contact@advancedanalytical.com.au
www.advancedanalytical.com.au

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

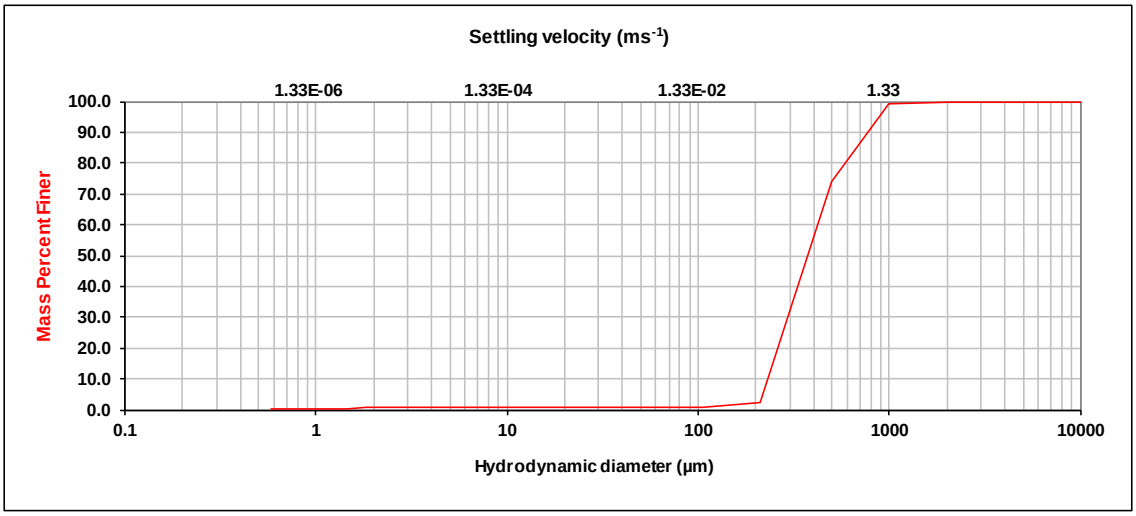
Client ID: A13 5156A 1 2-0

Job No: 13_1179

Laboratory ID: 13_1179_01

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	0.0	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	0.0	5.48E-05
1000.00	500.00	25.4	4.10E-01	7.29	5.79	0.0	3.46E-05
500.00	212.00	71.5	8.69E-02	5.79	4.60	0.0	2.18E-05
212.00	106.00	1.6	1.84E-02	4.60	3.65	0.0	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	0.0	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	0.0	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	0.0	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	0.0	2.18E-06
48.70	38.68	0.0	1.54E-03	1.45	1.15	0.0	1.37E-06
38.68	30.73	0.0	9.75E-04	1.15	0.92	0.0	8.68E-07
30.73	24.41	0.0	6.15E-04	0.92	0.73	0.0	5.51E-07
24.41	19.39	0.0	3.88E-04	0.73	0.58	0.0	3.47E-07
19.39	15.40	0.0	2.45E-04	0.58	0.10	0.4	4.76E-08
15.40	12.23	0.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by w et screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity w orksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

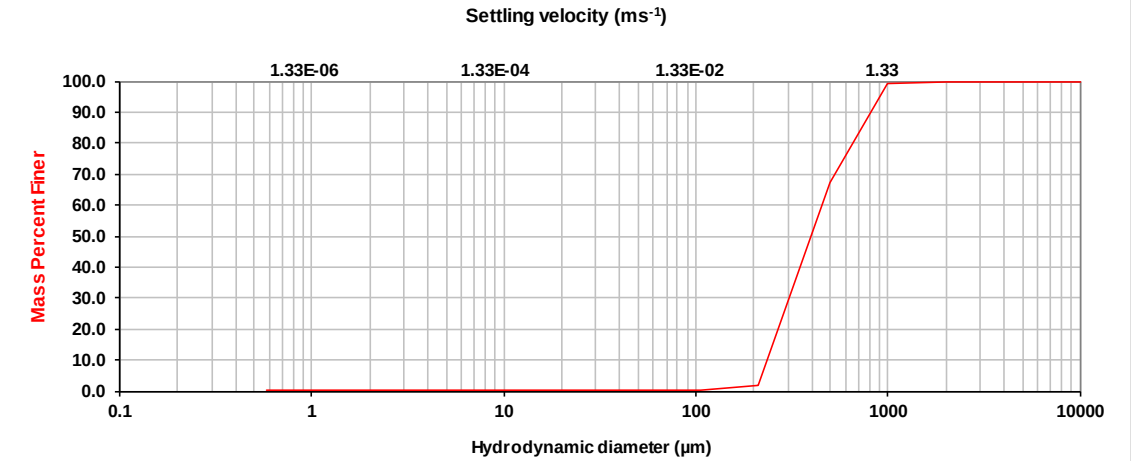
Client ID: A13/5156A/1 2-0

Job No: 13_1179

Laboratory ID: 13_1179_01Q(Sieving)

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 °C
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	0.0	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	0.0	5.48E-05
1000.00	500.00	31.7	4.10E-01	7.29	5.79	0.0	3.46E-05
500.00	212.00	65.9	8.69E-02	5.79	4.60	0.0	2.18E-05
212.00	106.00	1.1	1.84E-02	4.60	3.65	0.0	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	0.0	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	0.0	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	0.0	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	0.0	2.18E-06
48.70	38.68	0.0	1.54E-03	1.45	1.15	0.0	1.37E-06
38.68	30.73	0.0	9.75E-04	1.15	0.92	0.0	8.68E-07
30.73	24.41	0.0	6.15E-04	0.92	0.73	0.0	5.51E-07
24.41	19.39	0.0	3.88E-04	0.73	0.58	0.0	3.47E-07
19.39	15.40	0.0	2.45E-04	0.58	0.10	0.2	4.76E-08
15.40	12.23	0.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

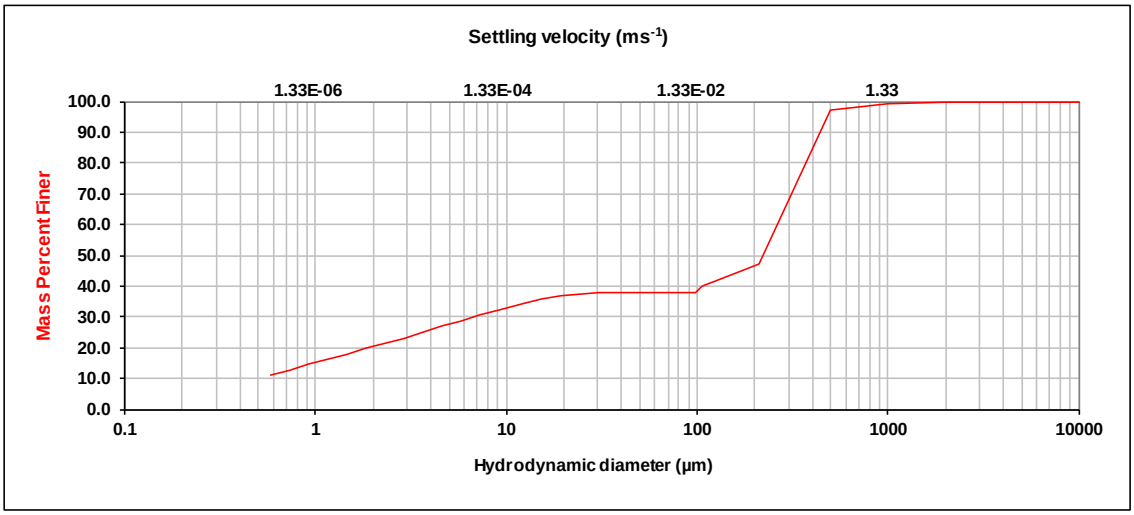
Client ID: A13 5156A 2 BC-2

Job No: 13_1179

Laboratory ID: 13_1179_02

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	1.9	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	1.7	5.48E-05
1000.00	500.00	2.0	4.10E-01	7.29	5.79	1.8	3.46E-05
500.00	212.00	49.9	8.69E-02	5.79	4.60	1.9	2.18E-05
212.00	106.00	7.2	1.84E-02	4.60	3.65	1.9	1.38E-05
106.00	97.16	2.0	8.45E-03	3.65	2.90	1.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	1.7	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	1.7	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	1.8	2.18E-06
48.70	38.68	0.0	1.54E-03	1.45	1.15	1.8	1.37E-06
38.68	30.73	0.1	9.75E-04	1.15	0.92	1.8	8.68E-07
30.73	24.41	0.3	6.15E-04	0.92	0.73	1.6	5.51E-07
24.41	19.39	0.6	3.88E-04	0.73	0.58	1.5	3.47E-07
19.39	15.40	1.1	2.45E-04	0.58	0.10	11.3	4.76E-08
15.40	12.23	1.4	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by w et screening , from 0.3µm to 106 µm by Sedimentation.

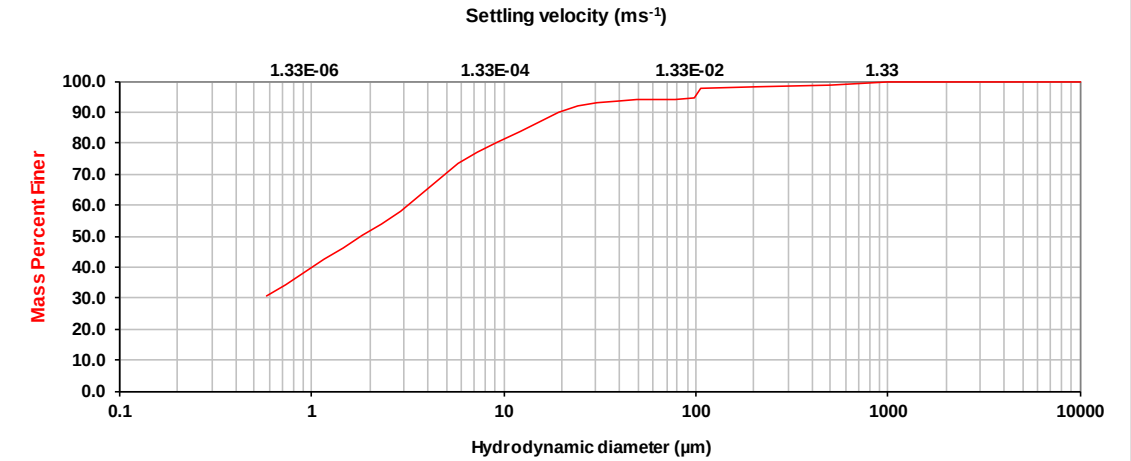
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity w orksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	Advanced
Client ID:	A13 5156A 3 4-4
Job No:	13_1179
Laboratory ID:	13_1179_03

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 °C
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	3.5	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	3.1	5.48E-05
1000.00	500.00	1.0	4.10E-01	7.29	5.79	3.9	3.46E-05
500.00	212.00	0.4	8.69E-02	5.79	4.60	4.8	2.18E-05
212.00	106.00	0.4	1.84E-02	4.60	3.65	5.2	1.38E-05
106.00	97.16	3.5	8.45E-03	3.65	2.90	5.2	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.5	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	3.6	3.45E-06
61.31	48.70	0.2	2.45E-03	1.83	1.45	3.6	2.18E-06
48.70	38.68	0.3	1.54E-03	1.45	1.15	4.0	1.37E-06
38.68	30.73	0.6	9.75E-04	1.15	0.92	4.1	8.68E-07
30.73	24.41	1.3	6.15E-04	0.92	0.73	3.9	5.51E-07
24.41	19.39	2.0	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	2.8	2.45E-04	0.58	0.10	30.5	4.76E-08
15.40	12.23	3.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

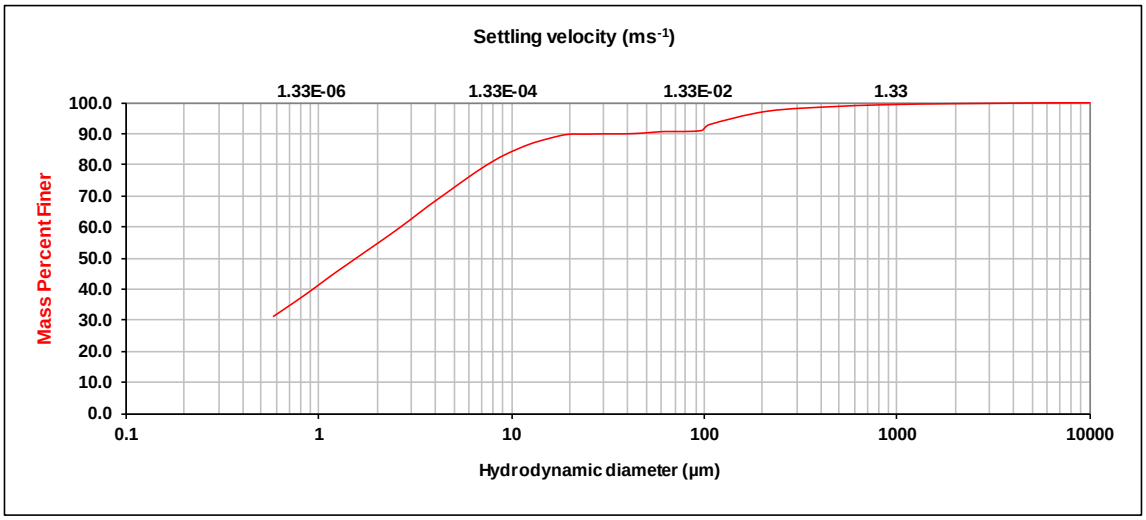
Client ID: A13 5156A 4 4-0

Job No: 13_1179

Laboratory ID: 13_1179_04

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	3.3	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	3.5	5.48E-05
1000.00	500.00	0.6	4.10E-01	7.29	5.79	4.2	3.46E-05
500.00	212.00	1.6	8.69E-02	5.79	4.60	4.5	2.18E-05
212.00	106.00	4.3	1.84E-02	4.60	3.65	4.5	1.38E-05
106.00	97.16	1.9	8.45E-03	3.65	2.90	4.7	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.6	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	4.3	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	4.4	2.18E-06
48.70	38.68	0.3	1.54E-03	1.45	1.15	4.4	1.37E-06
38.68	30.73	0.0	9.75E-04	1.15	0.92	4.5	8.68E-07
30.73	24.41	0.1	6.15E-04	0.92	0.73	4.4	5.51E-07
24.41	19.39	0.1	3.88E-04	0.73	0.58	4.2	3.47E-07
19.39	15.40	1.4	2.45E-04	0.58	0.10	31.2	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

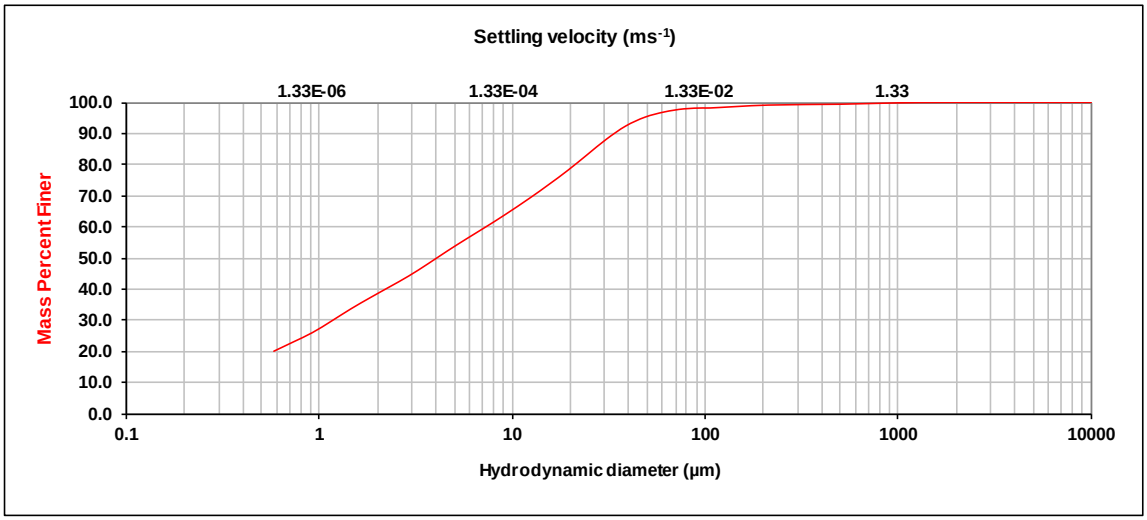
Client ID: A13 5156A 5 5-0

Job No: 13_1179

Laboratory ID: 13_1179_05

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	5.2	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	3.9	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.8	3.46E-05
500.00	212.00	0.3	8.69E-02	5.79	4.60	3.9	2.18E-05
212.00	106.00	0.9	1.84E-02	4.60	3.65	4.1	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.9	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	3.5	5.47E-06
77.18	61.31	1.0	3.88E-03	2.30	1.83	3.4	3.45E-06
61.31	48.70	1.7	2.45E-03	1.83	1.45	3.6	2.18E-06
48.70	38.68	2.8	1.54E-03	1.45	1.15	3.9	1.37E-06
38.68	30.73	4.2	9.75E-04	1.15	0.92	3.6	8.68E-07
30.73	24.41	5.0	6.15E-04	0.92	0.73	3.0	5.51E-07
24.41	19.39	5.0	3.88E-04	0.73	0.58	2.9	3.47E-07
19.39	15.40	4.6	2.45E-04	0.58	0.10	20.0	4.76E-08
15.40	12.23	4.4	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

microanalysis australia

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13 5156A 6 5-1A

Job No: 13_1179

Laboratory ID: 13_1179_06

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 °C

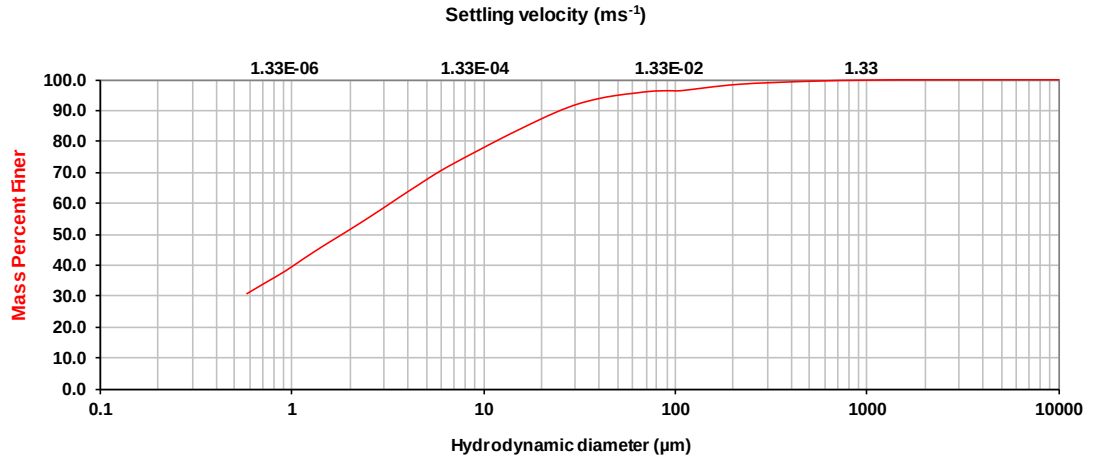
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.35 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	4.0	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.3	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.5	3.46E-05
500.00	212.00	1.0	8.69E-02	5.79	4.60	4.0	2.18E-05
212.00	106.00	2.1	1.84E-02	4.60	3.65	4.0	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.1	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.0	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	3.9	3.45E-06
61.31	48.70	0.8	2.45E-03	1.83	1.45	3.9	2.18E-06
48.70	38.68	1.2	1.54E-03	1.45	1.15	4.0	1.37E-06
38.68	30.73	1.6	9.75E-04	1.15	0.92	4.0	8.68E-07
30.73	24.41	2.3	6.15E-04	0.92	0.73	3.7	5.51E-07
24.41	19.39	2.8	3.88E-04	0.73	0.58	3.7	3.47E-07
19.39	15.40	3.0	2.45E-04	0.58	0.10	30.7	4.76E-08
15.40	12.23	3.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

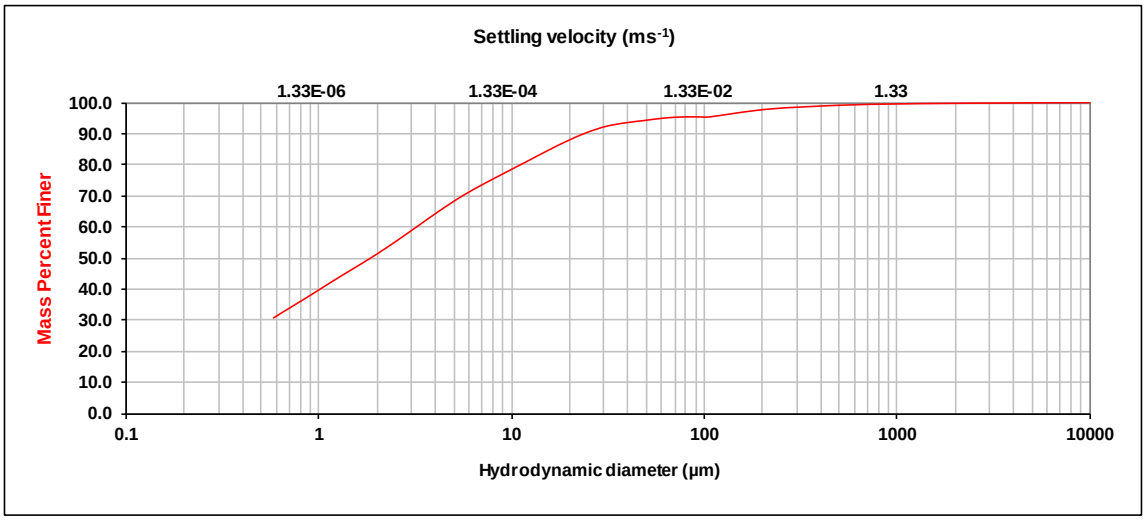
Client ID: A13 5156A 7 5-1B

Job No: 13_1179

Laboratory ID: 13_1179_07

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	4.0	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	3.2	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	1.3	8.69E-02	5.79	4.60	3.9	2.18E-05
212.00	106.00	2.5	1.84E-02	4.60	3.65	4.3	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.4	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.3	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	0.8	2.45E-03	1.83	1.45	3.8	2.18E-06
48.70	38.68	0.8	1.54E-03	1.45	1.15	3.8	1.37E-06
38.68	30.73	1.1	9.75E-04	1.15	0.92	3.8	8.68E-07
30.73	24.41	2.0	6.15E-04	0.92	0.73	3.8	5.51E-07
24.41	19.39	2.7	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	3.1	2.45E-04	0.58	0.10	30.7	4.76E-08
15.40	12.23	3.2	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

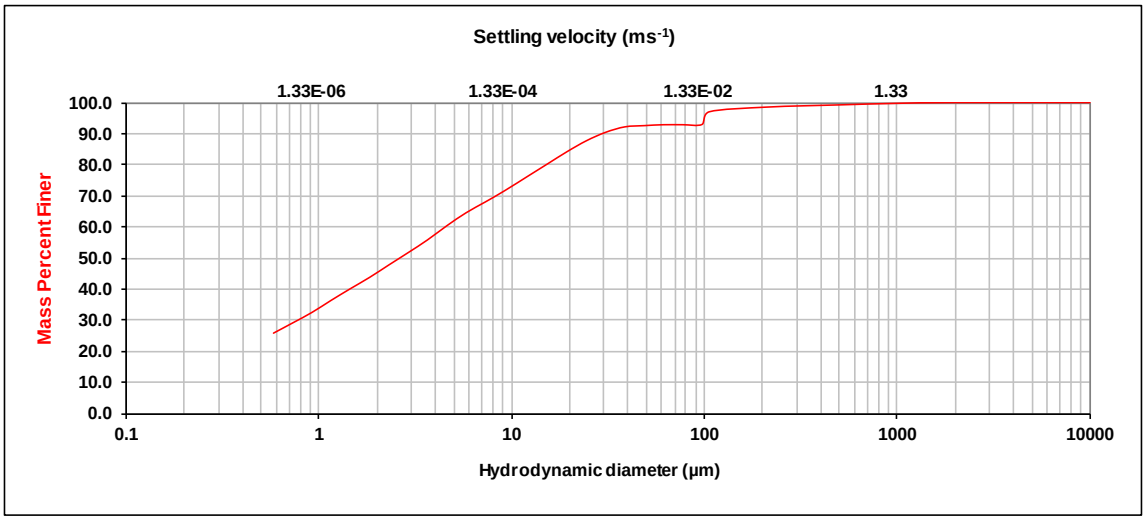
Client ID: A13 5156A 8 5-1C

Job No: 13_1179

Laboratory ID: 13_1179_08

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	4.9	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	3.6	5.48E-05
1000.00	500.00	0.5	4.10E-01	7.29	5.79	3.5	3.46E-05
500.00	212.00	0.7	8.69E-02	5.79	4.60	4.2	2.18E-05
212.00	106.00	1.5	1.84E-02	4.60	3.65	4.6	1.38E-05
106.00	97.16	4.1	8.45E-03	3.65	2.90	4.1	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.0	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	3.7	2.18E-06
48.70	38.68	0.4	1.54E-03	1.45	1.15	3.8	1.37E-06
38.68	30.73	1.7	9.75E-04	1.15	0.92	3.8	8.68E-07
30.73	24.41	2.7	6.15E-04	0.92	0.73	3.4	5.51E-07
24.41	19.39	3.5	3.88E-04	0.73	0.58	3.3	3.47E-07
19.39	15.40	3.9	2.45E-04	0.58	0.10	25.8	4.76E-08
15.40	12.23	3.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by w et screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity w orksheet

microanalysis australia

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

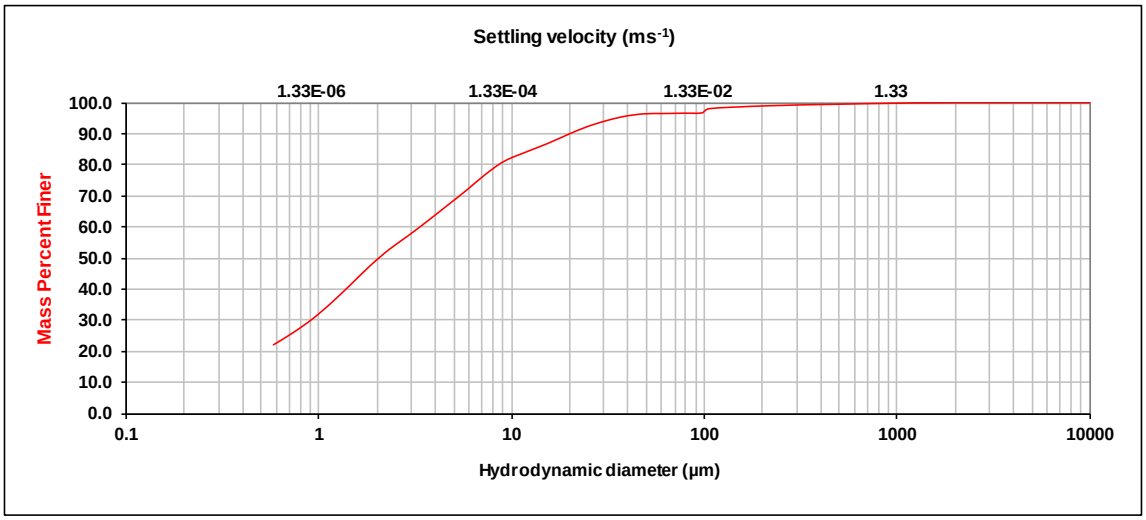
Client ID: A13 5156A 9 6-3

Job No: 13_1179

Laboratory ID: 13_1179_09

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	3.2	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	4.3	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	5.2	3.46E-05
500.00	212.00	0.5	8.69E-02	5.79	4.60	4.9	2.18E-05
212.00	106.00	0.9	1.84E-02	4.60	3.65	4.9	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	4.7	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.5	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	5.3	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	6.1	2.18E-06
48.70	38.68	0.8	1.54E-03	1.45	1.15	5.9	1.37E-06
38.68	30.73	1.5	9.75E-04	1.15	0.92	5.1	8.68E-07
30.73	24.41	2.0	6.15E-04	0.92	0.73	4.4	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	2.7	2.45E-04	0.58	0.10	22.1	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

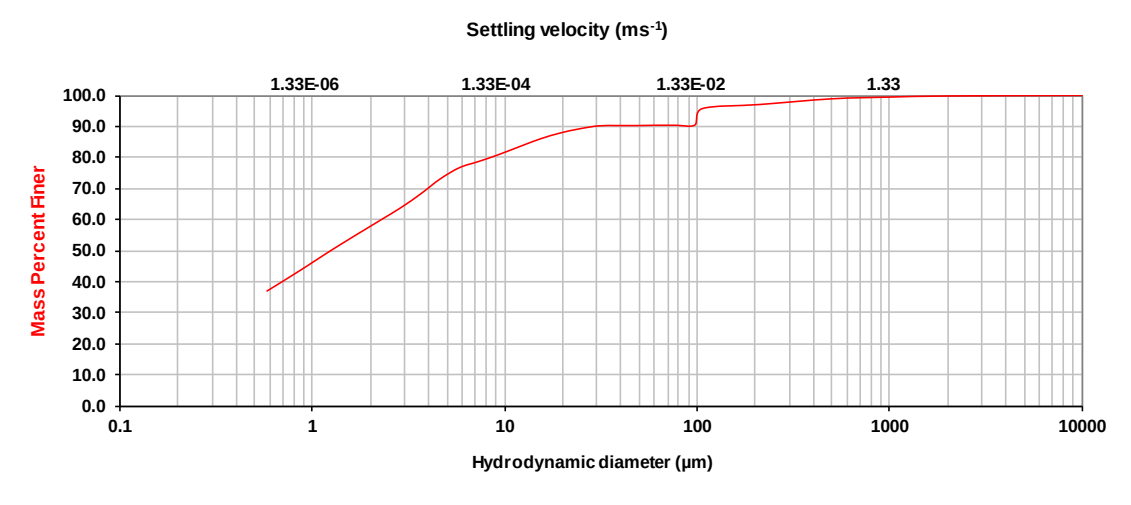
Client ID: A13 5156A 10 6-2A

Job No: 13_1179

Laboratory ID: 13_1179_10

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.0	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	0.6	4.10E-01	7.29	5.79	2.0	3.46E-05
500.00	212.00	1.8	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	1.3	1.84E-02	4.60	3.65	4.8	1.38E-05
106.00	97.16	5.3	8.45E-03	3.65	2.90	4.3	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	3.8	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	3.7	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	3.8	2.18E-06
48.70	38.68	0.0	1.54E-03	1.45	1.15	3.9	1.37E-06
38.68	30.73	0.1	9.75E-04	1.15	0.92	3.9	8.68E-07
30.73	24.41	1.0	6.15E-04	0.92	0.73	3.9	5.51E-07
24.41	19.39	1.3	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	36.9	4.76E-08
15.40	12.23	2.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13/5156A/10 6-2A

Job No: 13_1179

Laboratory ID: 13_1179_10Q(sedi)

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC

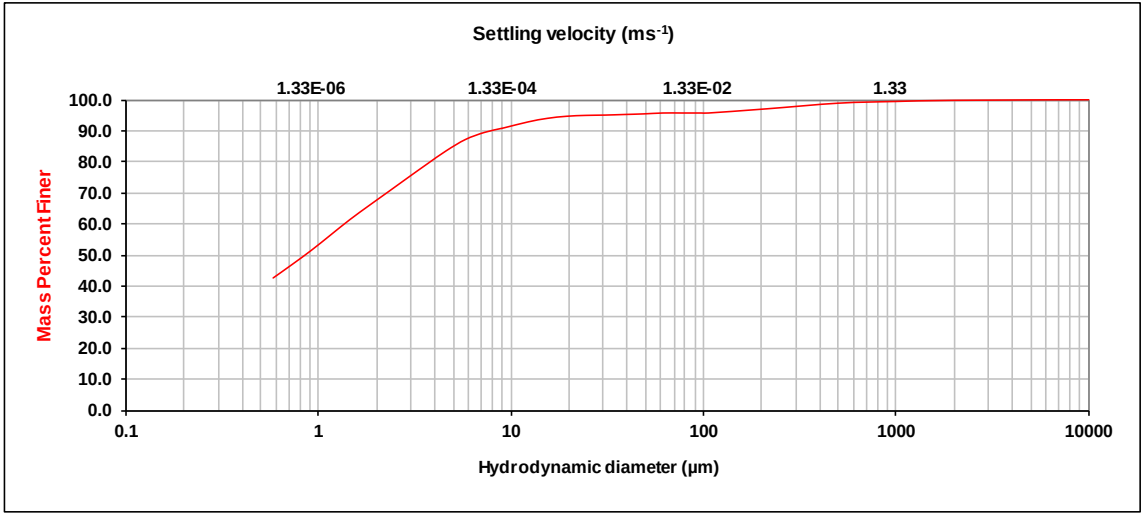
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.35 µm

Liquid viscosity: 0.725 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	1.9	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	1.4	5.48E-05
1000.00	500.00	0.6	4.10E-01	7.29	5.79	2.3	3.46E-05
500.00	212.00	1.8	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	1.3	1.84E-02	4.60	3.65	4.3	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.4	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.5	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	4.4	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	4.6	2.18E-06
48.70	38.68	0.2	1.54E-03	1.45	1.15	5.0	1.37E-06
38.68	30.73	0.2	9.75E-04	1.15	0.92	4.8	8.68E-07
30.73	24.41	0.1	6.15E-04	0.92	0.73	4.6	5.51E-07
24.41	19.39	0.3	3.88E-04	0.73	0.58	4.4	3.47E-07
19.39	15.40	0.7	2.45E-04	0.58	0.10	42.6	4.76E-08
15.40	12.23	1.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

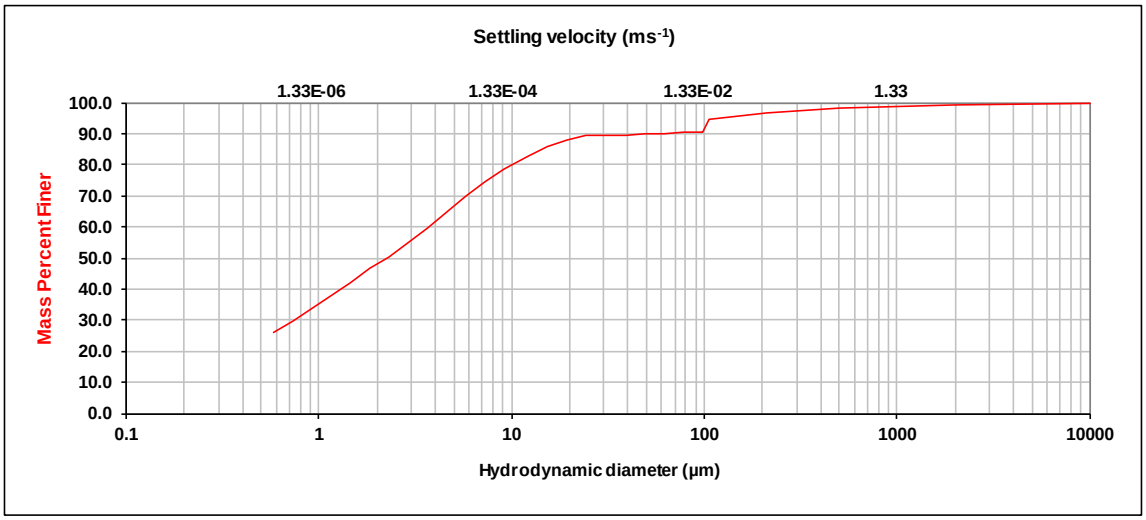
Client ID: A13 5156A 12 7-1

Job No: 13_1179

Laboratory ID: 13_1179_11

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.9	1.64E+01	12.23	9.17	4.2	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	4.1	5.48E-05
1000.00	500.00	0.7	4.10E-01	7.29	5.79	4.5	3.46E-05
500.00	212.00	1.5	8.69E-02	5.79	4.60	5.0	2.18E-05
212.00	106.00	2.0	1.84E-02	4.60	3.65	5.2	1.38E-05
106.00	97.16	4.1	8.45E-03	3.65	2.90	4.9	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.3	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	4.2	2.18E-06
48.70	38.68	0.4	1.54E-03	1.45	1.15	4.2	1.37E-06
38.68	30.73	0.1	9.75E-04	1.15	0.92	4.1	8.68E-07
30.73	24.41	0.0	6.15E-04	0.92	0.73	4.2	5.51E-07
24.41	19.39	1.5	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	2.3	2.45E-04	0.58	0.10	26.0	4.76E-08
15.40	12.23	2.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13/5156A/12 7-1

Job No: 13_1179

Laboratory ID: 13_1179_11Q(sieving)

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 °C

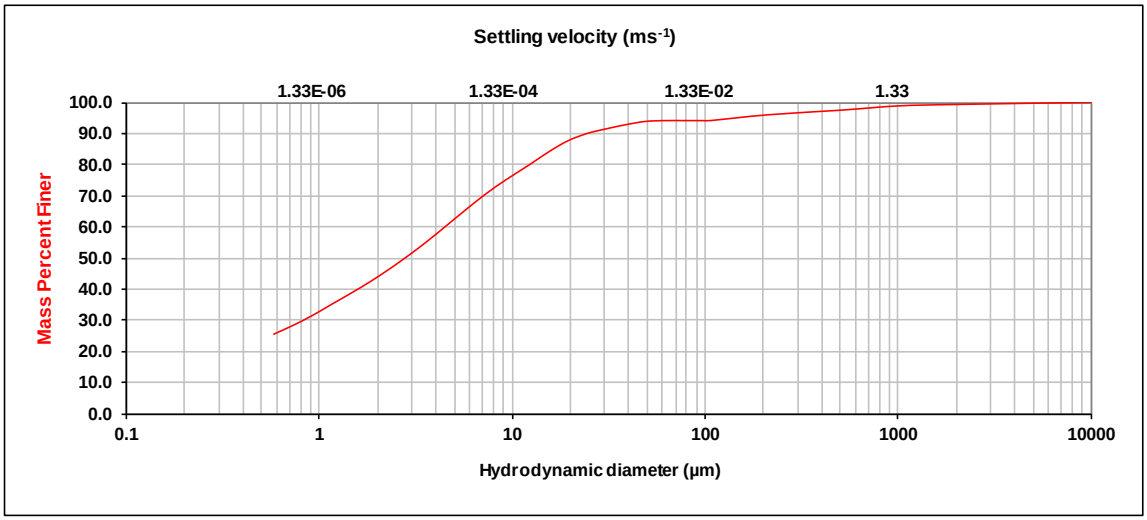
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (measured)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.35 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.7	1.64E+01	12.23	9.17	5.0	9.20E-05
2000.00	1000.00	0.5	1.64E+00	9.17	7.29	4.3	5.48E-05
1000.00	500.00	1.4	4.10E-01	7.29	5.79	4.9	3.46E-05
500.00	212.00	1.5	8.69E-02	5.79	4.60	5.1	2.18E-05
212.00	106.00	1.9	1.84E-02	4.60	3.65	5.1	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.7	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.4	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	3.8	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	3.6	1.37E-06
38.68	30.73	1.3	9.75E-04	1.15	0.92	3.5	8.68E-07
30.73	24.41	1.5	6.15E-04	0.92	0.73	3.2	5.51E-07
24.41	19.39	2.4	3.88E-04	0.73	0.58	2.8	3.47E-07
19.39	15.40	3.6	2.45E-04	0.58	0.10	25.5	4.76E-08
15.40	12.23	4.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

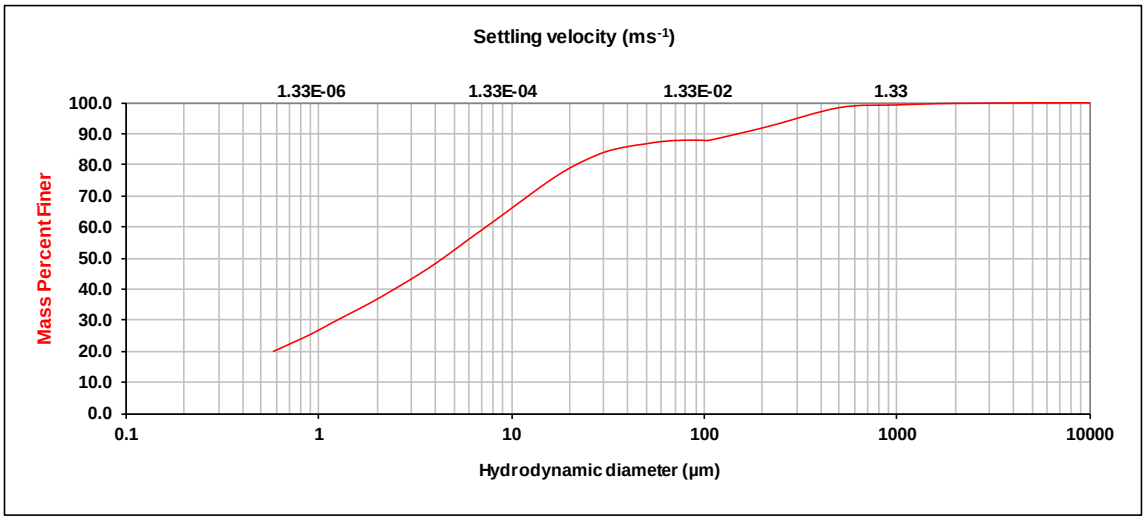
Client ID: A13 5156A 13 8-1

Job No: 13_1179

Laboratory ID: 13_1179_12

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	5.7	9.20E-05
2000.00	1000.00	0.5	1.64E+00	9.17	7.29	4.5	5.48E-05
1000.00	500.00	0.9	4.10E-01	7.29	5.79	4.5	3.46E-05
500.00	212.00	6.1	8.69E-02	5.79	4.60	4.6	2.18E-05
212.00	106.00	4.4	1.84E-02	4.60	3.65	4.3	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.7	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	3.5	3.45E-06
61.31	48.70	0.9	2.45E-03	1.83	1.45	3.3	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	1.5	9.75E-04	1.15	0.92	3.3	8.68E-07
30.73	24.41	2.5	6.15E-04	0.92	0.73	2.9	5.51E-07
24.41	19.39	3.2	3.88E-04	0.73	0.58	2.8	3.47E-07
19.39	15.40	4.0	2.45E-04	0.58	0.10	19.9	4.76E-08
15.40	12.23	4.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

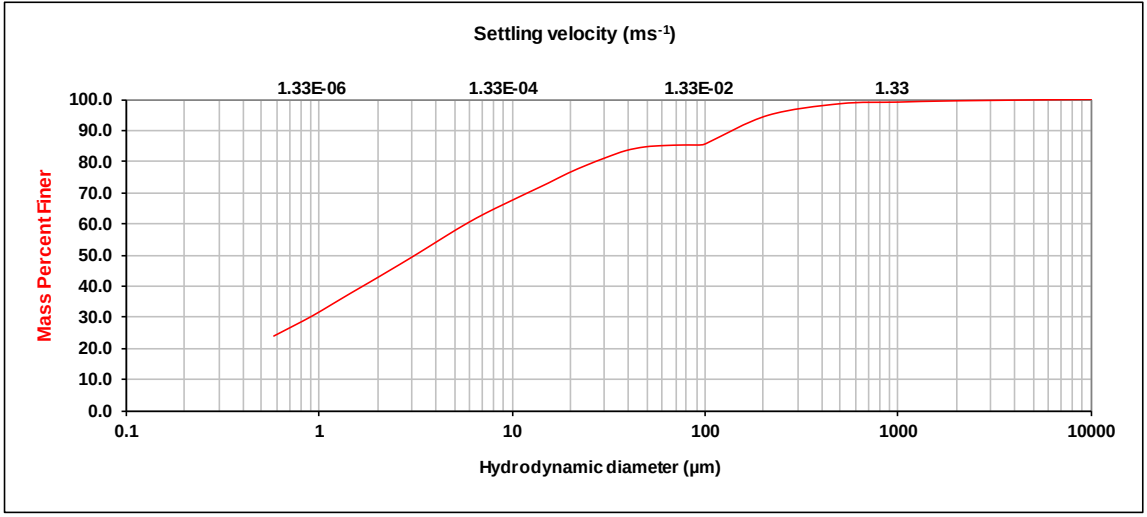
Client ID: A13 5156A 14 8-3

Job No: 13_1179

Laboratory ID: 13_1179_13

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.5	1.64E+01	12.23	9.17	3.7	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	3.0	5.48E-05
1000.00	500.00	0.5	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	3.7	8.69E-02	5.79	4.60	3.7	2.18E-05
212.00	106.00	8.4	1.84E-02	4.60	3.65	3.9	1.38E-05
106.00	97.16	1.0	8.45E-03	3.65	2.90	3.8	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	3.7	5.47E-06
77.18	61.31	0.2	3.88E-03	2.30	1.83	3.6	3.45E-06
61.31	48.70	0.4	2.45E-03	1.83	1.45	3.6	2.18E-06
48.70	38.68	1.2	1.54E-03	1.45	1.15	3.7	1.37E-06
38.68	30.73	2.2	9.75E-04	1.15	0.92	3.5	8.68E-07
30.73	24.41	2.4	6.15E-04	0.92	0.73	3.3	5.51E-07
24.41	19.39	2.7	3.88E-04	0.73	0.58	3.2	3.47E-07
19.39	15.40	3.1	2.45E-04	0.58	0.10	23.9	4.76E-08
15.40	12.23	2.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

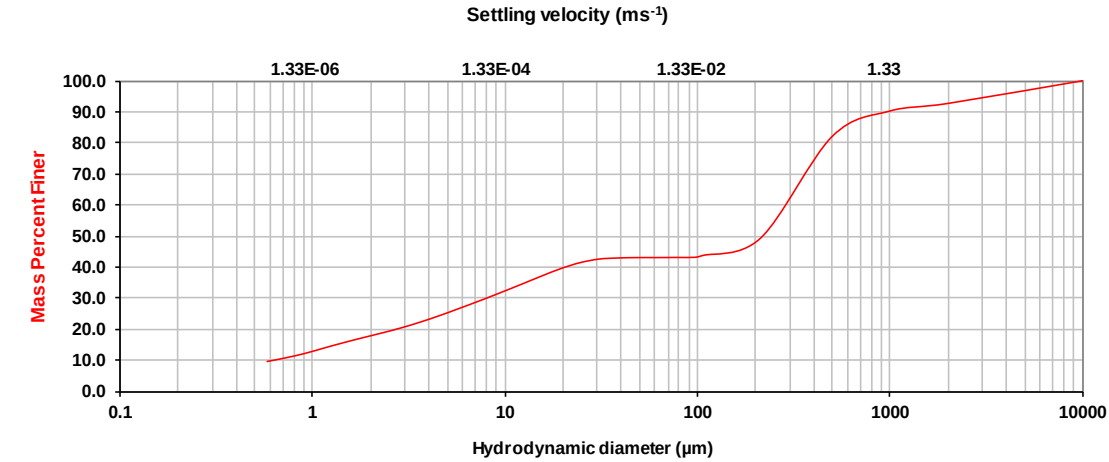
Client ID: A13 5156A 15 -91

Job No: 13_1179

Laboratory ID: 13_1179_14

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	7.3	1.64E+01	12.23	9.17	3.1	9.20E-05
2000.00	1000.00	2.4	1.64E+00	9.17	7.29	2.4	5.48E-05
1000.00	500.00	8.2	4.10E-01	7.29	5.79	2.3	3.46E-05
500.00	212.00	32.8	8.69E-02	5.79	4.60	2.3	2.18E-05
212.00	106.00	5.6	1.84E-02	4.60	3.65	2.1	1.38E-05
106.00	97.16	0.6	8.45E-03	3.65	2.90	1.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	1.7	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	1.5	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	1.6	2.18E-06
48.70	38.68	0.1	1.54E-03	1.45	1.15	1.7	1.37E-06
38.68	30.73	0.3	9.75E-04	1.15	0.92	1.7	8.68E-07
30.73	24.41	1.2	6.15E-04	0.92	0.73	1.4	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	1.2	3.47E-07
19.39	15.40	2.4	2.45E-04	0.58	0.10	9.6	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

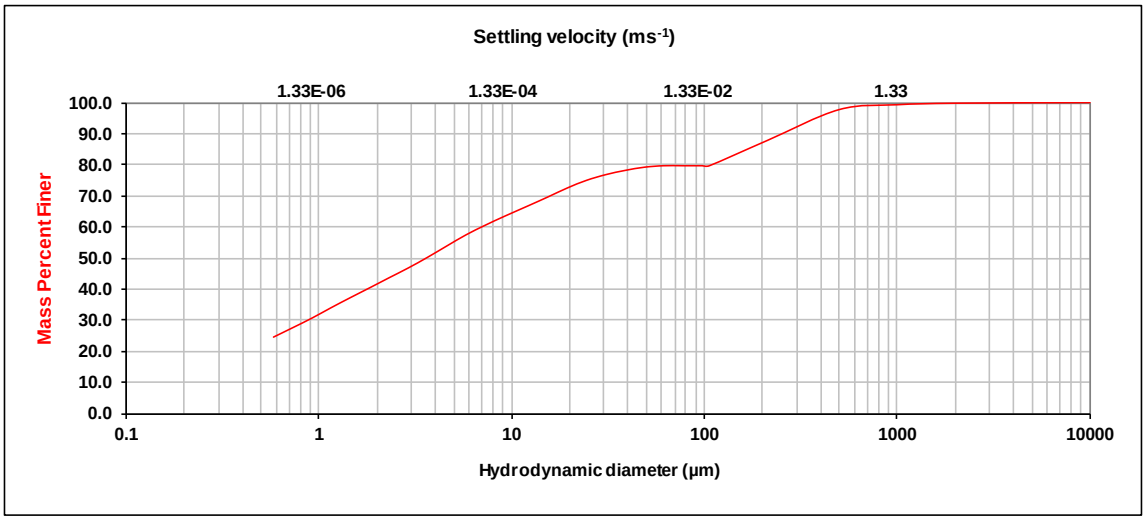
Client ID: A13 5156A 16 10-5

Job No: 13_1179

Laboratory ID: 13_1179_15

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.4	9.20E-05
2000.00	1000.00	0.5	1.64E+00	9.17	7.29	2.9	5.48E-05
1000.00	500.00	1.6	4.10E-01	7.29	5.79	3.1	3.46E-05
500.00	212.00	9.9	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	8.1	1.84E-02	4.60	3.65	3.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.4	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.2	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	3.2	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	3.2	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	1.4	9.75E-04	1.15	0.92	3.3	8.68E-07
30.73	24.41	1.8	6.15E-04	0.92	0.73	3.1	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	3.0	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	24.5	4.76E-08
15.40	12.23	2.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

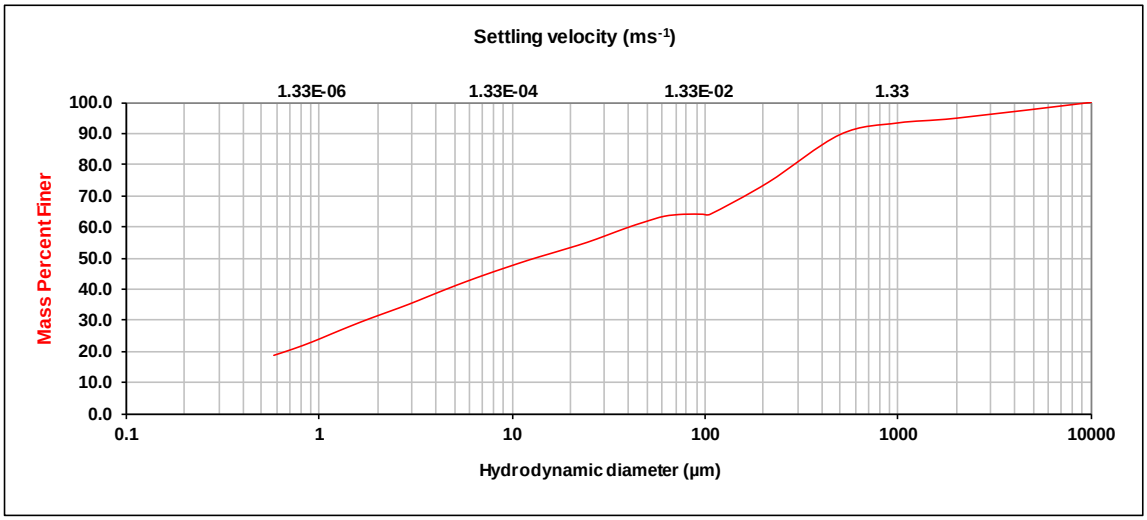
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced
Client ID: A13 5156A 17 10-6
Job No: 13_1179
Laboratory ID: 13_1179_16

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC
Dispersant: Water **Sonication:** 10 min
Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)
Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.34 µm
Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	5.1	1.64E+01	12.23	9.17	2.6	9.20E-05
2000.00	1000.00	1.5	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	3.7	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	15.4	8.69E-02	5.79	4.60	2.4	2.18E-05
212.00	106.00	10.3	1.84E-02	4.60	3.65	2.5	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	2.5	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	2.3	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	2.2	3.45E-06
61.31	48.70	1.8	2.45E-03	1.83	1.45	2.4	2.18E-06
48.70	38.68	2.0	1.54E-03	1.45	1.15	2.6	1.37E-06
38.68	30.73	2.3	9.75E-04	1.15	0.92	2.5	8.68E-07
30.73	24.41	2.2	6.15E-04	0.92	0.73	2.3	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	2.0	3.47E-07
19.39	15.40	1.9	2.45E-04	0.58	0.10	18.7	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

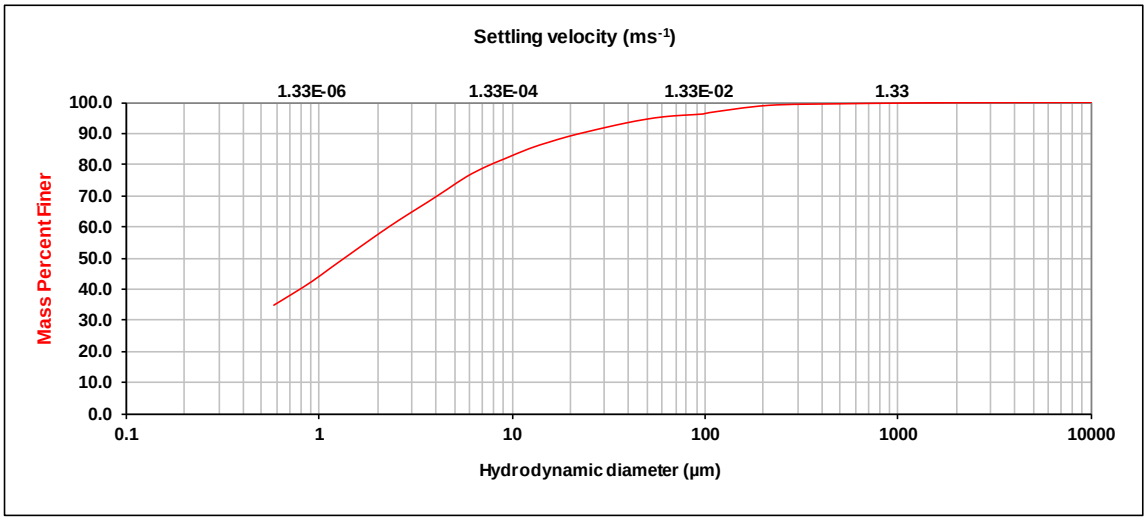
Client ID: A13 5156A 19 10-8

Job No: 13_1179

Laboratory ID: 13_1179_17

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.2	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.2	3.46E-05
500.00	212.00	0.5	8.69E-02	5.79	4.60	4.1	2.18E-05
212.00	106.00	2.3	1.84E-02	4.60	3.65	4.1	1.38E-05
106.00	97.16	0.5	8.45E-03	3.65	2.90	3.9	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.1	5.47E-06
77.18	61.31	0.5	3.88E-03	2.30	1.83	4.3	3.45E-06
61.31	48.70	0.9	2.45E-03	1.83	1.45	4.4	2.18E-06
48.70	38.68	1.2	1.54E-03	1.45	1.15	4.4	1.37E-06
38.68	30.73	1.4	9.75E-04	1.15	0.92	4.4	8.68E-07
30.73	24.41	1.5	6.15E-04	0.92	0.73	4.0	5.51E-07
24.41	19.39	1.5	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	34.8	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

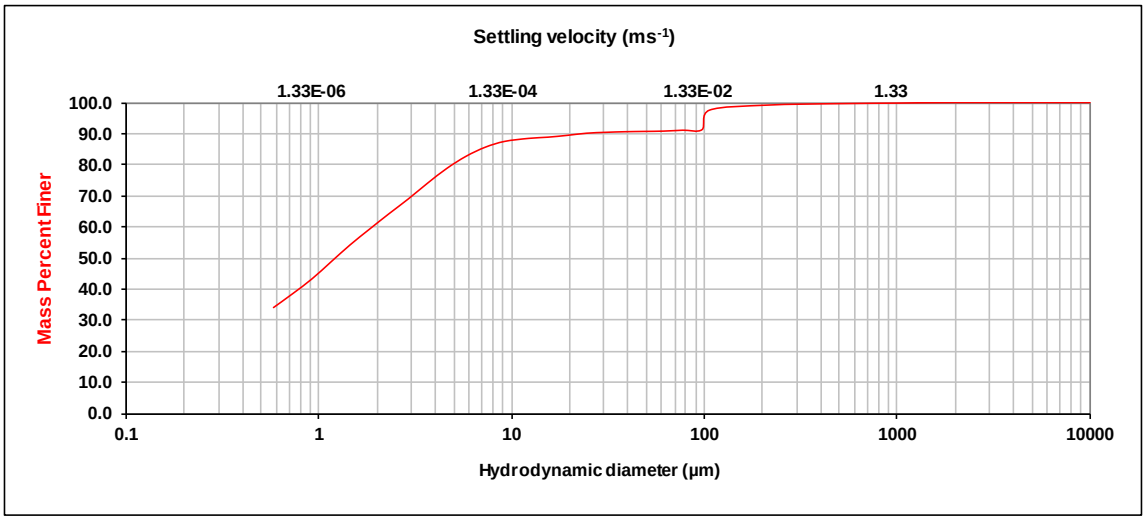
Client ID: A13 5156A 20 11-9A

Job No: 13_1179

Laboratory ID: 13_1179_18

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	1.0	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	1.9	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	2.9	3.46E-05
500.00	212.00	0.5	8.69E-02	5.79	4.60	3.9	2.18E-05
212.00	106.00	1.6	1.84E-02	4.60	3.65	4.8	1.38E-05
106.00	97.16	6.2	8.45E-03	3.65	2.90	5.1	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	4.8	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	4.9	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	5.1	2.18E-06
48.70	38.68	0.1	1.54E-03	1.45	1.15	5.6	1.37E-06
38.68	30.73	0.2	9.75E-04	1.15	0.92	5.4	8.68E-07
30.73	24.41	0.3	6.15E-04	0.92	0.73	4.8	5.51E-07
24.41	19.39	0.7	3.88E-04	0.73	0.58	4.5	3.47E-07
19.39	15.40	0.6	2.45E-04	0.58	0.10	34.0	4.76E-08
15.40	12.23	0.4	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

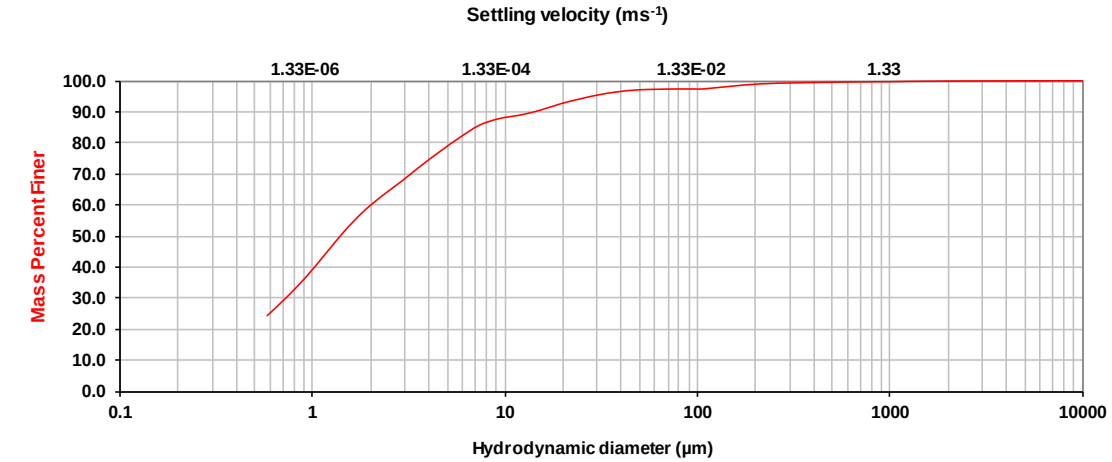
Client ID: A13 5156A 21 11-9B

Job No: 13_1179

Laboratory ID: 13_1179_19

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	1.4	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.9	3.46E-05
500.00	212.00	0.5	8.69E-02	5.79	4.60	4.4	2.18E-05
212.00	106.00	1.6	1.84E-02	4.60	3.65	4.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	5.0	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.7	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	5.2	3.45E-06
61.31	48.70	0.2	2.45E-03	1.83	1.45	6.5	2.18E-06
48.70	38.68	0.6	1.54E-03	1.45	1.15	7.5	1.37E-06
38.68	30.73	1.0	9.75E-04	1.15	0.92	7.1	8.68E-07
30.73	24.41	1.4	6.15E-04	0.92	0.73	6.5	5.51E-07
24.41	19.39	1.6	3.88E-04	0.73	0.58	5.8	3.47E-07
19.39	15.40	1.9	2.45E-04	0.58	0.10	24.3	4.76E-08
15.40	12.23	1.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

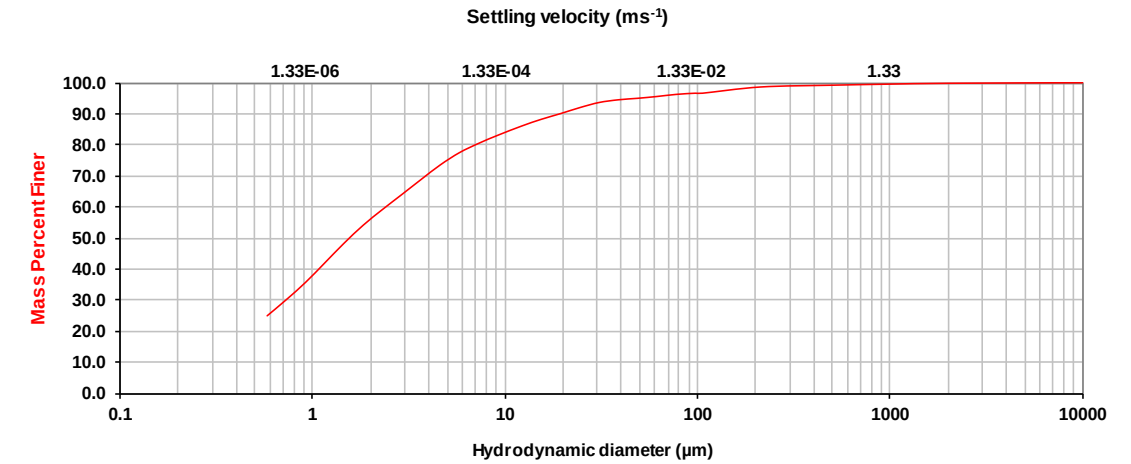
Client ID: A13 5156A 22 11-9C

Job No: 13_1179

Laboratory ID: 13_1179_20

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.0	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	0.6	8.69E-02	5.79	4.60	4.0	2.18E-05
212.00	106.00	2.0	1.84E-02	4.60	3.65	4.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.8	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.8	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	5.0	3.45E-06
61.31	48.70	0.6	2.45E-03	1.83	1.45	5.9	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	6.4	1.37E-06
38.68	30.73	0.9	9.75E-04	1.15	0.92	6.1	8.68E-07
30.73	24.41	1.6	6.15E-04	0.92	0.73	5.6	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	5.2	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	24.9	4.76E-08
15.40	12.23	2.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13/5156A/22 11-9C

Job No: 13_1179

Laboratory ID: 13_1179_20

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC

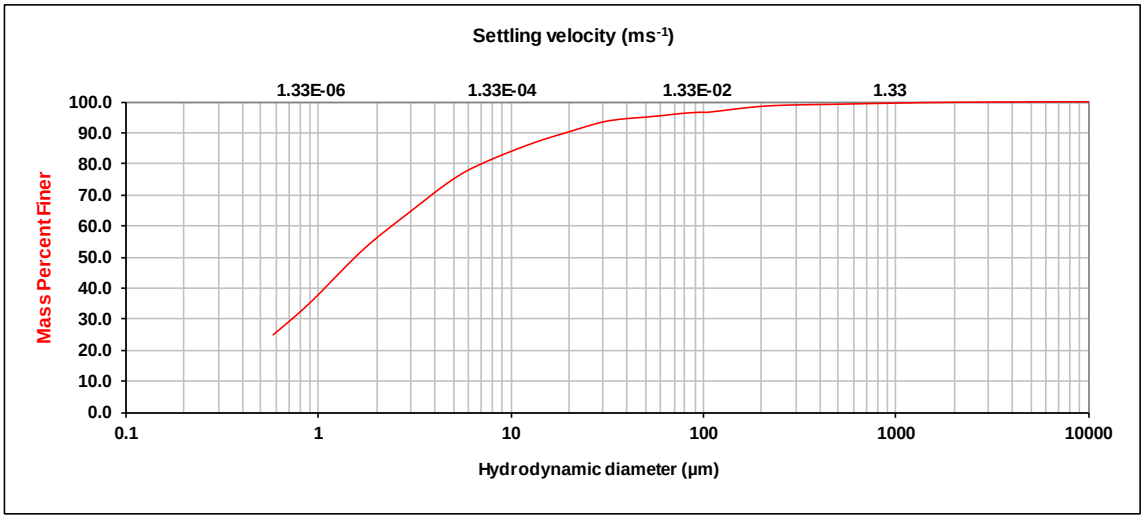
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.35 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.0	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	0.6	8.69E-02	5.79	4.60	4.0	2.18E-05
212.00	106.00	2.0	1.84E-02	4.60	3.65	4.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.8	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.8	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	5.0	3.45E-06
61.31	48.70	0.6	2.45E-03	1.83	1.45	5.9	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	6.4	1.37E-06
38.68	30.73	0.9	9.75E-04	1.15	0.92	6.1	8.68E-07
30.73	24.41	1.6	6.15E-04	0.92	0.73	5.6	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	5.2	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	24.9	4.76E-08
15.40	12.23	2.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

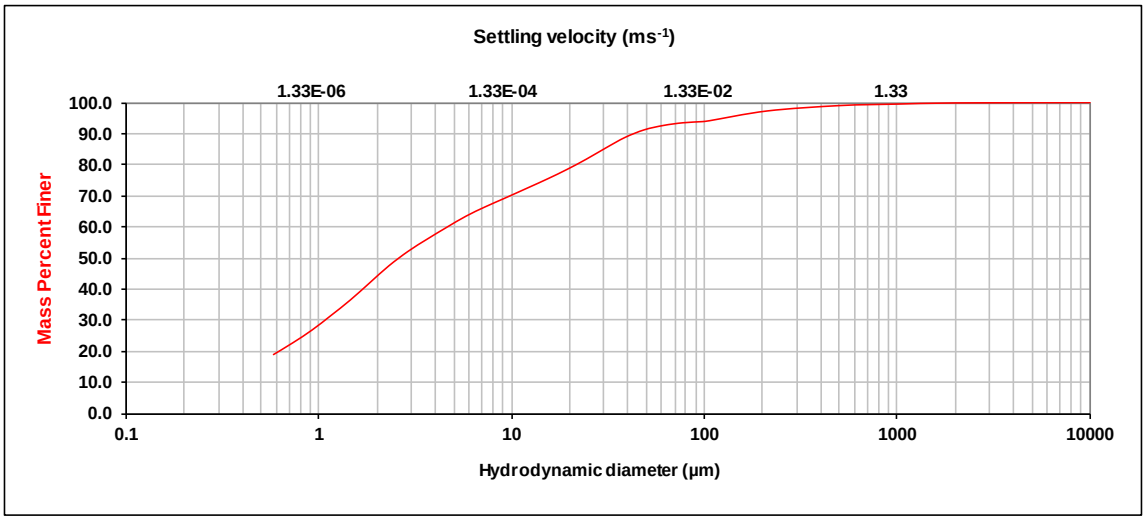
Client ID: A13 5156A 23 11-8

Job No: 13_1179

Laboratory ID: 13_1179_21

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.5	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	2.7	5.48E-05
1000.00	500.00	0.5	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	1.7	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	3.2	1.84E-02	4.60	3.65	3.8	1.38E-05
106.00	97.16	0.3	8.45E-03	3.65	2.90	4.0	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.7	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	5.5	3.45E-06
61.31	48.70	1.4	2.45E-03	1.83	1.45	5.6	2.18E-06
48.70	38.68	2.4	1.54E-03	1.45	1.15	5.0	1.37E-06
38.68	30.73	3.4	9.75E-04	1.15	0.92	4.6	8.68E-07
30.73	24.41	3.6	6.15E-04	0.92	0.73	4.1	5.51E-07
24.41	19.39	3.3	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	3.0	2.45E-04	0.58	0.10	18.9	4.76E-08
15.40	12.23	2.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

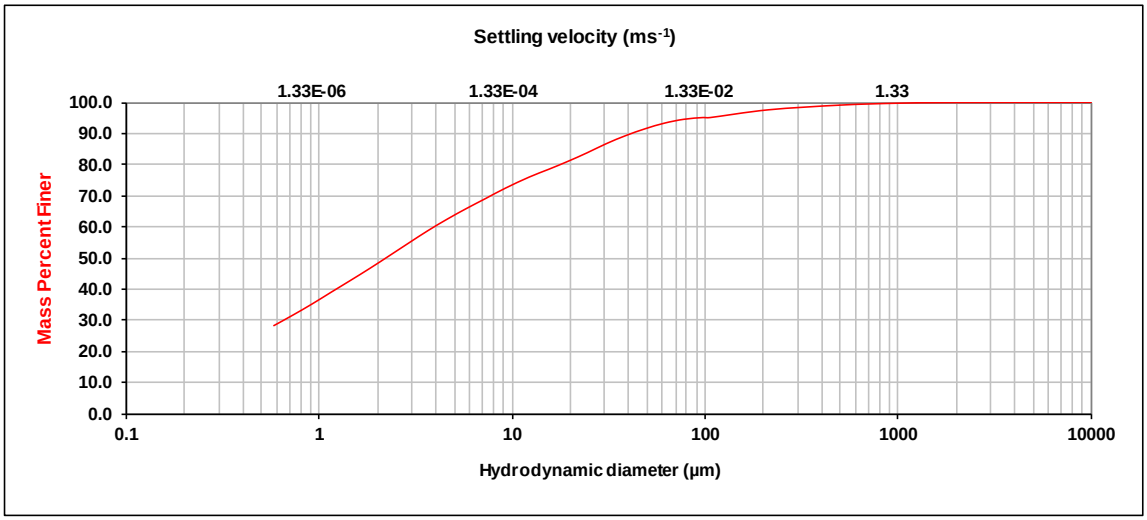
Client ID: A13/5156A/23 11-8

Job No: 13_1179

Laboratory ID: 13_1179_21SieveQAQC

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.6	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	3.2	5.48E-05
1000.00	500.00	0.6	4.10E-01	7.29	5.79	3.2	3.46E-05
500.00	212.00	1.5	8.69E-02	5.79	4.60	3.4	2.18E-05
212.00	106.00	2.5	1.84E-02	4.60	3.65	3.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.0	8.68E-06
97.16	77.18	0.6	6.15E-03	2.90	2.30	4.1	5.47E-06
77.18	61.31	1.2	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	1.8	2.45E-03	1.83	1.45	3.9	2.18E-06
48.70	38.68	2.2	1.54E-03	1.45	1.15	3.8	1.37E-06
38.68	30.73	2.6	9.75E-04	1.15	0.92	3.7	8.68E-07
30.73	24.41	2.9	6.15E-04	0.92	0.73	3.6	5.51E-07
24.41	19.39	2.8	3.88E-04	0.73	0.58	3.4	3.47E-07
19.39	15.40	2.6	2.45E-04	0.58	0.10	28.2	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13 5156A 24 11-5

Job No: 13_1179

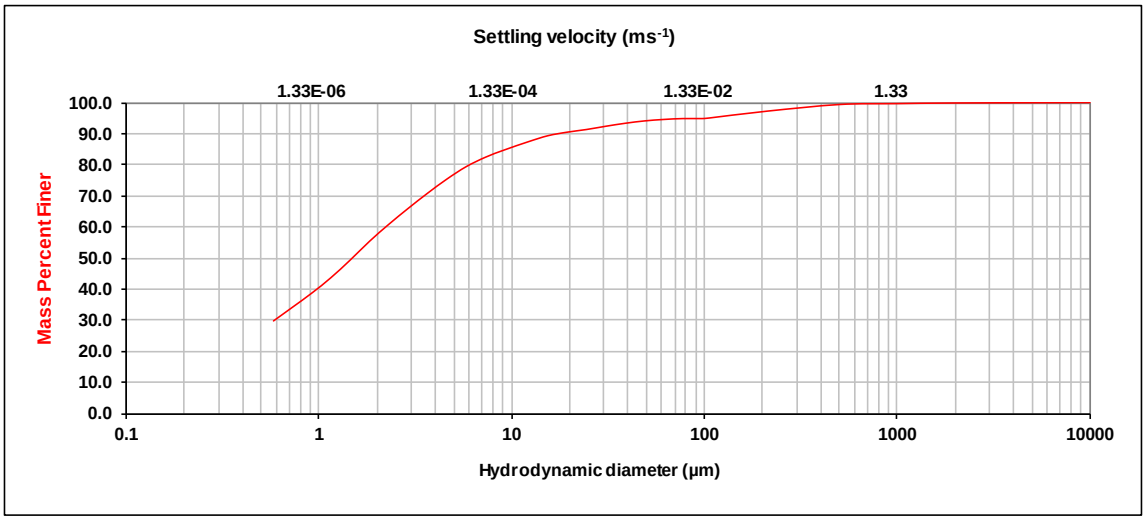
Laboratory ID: 13_1179_22

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density: 2.650 g/cm^3 (measured)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.35 µm

Liquid viscosity: 0.725 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	2.7	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.4	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	2.1	8.69E-02	5.79	4.60	4.0	2.18E-05
212.00	106.00	2.2	1.84E-02	4.60	3.65	4.6	1.38E-05
106.00	97.16	0.2	8.45E-03	3.65	2.90	4.8	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	5.1	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	5.4	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	6.1	2.18E-06
48.70	38.68	0.8	1.54E-03	1.45	1.15	5.7	1.37E-06
38.68	30.73	1.0	9.75E-04	1.15	0.92	4.8	8.68E-07
30.73	24.41	1.0	6.15E-04	0.92	0.73	4.6	5.51E-07
24.41	19.39	0.9	3.88E-04	0.73	0.58	4.5	3.47E-07
19.39	15.40	1.1	2.45E-04	0.58	0.10	29.7	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

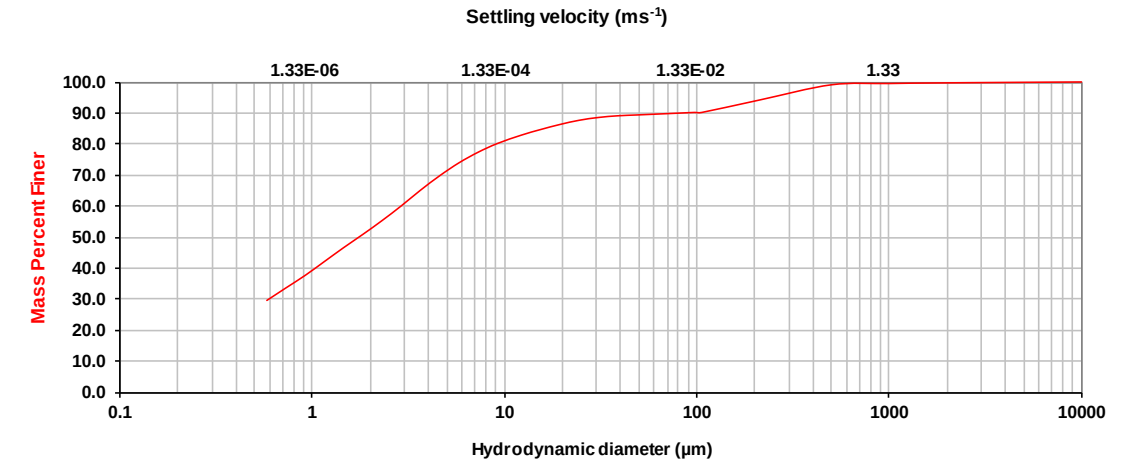
Client ID: A13 5156A 25 12-1

Job No: 13_1179

Laboratory ID: 13_1179_23

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 °C
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	2.7	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.8	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	4.9	8.69E-02	5.79	4.60	4.1	2.18E-05
212.00	106.00	4.0	1.84E-02	4.60	3.65	4.7	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	5.0	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	4.8	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	4.4	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	4.3	2.18E-06
48.70	38.68	0.3	1.54E-03	1.45	1.15	4.5	1.37E-06
38.68	30.73	0.5	9.75E-04	1.15	0.92	4.3	8.68E-07
30.73	24.41	0.9	6.15E-04	0.92	0.73	4.1	5.51E-07
24.41	19.39	1.4	3.88E-04	0.73	0.58	4.1	3.47E-07
19.39	15.40	1.6	2.45E-04	0.58	0.10	29.6	4.76E-08
15.40	12.23	1.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

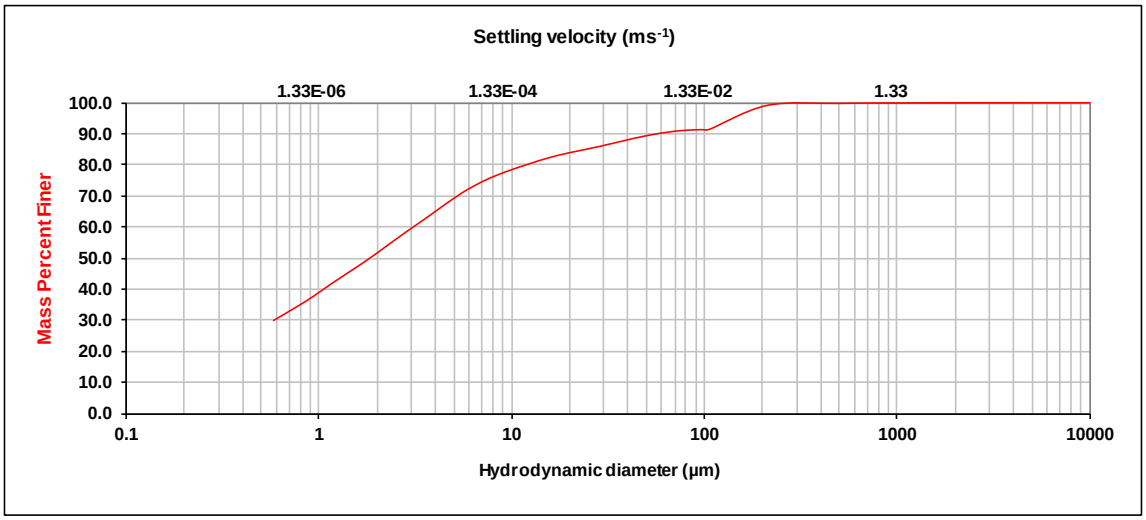
Client ID: A13 5156A 26 12-2

Job No: 13_1179

Laboratory ID: 13_1179_24

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	2.6	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.1	4.10E-01	7.29	5.79	3.3	3.46E-05
500.00	212.00	0.6	8.69E-02	5.79	4.60	4.1	2.18E-05
212.00	106.00	7.7	1.84E-02	4.60	3.65	4.5	1.38E-05
106.00	97.16	0.1	8.45E-03	3.65	2.90	4.3	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	4.5	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	4.5	3.45E-06
61.31	48.70	1.1	2.45E-03	1.83	1.45	4.2	2.18E-06
48.70	38.68	1.4	1.54E-03	1.45	1.15	4.1	1.37E-06
38.68	30.73	1.5	9.75E-04	1.15	0.92	4.2	8.68E-07
30.73	24.41	1.4	6.15E-04	0.92	0.73	3.8	5.51E-07
24.41	19.39	1.3	3.88E-04	0.73	0.58	3.7	3.47E-07
19.39	15.40	1.6	2.45E-04	0.58	0.10	29.9	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

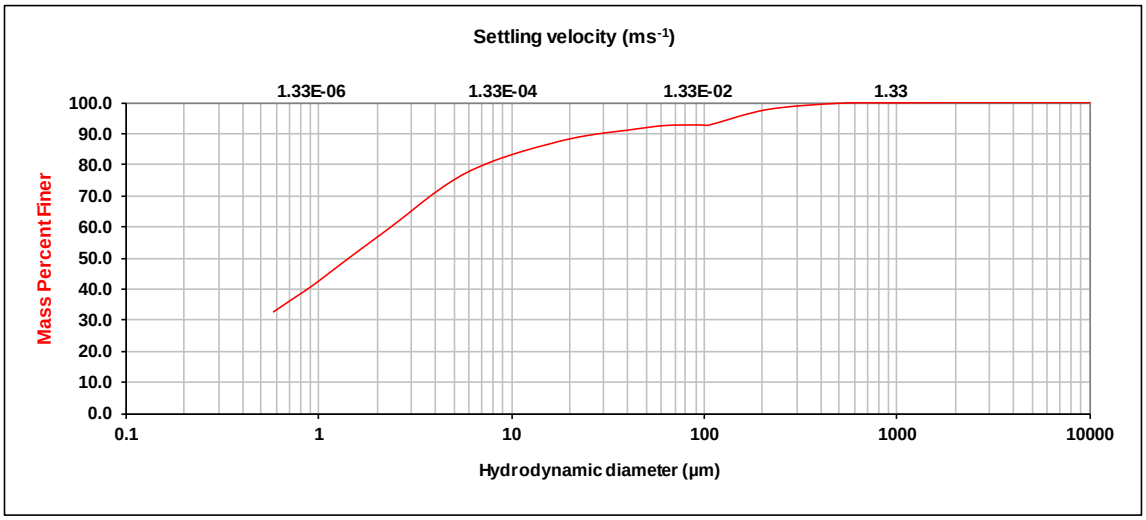
Client ID: A13 5156A 27 15-1

Job No: 13_1179

Laboratory ID: 13_1179_25

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	2.4	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.3	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	2.8	3.46E-05
500.00	212.00	2.0	8.69E-02	5.79	4.60	3.7	2.18E-05
212.00	106.00	5.0	1.84E-02	4.60	3.65	4.5	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	4.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.8	5.47E-06
77.18	61.31	0.2	3.88E-03	2.30	1.83	4.5	3.45E-06
61.31	48.70	0.7	2.45E-03	1.83	1.45	4.6	2.18E-06
48.70	38.68	0.8	1.54E-03	1.45	1.15	4.7	1.37E-06
38.68	30.73	0.7	9.75E-04	1.15	0.92	4.5	8.68E-07
30.73	24.41	0.9	6.15E-04	0.92	0.73	4.2	5.51E-07
24.41	19.39	1.2	3.88E-04	0.73	0.58	4.2	3.47E-07
19.39	15.40	1.6	2.45E-04	0.58	0.10	32.7	4.76E-08
15.40	12.23	1.7	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

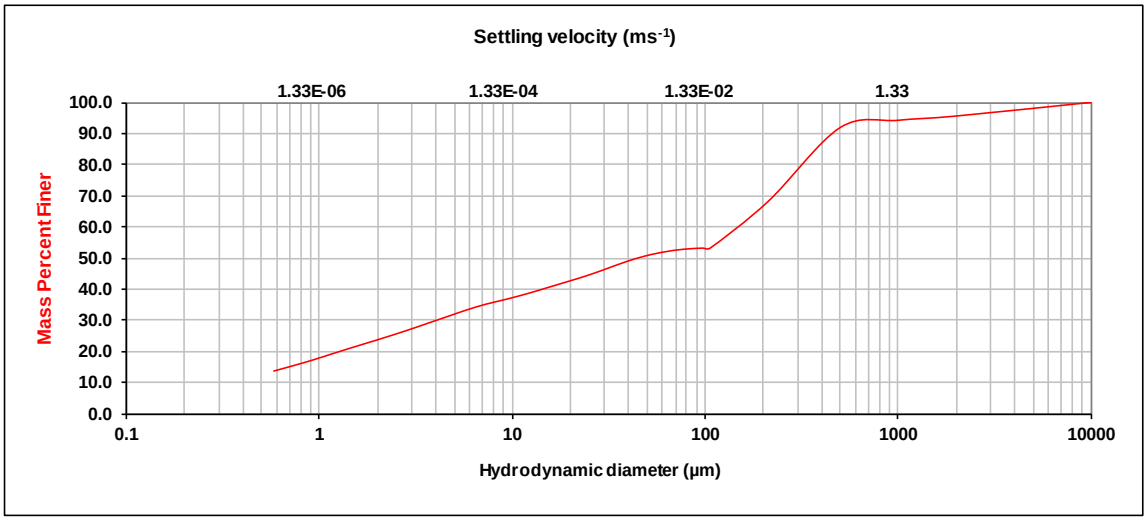
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced
Client ID: A13 5156A 28 15-2
Job No: 13_1179
Laboratory ID: 13_1179_26

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	4.4	1.64E+01	12.23	9.17	2.1	9.20E-05
2000.00	1000.00	1.4	1.64E+00	9.17	7.29	1.5	5.48E-05
1000.00	500.00	2.3	4.10E-01	7.29	5.79	1.9	3.46E-05
500.00	212.00	23.7	8.69E-02	5.79	4.60	2.1	2.18E-05
212.00	106.00	15.0	1.84E-02	4.60	3.65	2.1	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	2.1	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	2.0	5.47E-06
77.18	61.31	0.9	3.88E-03	2.30	1.83	1.9	3.45E-06
61.31	48.70	1.3	2.45E-03	1.83	1.45	1.9	2.18E-06
48.70	38.68	1.9	1.54E-03	1.45	1.15	2.0	1.37E-06
38.68	30.73	2.2	9.75E-04	1.15	0.92	1.9	8.68E-07
30.73	24.41	2.2	6.15E-04	0.92	0.73	1.8	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	1.7	3.47E-07
19.39	15.40	1.9	2.45E-04	0.58	0.10	13.7	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

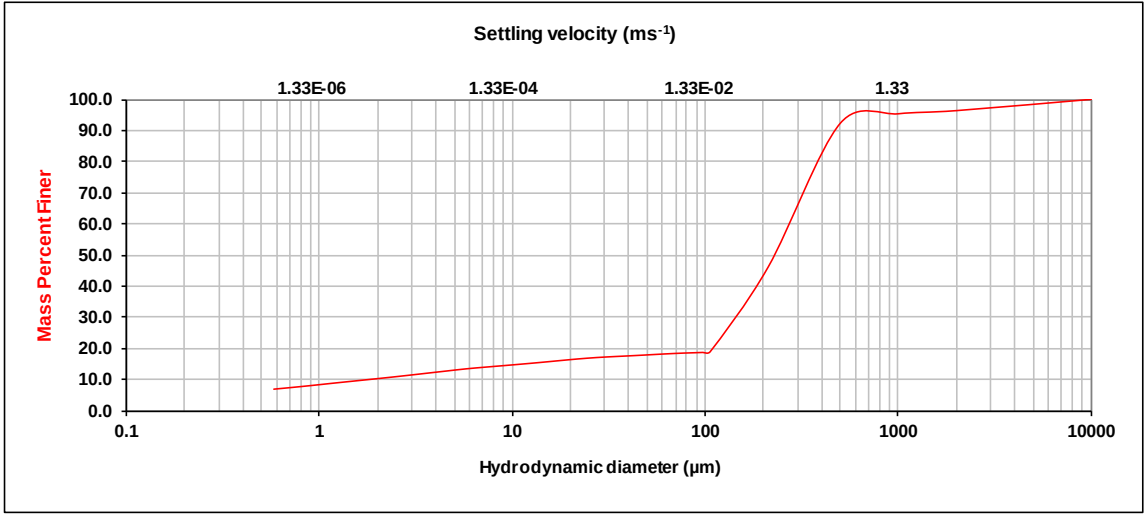
Client ID: A13 5156A 29 15-3

Job No: 13_1179

Laboratory ID: 13_1179_27

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	3.6	1.64E+01	12.23	9.17	0.7	9.20E-05
2000.00	1000.00	1.0	1.64E+00	9.17	7.29	0.5	5.48E-05
1000.00	500.00	3.1	4.10E-01	7.29	5.79	0.5	3.46E-05
500.00	212.00	46.1	8.69E-02	5.79	4.60	0.7	2.18E-05
212.00	106.00	27.3	1.84E-02	4.60	3.65	0.7	1.38E-05
106.00	97.16	0.2	8.45E-03	3.65	2.90	0.7	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	0.7	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	0.6	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	0.6	2.18E-06
48.70	38.68	0.3	1.54E-03	1.45	1.15	0.6	1.37E-06
38.68	30.73	0.3	9.75E-04	1.15	0.92	0.6	8.68E-07
30.73	24.41	0.4	6.15E-04	0.92	0.73	0.6	5.51E-07
24.41	19.39	0.5	3.88E-04	0.73	0.58	0.6	3.47E-07
19.39	15.40	0.6	2.45E-04	0.58	0.10	6.9	4.76E-08
15.40	12.23	0.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

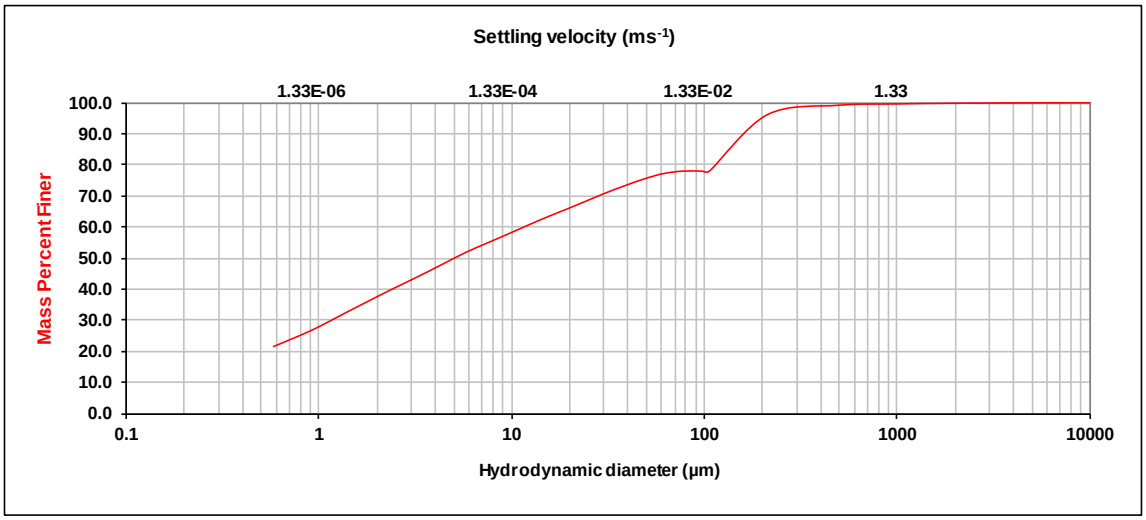
Client ID: A13 5156A 30 13-1

Job No: 13_1179

Laboratory ID: 13_1179_28

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.4	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	2.7	3.46E-05
500.00	212.00	3.0	8.69E-02	5.79	4.60	3.1	2.18E-05
212.00	106.00	18.2	1.84E-02	4.60	3.65	3.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.0	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.0	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	3.1	3.45E-06
61.31	48.70	1.7	2.45E-03	1.83	1.45	3.2	2.18E-06
48.70	38.68	2.2	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	2.3	9.75E-04	1.15	0.92	3.0	8.68E-07
30.73	24.41	2.6	6.15E-04	0.92	0.73	2.7	5.51E-07
24.41	19.39	2.6	3.88E-04	0.73	0.58	2.6	3.47E-07
19.39	15.40	2.5	2.45E-04	0.58	0.10	21.5	4.76E-08
15.40	12.23	2.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

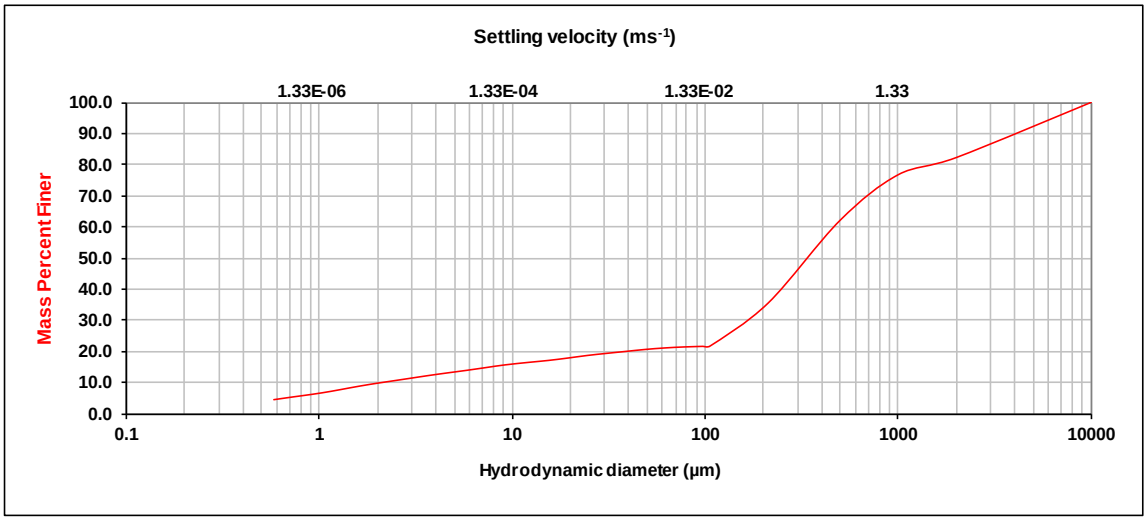
Client ID: A13 5156A 31 13-4A

Job No: 13_1179

Laboratory ID: 13_1179_29

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	17.7	1.64E+01	12.23	9.17	0.8	9.20E-05
2000.00	1000.00	5.5	1.64E+00	9.17	7.29	0.9	5.48E-05
1000.00	500.00	14.6	4.10E-01	7.29	5.79	0.9	3.46E-05
500.00	212.00	26.6	8.69E-02	5.79	4.60	0.8	2.18E-05
212.00	106.00	13.8	1.84E-02	4.60	3.65	0.9	1.38E-05
106.00	97.16	0.1	8.45E-03	3.65	2.90	0.9	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	0.9	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	1.1	2.18E-06
48.70	38.68	0.6	1.54E-03	1.45	1.15	1.2	1.37E-06
38.68	30.73	0.6	9.75E-04	1.15	0.92	1.0	8.68E-07
30.73	24.41	0.7	6.15E-04	0.92	0.73	0.8	5.51E-07
24.41	19.39	0.8	3.88E-04	0.73	0.58	0.9	3.47E-07
19.39	15.40	0.8	2.45E-04	0.58	0.10	4.5	4.76E-08
15.40	12.23	0.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

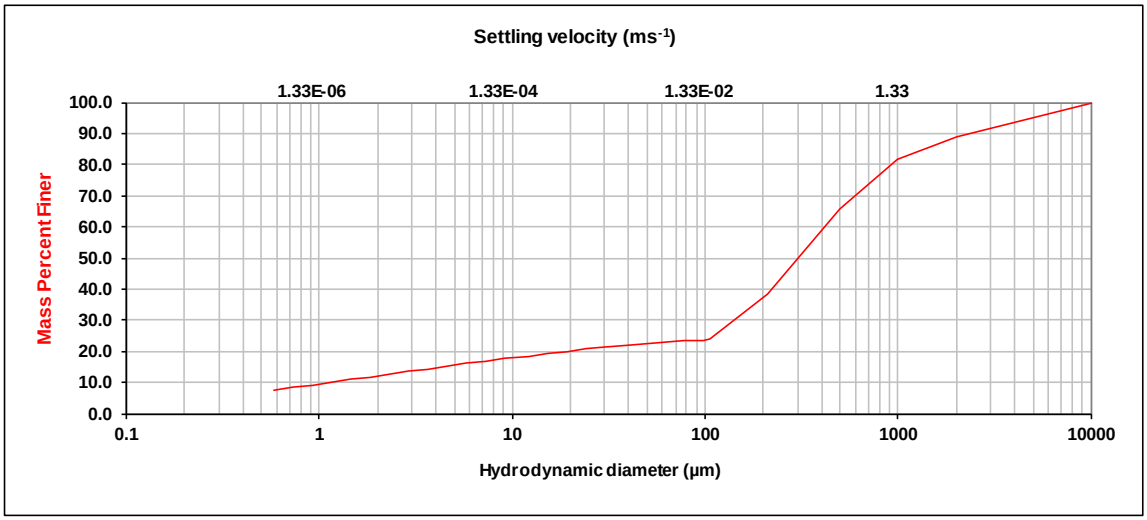
Client ID: A13/5156A/32 13-4B

Job No: 13_1179

Laboratory ID: 13_1179_30

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	11.2	1.64E+01	12.23	9.17	0.9	9.20E-05
2000.00	1000.00	7.0	1.64E+00	9.17	7.29	0.7	5.48E-05
1000.00	500.00	16.3	4.10E-01	7.29	5.79	0.8	3.46E-05
500.00	212.00	27.0	8.69E-02	5.79	4.60	0.9	2.18E-05
212.00	106.00	14.6	1.84E-02	4.60	3.65	0.9	1.38E-05
106.00	97.16	0.6	8.45E-03	3.65	2.90	0.9	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	0.2	3.88E-03	2.30	1.83	0.8	3.45E-06
61.31	48.70	0.4	2.45E-03	1.83	1.45	0.8	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	0.9	1.37E-06
38.68	30.73	0.6	9.75E-04	1.15	0.92	0.8	8.68E-07
30.73	24.41	0.8	6.15E-04	0.92	0.73	0.8	5.51E-07
24.41	19.39	0.7	3.88E-04	0.73	0.58	0.8	3.47E-07
19.39	15.40	0.7	2.45E-04	0.58	0.10	7.7	4.76E-08
15.40	12.23	0.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

microanalysis australia

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13/5156A/32 13-4B

Job No: 13_1179

Laboratory ID: 13_1179_30Q(sedi)

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC

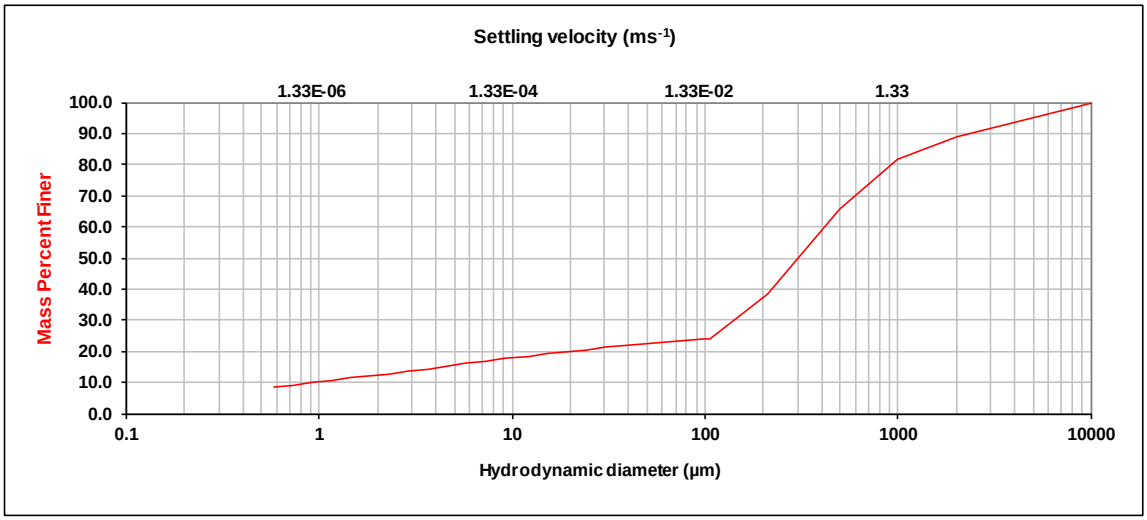
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.34 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	11.2	1.64E+01	12.23	9.17	0.9	9.20E-05
2000.00	1000.00	7.0	1.64E+00	9.17	7.29	0.8	5.48E-05
1000.00	500.00	16.3	4.10E-01	7.29	5.79	0.8	3.46E-05
500.00	212.00	27.0	8.69E-02	5.79	4.60	0.8	2.18E-05
212.00	106.00	14.6	1.84E-02	4.60	3.65	0.8	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	0.8	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	0.8	5.47E-06
77.18	61.31	0.5	3.88E-03	2.30	1.83	0.7	3.45E-06
61.31	48.70	0.6	2.45E-03	1.83	1.45	0.7	2.18E-06
48.70	38.68	0.6	1.54E-03	1.45	1.15	0.8	1.37E-06
38.68	30.73	0.7	9.75E-04	1.15	0.92	0.7	8.68E-07
30.73	24.41	0.7	6.15E-04	0.92	0.73	0.7	5.51E-07
24.41	19.39	0.7	3.88E-04	0.73	0.58	0.7	3.47E-07
19.39	15.40	0.7	2.45E-04	0.58	0.10	8.5	4.76E-08
15.40	12.23	0.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

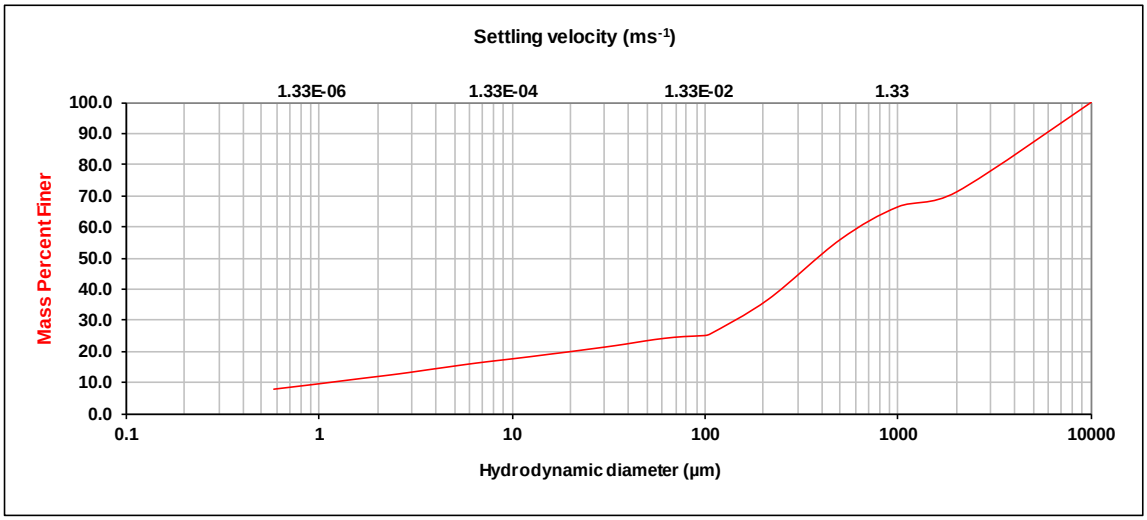
Client ID: A13 5156A 33 13-4C

Job No: 13_1179

Laboratory ID: 13_1179_31

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	28.8	1.64E+01	12.23	9.17	0.9	9.20E-05
2000.00	1000.00	4.7	1.64E+00	9.17	7.29	0.7	5.48E-05
1000.00	500.00	10.6	4.10E-01	7.29	5.79	0.8	3.46E-05
500.00	212.00	19.2	8.69E-02	5.79	4.60	0.9	2.18E-05
212.00	106.00	11.1	1.84E-02	4.60	3.65	0.9	1.38E-05
106.00	97.16	0.5	8.45E-03	3.65	2.90	0.9	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	0.8	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	0.7	3.45E-06
61.31	48.70	0.8	2.45E-03	1.83	1.45	0.8	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	0.8	1.37E-06
38.68	30.73	0.9	9.75E-04	1.15	0.92	0.7	8.68E-07
30.73	24.41	0.8	6.15E-04	0.92	0.73	0.7	5.51E-07
24.41	19.39	0.8	3.88E-04	0.73	0.58	0.7	3.47E-07
19.39	15.40	0.8	2.45E-04	0.58	0.10	7.8	4.76E-08
15.40	12.23	0.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

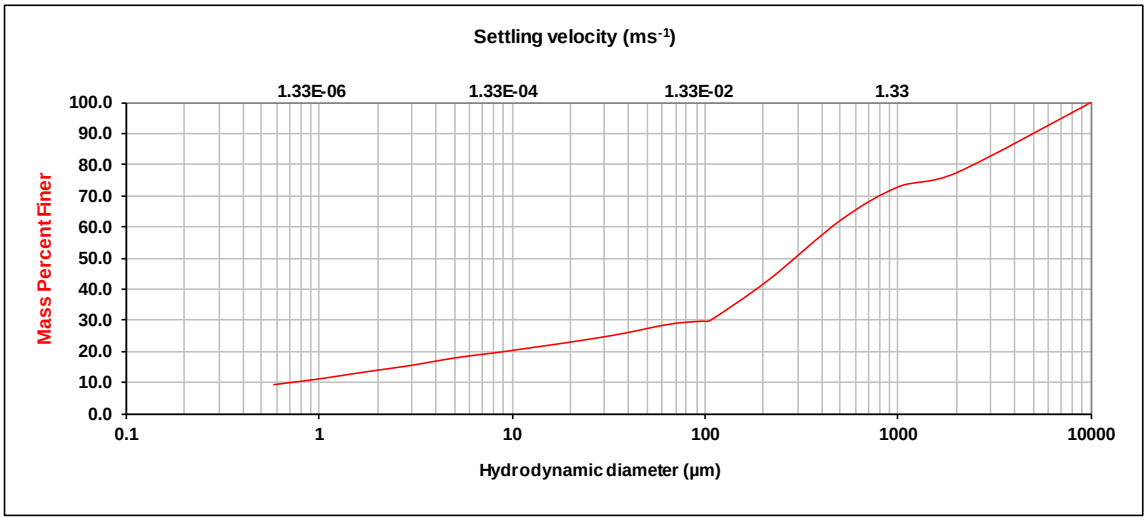
Client ID: A13/5156A/33 13-4C

Job No: 13_1179

Laboratory ID: 13_1179_31SieveQAQC

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.33 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	22.6	1.64E+01	12.23	9.17	1.1	9.20E-05
2000.00	1000.00	4.5	1.64E+00	9.17	7.29	0.8	5.48E-05
1000.00	500.00	10.8	4.10E-01	7.29	5.79	0.7	3.46E-05
500.00	212.00	19.2	8.69E-02	5.79	4.60	0.9	2.18E-05
212.00	106.00	12.9	1.84E-02	4.60	3.65	1.1	1.38E-05
106.00	97.16	0.2	8.45E-03	3.65	2.90	1.0	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	0.9	3.45E-06
61.31	48.70	1.3	2.45E-03	1.83	1.45	0.9	2.18E-06
48.70	38.68	1.3	1.54E-03	1.45	1.15	1.0	1.37E-06
38.68	30.73	1.1	9.75E-04	1.15	0.92	0.9	8.68E-07
30.73	24.41	1.0	6.15E-04	0.92	0.73	0.8	5.51E-07
24.41	19.39	1.0	3.88E-04	0.73	0.58	0.8	3.47E-07
19.39	15.40	0.9	2.45E-04	0.58	0.10	9.3	4.76E-08
15.40	12.23	0.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

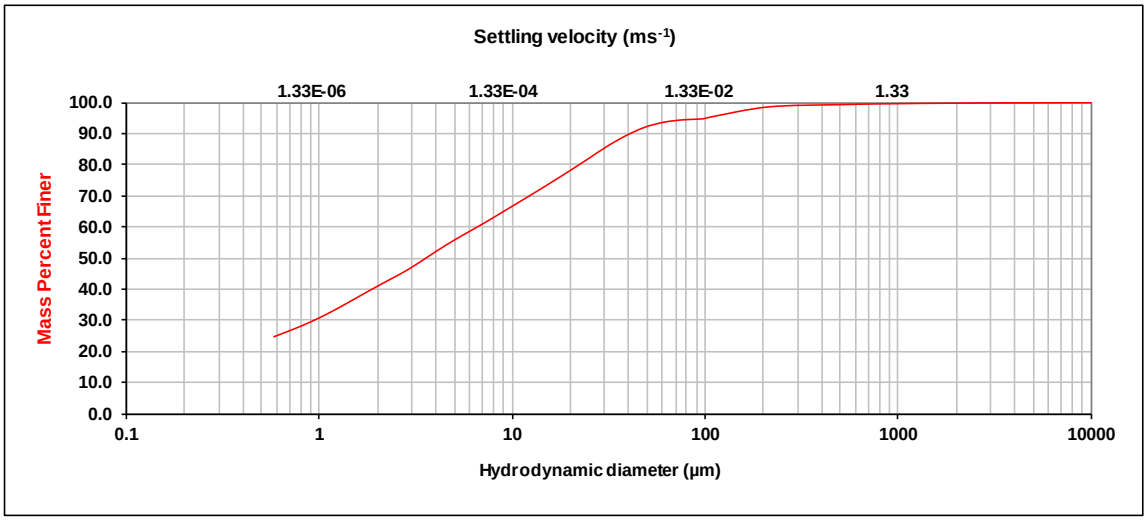
Client ID: A13 5156A 34 13-5

Job No: 13_1179

Laboratory ID: 13_1179_32

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.33 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	4.7	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	3.7	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	3.5	3.46E-05
500.00	212.00	0.7	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	3.3	1.84E-02	4.60	3.65	4.0	1.38E-05
106.00	97.16	0.6	8.45E-03	3.65	2.90	4.0	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	3.4	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	3.3	3.45E-06
61.31	48.70	1.6	2.45E-03	1.83	1.45	3.5	2.18E-06
48.70	38.68	2.8	1.54E-03	1.45	1.15	3.4	1.37E-06
38.68	30.73	3.5	9.75E-04	1.15	0.92	3.0	8.68E-07
30.73	24.41	4.1	6.15E-04	0.92	0.73	2.7	5.51E-07
24.41	19.39	4.0	3.88E-04	0.73	0.58	2.4	3.47E-07
19.39	15.40	3.9	2.45E-04	0.58	0.10	24.7	4.76E-08
15.40	12.23	3.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

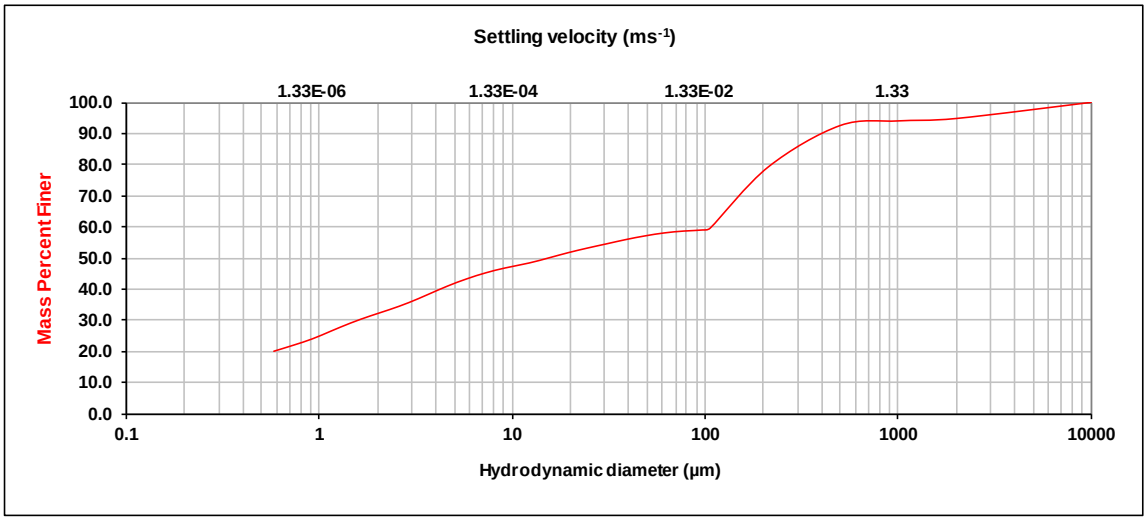
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced
Client ID: A13 5156A 35 13-8
Job No: 13_1179
Laboratory ID: 13_1179_33

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	5.2	1.64E+01	12.23	9.17	1.6	9.20E-05
2000.00	1000.00	0.8	1.64E+00	9.17	7.29	1.5	5.48E-05
1000.00	500.00	1.5	4.10E-01	7.29	5.79	2.0	3.46E-05
500.00	212.00	13.3	8.69E-02	5.79	4.60	2.3	2.18E-05
212.00	106.00	19.7	1.84E-02	4.60	3.65	2.7	1.38E-05
106.00	97.16	0.6	8.45E-03	3.65	2.90	2.6	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	2.3	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	2.0	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	2.3	2.18E-06
48.70	38.68	1.2	1.54E-03	1.45	1.15	2.6	1.37E-06
38.68	30.73	1.4	9.75E-04	1.15	0.92	2.5	8.68E-07
30.73	24.41	1.4	6.15E-04	0.92	0.73	2.1	5.51E-07
24.41	19.39	1.5	3.88E-04	0.73	0.58	1.9	3.47E-07
19.39	15.40	1.7	2.45E-04	0.58	0.10	20.0	4.76E-08
15.40	12.23	1.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

microanalysis australia

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

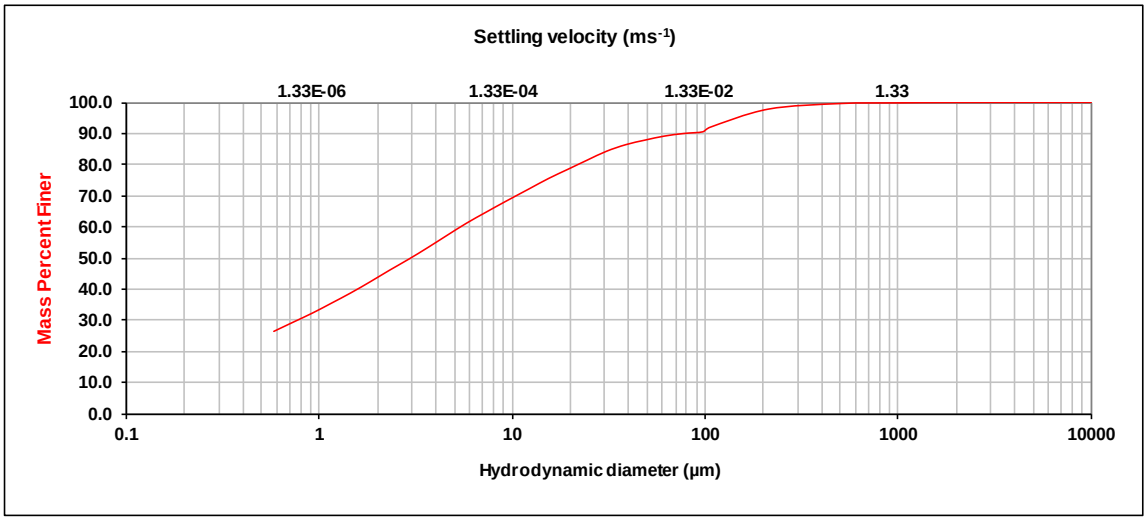
Client ID: A13 5156A 36 16-1

Job No: 13_1179

Laboratory ID: 13_1179_34

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	4.1	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.4	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.5	3.46E-05
500.00	212.00	1.8	8.69E-02	5.79	4.60	3.9	2.18E-05
212.00	106.00	5.8	1.84E-02	4.60	3.65	4.0	1.38E-05
106.00	97.16	1.5	8.45E-03	3.65	2.90	3.8	8.68E-06
97.16	77.18	0.6	6.15E-03	2.90	2.30	3.6	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	3.7	3.45E-06
61.31	48.70	1.3	2.45E-03	1.83	1.45	3.6	2.18E-06
48.70	38.68	1.5	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	2.1	9.75E-04	1.15	0.92	3.1	8.68E-07
30.73	24.41	2.9	6.15E-04	0.92	0.73	2.9	5.51E-07
24.41	19.39	2.9	3.88E-04	0.73	0.58	2.9	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	26.4	4.76E-08
15.40	12.23	3.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

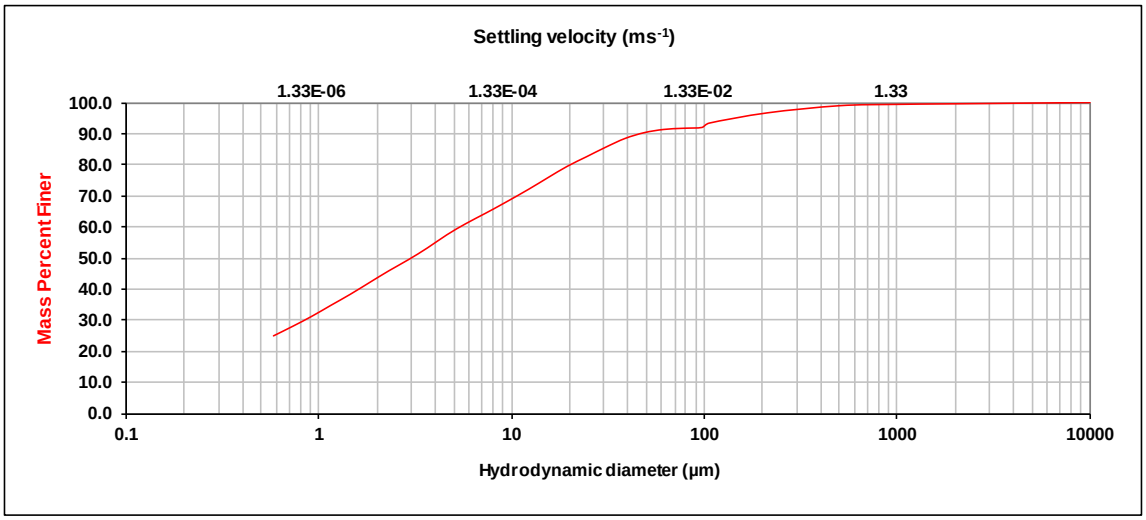
Client ID: A13 5156A 37 16-0

Job No: 13_1179

Laboratory ID: 13_1179_35

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	4.4	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	3.4	5.48E-05
1000.00	500.00	0.4	4.10E-01	7.29	5.79	3.3	3.46E-05
500.00	212.00	2.3	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	3.3	1.84E-02	4.60	3.65	4.2	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	3.8	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	3.5	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	3.7	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	3.8	2.18E-06
48.70	38.68	1.9	1.54E-03	1.45	1.15	3.5	1.37E-06
38.68	30.73	2.8	9.75E-04	1.15	0.92	3.5	8.68E-07
30.73	24.41	3.1	6.15E-04	0.92	0.73	3.3	5.51E-07
24.41	19.39	3.1	3.88E-04	0.73	0.58	3.1	3.47E-07
19.39	15.40	3.6	2.45E-04	0.58	0.10	24.9	4.76E-08
15.40	12.23	3.7	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

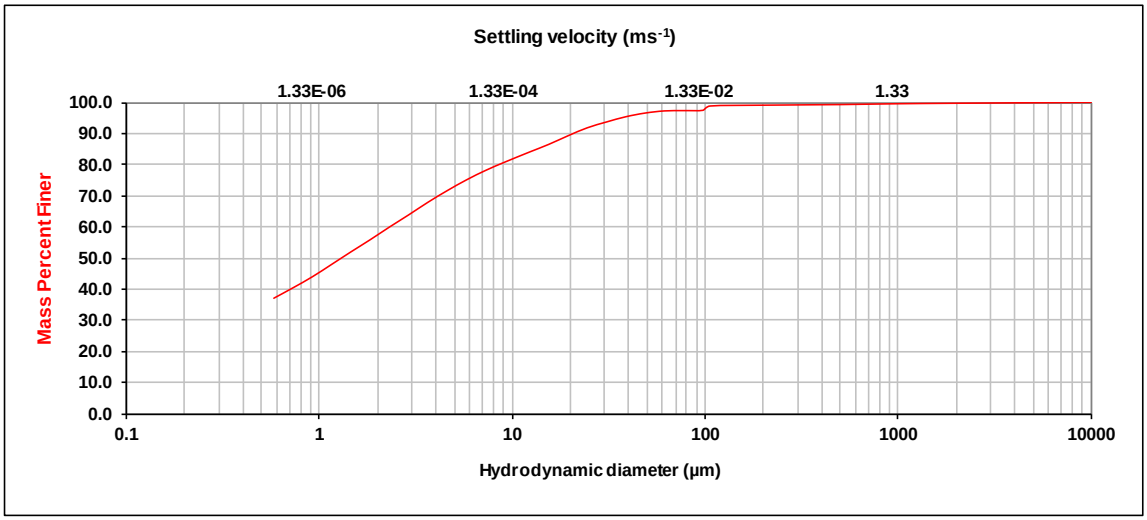
Client ID: A13 5156A 38 RF2

Job No: 13_1179

Laboratory ID: 13_1179_36

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	3.2	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.7	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	3.1	3.46E-05
500.00	212.00	0.2	8.69E-02	5.79	4.60	3.5	2.18E-05
212.00	106.00	0.3	1.84E-02	4.60	3.65	3.8	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	4.1	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.0	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	4.1	3.45E-06
61.31	48.70	0.7	2.45E-03	1.83	1.45	4.0	2.18E-06
48.70	38.68	1.2	1.54E-03	1.45	1.15	4.1	1.37E-06
38.68	30.73	1.7	9.75E-04	1.15	0.92	3.9	8.68E-07
30.73	24.41	1.9	6.15E-04	0.92	0.73	3.6	5.51E-07
24.41	19.39	2.6	3.88E-04	0.73	0.58	3.4	3.47E-07
19.39	15.40	2.8	2.45E-04	0.58	0.10	37.1	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

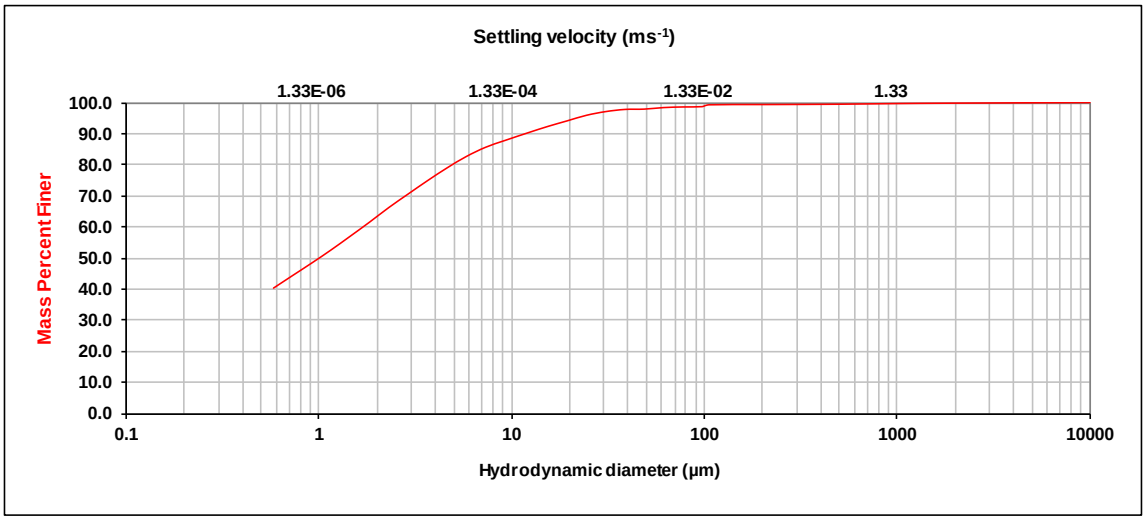
Client ID: A13 5156A 39 RF3

Job No: 13_1179

Laboratory ID: 13_1179_37

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	2.6	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.2	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	0.1	8.69E-02	5.79	4.60	3.7	2.18E-05
212.00	106.00	0.1	1.84E-02	4.60	3.65	4.1	1.38E-05
106.00	97.16	0.6	8.45E-03	3.65	2.90	4.3	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	4.4	5.47E-06
77.18	61.31	0.2	3.88E-03	2.30	1.83	4.7	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	4.6	2.18E-06
48.70	38.68	0.1	1.54E-03	1.45	1.15	4.5	1.37E-06
38.68	30.73	0.7	9.75E-04	1.15	0.92	4.1	8.68E-07
30.73	24.41	1.2	6.15E-04	0.92	0.73	4.1	5.51E-07
24.41	19.39	1.8	3.88E-04	0.73	0.58	4.1	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	40.3	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

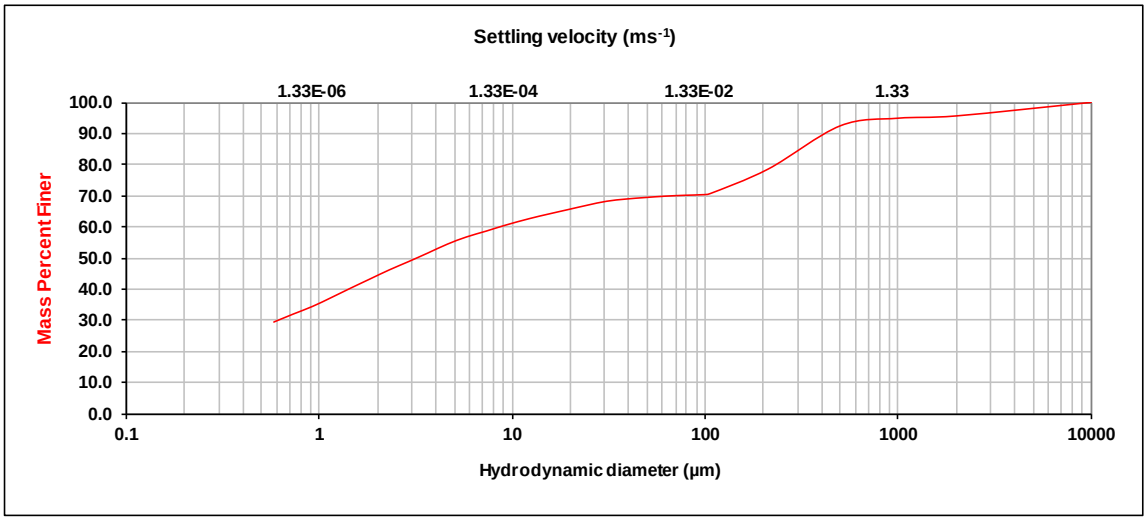
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced
Client ID: A13 5156A 40 RF4
Job No: 13_1179
Laboratory ID: 13_1179_38

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC
Dispersant: Water **Sonication:** 10 min
Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)
Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.34 µm
Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	4.4	1.64E+01	12.23	9.17	2.1	9.20E-05
2000.00	1000.00	0.7	1.64E+00	9.17	7.29	1.9	5.48E-05
1000.00	500.00	2.5	4.10E-01	7.29	5.79	1.8	3.46E-05
500.00	212.00	13.9	8.69E-02	5.79	4.60	2.3	2.18E-05
212.00	106.00	7.9	1.84E-02	4.60	3.65	2.8	1.38E-05
106.00	97.16	0.4	8.45E-03	3.65	2.90	2.8	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	2.7	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	2.9	3.45E-06
61.31	48.70	0.4	2.45E-03	1.83	1.45	3.0	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	3.0	1.37E-06
38.68	30.73	0.7	9.75E-04	1.15	0.92	2.8	8.68E-07
30.73	24.41	1.3	6.15E-04	0.92	0.73	2.5	5.51E-07
24.41	19.39	1.4	3.88E-04	0.73	0.58	2.5	3.47E-07
19.39	15.40	1.4	2.45E-04	0.58	0.10	29.4	4.76E-08
15.40	12.23	1.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

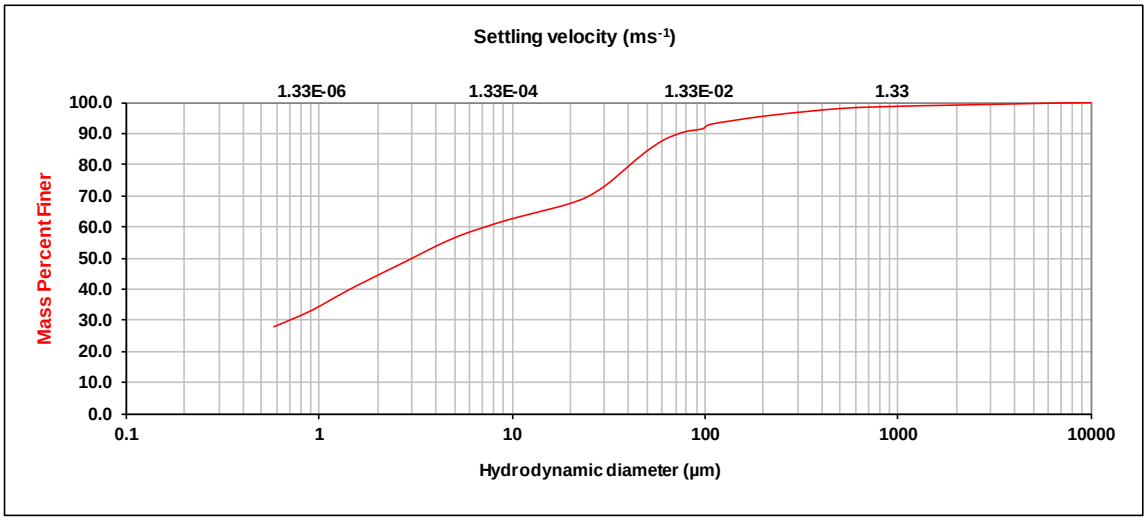
Client ID: A13 5156A 41 RF6

Job No: 13_1179

Laboratory ID: 13_1179_39

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.9	1.64E+01	12.23	9.17	2.0	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	2.0	5.48E-05
1000.00	500.00	0.7	4.10E-01	7.29	5.79	2.0	3.46E-05
500.00	212.00	2.3	8.69E-02	5.79	4.60	2.5	2.18E-05
212.00	106.00	2.8	1.84E-02	4.60	3.65	3.0	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	3.2	8.68E-06
97.16	77.18	1.1	6.15E-03	2.90	2.30	3.1	5.47E-06
77.18	61.31	2.4	3.88E-03	2.30	1.83	3.1	3.45E-06
61.31	48.70	4.1	2.45E-03	1.83	1.45	3.2	2.18E-06
48.70	38.68	5.2	1.54E-03	1.45	1.15	3.4	1.37E-06
38.68	30.73	5.2	9.75E-04	1.15	0.92	3.3	8.68E-07
30.73	24.41	3.9	6.15E-04	0.92	0.73	2.8	5.51E-07
24.41	19.39	2.3	3.88E-04	0.73	0.58	2.6	3.47E-07
19.39	15.40	1.7	2.45E-04	0.58	0.10	27.9	4.76E-08
15.40	12.23	1.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13 5156A 42 RF7

Job No: 13_1179

Laboratory ID: 13_1179_40

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC

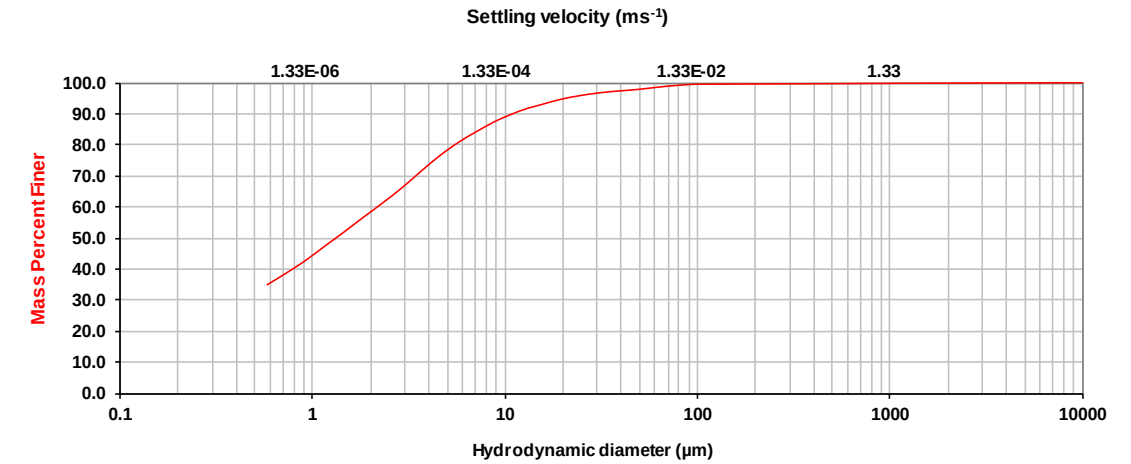
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.34 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.2	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.3	5.48E-05
1000.00	500.00	0.1	4.10E-01	7.29	5.79	3.7	3.46E-05
500.00	212.00	0.1	8.69E-02	5.79	4.60	4.4	2.18E-05
212.00	106.00	0.1	1.84E-02	4.60	3.65	5.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	5.4	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.9	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	4.6	3.45E-06
61.31	48.70	0.7	2.45E-03	1.83	1.45	4.8	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	4.6	1.37E-06
38.68	30.73	0.6	9.75E-04	1.15	0.92	4.5	8.68E-07
30.73	24.41	0.9	6.15E-04	0.92	0.73	4.1	5.51E-07
24.41	19.39	1.2	3.88E-04	0.73	0.58	3.8	3.47E-07
19.39	15.40	1.7	2.45E-04	0.58	0.10	34.9	4.76E-08
15.40	12.23	1.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

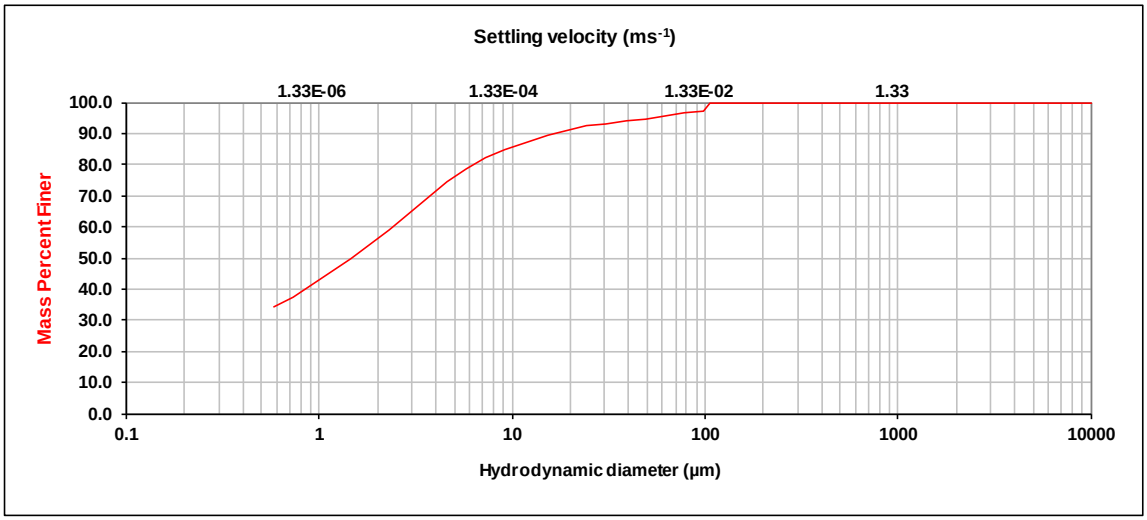
Client ID: A13/5156A/42 RF7

Job No: 13_1179

Laboratory ID: 13_1179_40Q(Sedi)

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 °C
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	2.8	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	0.1	4.10E-01	7.29	5.79	3.5	3.46E-05
500.00	212.00	0.1	8.69E-02	5.79	4.60	4.3	2.18E-05
212.00	106.00	0.1	1.84E-02	4.60	3.65	5.0	1.38E-05
106.00	97.16	2.6	8.45E-03	3.65	2.90	5.4	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	5.0	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	4.7	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	4.4	2.18E-06
48.70	38.68	0.9	1.54E-03	1.45	1.15	4.4	1.37E-06
38.68	30.73	0.7	9.75E-04	1.15	0.92	4.3	8.68E-07
30.73	24.41	0.8	6.15E-04	0.92	0.73	3.8	5.51E-07
24.41	19.39	1.3	3.88E-04	0.73	0.58	3.5	3.47E-07
19.39	15.40	1.6	2.45E-04	0.58	0.10	34.0	4.76E-08
15.40	12.23	2.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

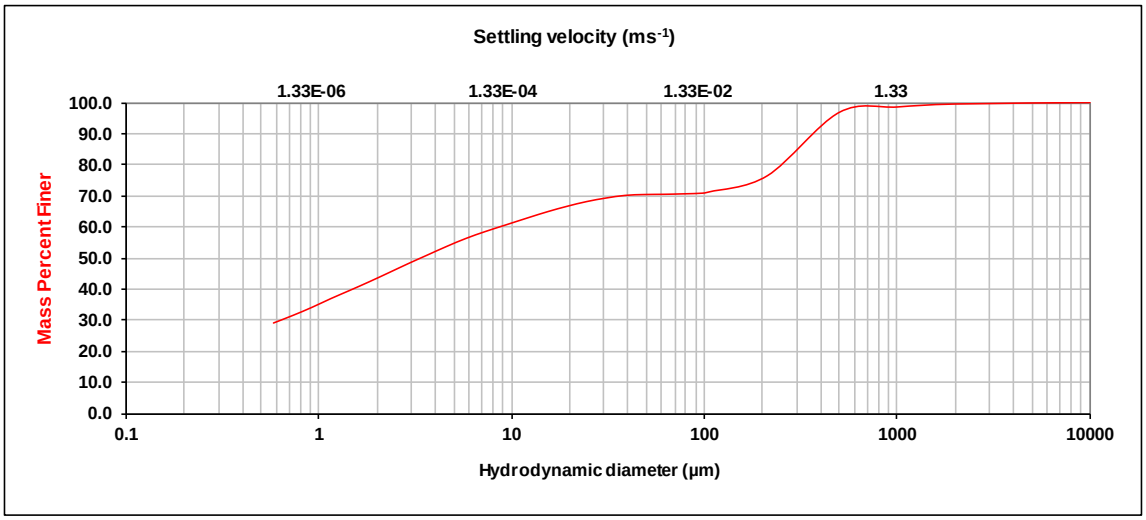
Client ID: A13 5156A 43 13-9

Job No: 13_1179

Laboratory ID: 13_1179_41

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.5	1.64E+01	12.23	9.17	2.5	9.20E-05
2000.00	1000.00	1.0	1.64E+00	9.17	7.29	2.0	5.48E-05
1000.00	500.00	1.7	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	20.4	8.69E-02	5.79	4.60	2.6	2.18E-05
212.00	106.00	5.2	1.84E-02	4.60	3.65	2.8	1.38E-05
106.00	97.16	0.4	8.45E-03	3.65	2.90	2.8	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	2.9	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	2.9	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	2.8	2.18E-06
48.70	38.68	0.3	1.54E-03	1.45	1.15	2.7	1.37E-06
38.68	30.73	0.9	9.75E-04	1.15	0.92	2.8	8.68E-07
30.73	24.41	1.1	6.15E-04	0.92	0.73	2.6	5.51E-07
24.41	19.39	1.5	3.88E-04	0.73	0.58	2.4	3.47E-07
19.39	15.40	1.7	2.45E-04	0.58	0.10	29.1	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: Advanced

Client ID: A13/5156A/43 13-9

Job No: 13_1179

Laboratory ID: 13_1179_41Q(Sieving)

Analysis: X-ray sedimentation by Sedigraph 5100 **Analysis temp.:** 35.7 ºC

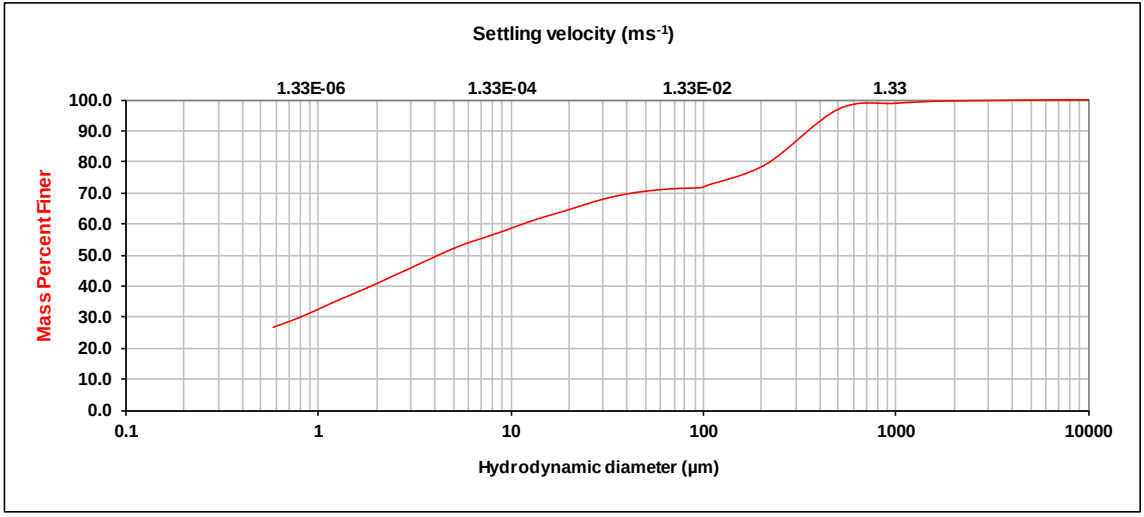
Dispersant: Water **Sonication:** 10 min

Additives: 10 mL sodium hexametaphosphate **Concentration:** ~5 % w/w

Sample density: 2.650 g/cm^3 (assumed)

Liquid density: 0.994 g/cm^3 **Critical diameter:** 54.34 µm

Liquid viscosity: 0.724 cp



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	2.8	9.20E-05
2000.00	1000.00	0.8	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	1.9	4.10E-01	7.29	5.79	2.0	3.46E-05
500.00	212.00	17.6	8.69E-02	5.79	4.60	2.5	2.18E-05
212.00	106.00	6.8	1.84E-02	4.60	3.65	2.8	1.38E-05
106.00	97.16	0.9	8.45E-03	3.65	2.90	2.9	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	2.8	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	2.8	3.45E-06
61.31	48.70	0.7	2.45E-03	1.83	1.45	2.7	2.18E-06
48.70	38.68	0.9	1.54E-03	1.45	1.15	2.7	1.37E-06
38.68	30.73	1.4	9.75E-04	1.15	0.92	2.8	8.68E-07
30.73	24.41	1.8	6.15E-04	0.92	0.73	2.6	5.51E-07
24.41	19.39	2.0	3.88E-04	0.73	0.58	2.2	3.47E-07
19.39	15.40	1.8	2.45E-04	0.58	0.10	26.7	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Appendix D Laboratory Results – Secondary Laboratory

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4908 9433 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	BMT WBM	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	200 Creek St. Brisbane		
PROJECT:	PoB Sediments	PROJECT NO: B20259	ALS QUOTE NO.:
ORDER NUMBER:		PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:
PROJECT MANAGER:	Markus Billerbeck	CONTACT PH:	
SAMPLER:	Conor Jones	SAMPLER MOBILE:	
COC Emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed):	markus.billerbeck@bmtwbm.com.au		
Email Invoice to (will default to PM if no other addresses are listed):	"		

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Conor Jones	David		
DATE/TIME:	DATE/TIME: 23/10/13 13:10	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Metals	Organotins (MBT, DBT, TBT)	Organochlorine Pesticides (ODD, DDE, Chlordane)	TOC	PAH's, TPH, PCB's	Nutrients TP, TN, NOx, TKN	Acid Sulphate Soils		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	6-2C	22/10	S	ST, ~~ASS~~	3	✓	✓	✓	✓					
	10-6C	22/10	S	ST ASS	3+1	✓	✓	✓	✓	✓	✓	✓		
				TOTAL										

Environmental Division Brisbane

Monique Work Order

EB1325875

Telephone : +61-7-3243 7222

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; L = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CERTIFICATE OF ANALYSIS

Work Order	: **EB1325875**	Page	: 1 of 7
Client	: **BMT WBM GROUP LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR MARKUS BILLERBECK	Contact	: Customer Services
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: markus.billerbeck@bmtwbm.com.au	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3831 6744	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3832 3627	Facsimile	: +61 7 3243 7218
Project	: B20259 POB Sediments	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 23-OCT-2013
Sampler	: Conor Jones	Issue Date	: 12-NOV-2013
Site	: ----		
		No. of samples received	: 2
Quote number	: BN/450/13	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **ALS is not NATA accredited for the analysis of Bifenthrin in soils when performed under ALS Method EP068D**
- **ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5**
- **EP068 (OCOP)/EP066 (PCB): High failing LCS deemed acceptable as all associated analyte results are less than LOR.**
- **EP090: High failing LCS deemed acceptable as all associated analyte results are less than LOR.**
- **EP090: Sample '10-6C' shows poor matrix spike recovery due to matrix interference.**
- **Radiological analysis will be undertaken by ALS Laboratory Group (Ceska Lipa). The Estimated due date for this data is 20/11/2013.**
- **Radiological work undertaken by ALS Laboratory Group (Ceska Lipa) under CAI accreditation No. L1163. Report No. PR1352255 . NATA and CAI accreditations' are both recognised under ILAC.**

Signatories

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

Signatories	Position	Accreditation Category
Jacob Waugh	Laboratory Coordinator	Sydney External Subcontracting
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Ryan Story	2IC Organic Instrument Chemist	Brisbane Organics
SATISH.TRIVEDI	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	6-2C	10-6C	----	----	----
			Client sampling date / time	22-OCT-2013 15:00	22-OCT-2013 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1325875-001	EB1325875-002	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	7.4	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.326	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	203	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	3.11	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	621	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	1.00	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	63.4	55.4	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	29400	19800	----	----	----
Iron	7439-89-6	50	mg/kg	54300	38700	----	----	----
Silver	7440-22-4	2	mg/kg	<2	<2	----	----	----
Arsenic	7440-38-2	5	mg/kg	7	9	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	55	41	----	----	----
Copper	7440-50-8	5	mg/kg	41	27	----	----	----
Lead	7439-92-1	5	mg/kg	17	16	----	----	----
Nickel	7440-02-0	2	mg/kg	57	30	----	----	----
Zinc	7440-66-6	5	mg/kg	146	100	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	6-2C	10-6C	----	----	----
			Client sampling date / time	22-OCT-2013 15:00	22-OCT-2013 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1325875-001	EB1325875-002	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	<0.1	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	**850**	----	----	----
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	----	**850**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	----	**418**	----	----	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**1.50**	**0.96**	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	6-2C	10-6C	----	----	----
			Client sampling date / time	22-OCT-2013 15:00	22-OCT-2013 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1325875-001	EB1325875-002	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	----	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg	----	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg	----	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	----	<1	----	----	----
EP090: Organotin Compounds								
Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	----	----	----
Dibutyltin	1002-53-5	1	µgSn/kg	<1	<1	----	----	----
Tributyltin	56573-85-4	0.5	µgSn/kg	**1.2**	**0.7**	----	----	----
Radionucleides / Activity								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	6-2C	10-6C	----	----	----
			Client sampling date / time	22-OCT-2013 15:00	22-OCT-2013 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1325875-001	EB1325875-002	----	----	----
Radionuclides / Activity - Continued								
Gross alpha	----	500	Bq/kg DW	----	<500	----	----	----
Gross beta	----	500	Bq/kg DW	----	550	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	116	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	92.7	95.1	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	52.5	107	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	----	120	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	----	114	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	----	101	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	118	----	----	----
Anthracene-d10	1719-06-8	0.1	%	----	106	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	----	110	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	70.9	----	----	----
Toluene-D8	2037-26-5	0.1	%	----	73.1	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	----	64.2	----	----	----
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	77.0	73.1	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	16.2	133.7
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	138
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	22.8	134.5
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	34.8	154.5
2-Chlorophenol-D4	93951-73-6	41.9	152.8
2.4.6-Tribromophenol	118-79-6	26.0	156.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	33.8	156.5
Anthracene-d10	1719-06-8	36.9	153.1
4-Terphenyl-d14	1718-51-0	41.8	172.2
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	52.7	133.7
Toluene-D8	2037-26-5	60.3	131.1
4-Bromofluorobenzene	460-00-4	59.2	126.6
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130

QUALITY CONTROL REPORT

Work Order	: **EB1325875**	Page	: 1 of 10
Client	: **BMT WBM GROUP LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR MARKUS BILLERBECK	Contact	: Customer Services
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: markus.billerbeck@bmtwbm.com.au	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3831 6744	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3832 3627	Facsimile	: +61 7 3243 7218
Project	: B20259 POB Sediments	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 23-OCT-2013
Sampler	: Conor Jones	Issue Date	: 12-NOV-2013
Order number	: ----		
		No. of samples received	: 2
Quote number	: BN/450/13	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

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

General Comments

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

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

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

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

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

Signatories

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

Signatories	Position	Accreditation Category
Jacob Waugh	Laboratory Coordinator	Sydney External Subcontracting
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Ryan Story	2IC Organic Instrument Chemist	Brisbane Organics
SATISH.TRIVEDI	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 3128712)									
EB1325875-002	10-6C	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	7.4	7.4	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 3128712)									
EB1325875-002	10-6C	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.326	0.327	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	203	204	0.0	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 3128712)									
EB1325875-002	10-6C	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.11	3.08	1.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.00	0.99	0.0	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	621	615	1.0	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 3125725)									
EB1325875-001	6-2C	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	55	54	0.0	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	57	54	4.1	0% - 20%
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	8	14.7	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	41	41	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	17	18	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	146	137	6.5	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	29400	29200	0.6	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	54300	54200	0.2	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3125726)									
EB1325875-001	6-2C	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3125766)									
EB1325875-002	10-6C	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3125778)									
EB1325875-002	10-6C	EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	850	740	14.3	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3125779)									
EB1325875-002	10-6C	EK067G: Total Phosphorus as P	----	2	mg/kg	418	468	11.4	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 3126119)									
EB1324424-001	Anonymous	EP003: Total Organic Carbon	----	0.02	%	8.04	7.98	0.7	0% - 20%
EB1325904-002	Anonymous	EP003: Total Organic Carbon	----	0.02	%	32.8	32.1	2.2	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3125717)									
EB1325875-002	10-6C	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3125716)									
EB1325875-002	10-6C	EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3125697)									
EB1325875-002	10-6C	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3125554)									
EB1325583-054	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EB1325653-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3125696)									
EB1325875-002	10-6C	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3125554)									
EB1325583-054	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EB1325653-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3125696)									
EB1325875-002	10-6C	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3125554)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 3125554) - continued									
EB1325583-054	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EB1325653-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 3125702)									
EB1325875-001	6-2C	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	1.2	1.8	40.1	No Limit
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	<1	0.0	No Limit
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	<1	0.0	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 3128712)								
EA033: pH KCl (23A)	----	0.1	pH Unit	----	4.50 pH Unit	100	70	130
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	25.2 mole H+ / t	100	70	130
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 3128712)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.24 % S	96.5	70	130
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 3128712)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	103	70	130
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3125725)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	113	84	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	88	118
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	102	73	127
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	116	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	8400 mg/kg	91.6	70	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	111	84	121
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	116	89	126
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.10 mg/kg	99.0	84	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	113	87	127
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3125726)								
EG035T: Mercury	7439-97-6	0.10	mg/kg	<0.1	2.57 mg/kg	97.9	78	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3125766)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.50 mg/kg	91.8	90	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3125778)								
EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	<20	1000 mg/kg	84.8	70	118
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3125779)								
EK067G: Total Phosphorus as P	----	2	mg/kg	<2	442 mg/kg	99.5	75	117
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 3126119)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	8.4 %	101	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3125717)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	# 136	68	118

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 3125716)								
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	116	61	118
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	# 122	67	121
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	107	60	123
EP068: 4.4`-DDT	50-29-3	0.05	mg/kg	----	0.5 mg/kg	127	80	142
		0.2	mg/kg	<0.2	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3125697)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	5.0 mg/kg	110	74	119
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	5.0 mg/kg	107	74	118
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	5.0 mg/kg	114	83	121
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	5.0 mg/kg	104	81	116
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	5.0 mg/kg	110	72	117
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	5.0 mg/kg	113	72	115
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	5.0 mg/kg	111	70	116
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	5.0 mg/kg	108	70	134
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	5.0 mg/kg	99.6	64	120
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	5.0 mg/kg	111	66	119
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	5.0 mg/kg	106	59	129
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	5.0 mg/kg	108	70	129
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	5.0 mg/kg	104	76	121
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	5.0 mg/kg	116	53	135
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	5.0 mg/kg	116	45	134
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	5.0 mg/kg	113	64	133
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125554)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	16 mg/kg	87.4	66	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125696)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	312 mg/kg	106	84	117
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	500 mg/kg	105	80	118
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125554)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	18.5 mg/kg	85.7	66	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125696)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	413 mg/kg	109	86	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	360 mg/kg	107	73	113
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
EP080: BTEXN (QCLot: 3125554)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	85.8	73	108
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	85.6	73	111
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	87.1	67	107

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3125554) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	83.2	66	109
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	84.5	68	108
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	82.6	72	115
EP090: Organotin Compounds (QCLot: 3125702)								
EP090: Monobutyltin	78763-54-9	1.0	µgSn/kg	<1	1.25 µgSn/kg	# 124	36	118
EP090: Dibutyltin	1002-53-5	1.0	µgSn/kg	<1	1.25 µgSn/kg	104	47	123
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	124	52	134

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 3125725)							
EB1325875-002	10-6C	EG005T: Arsenic	7440-38-2	50 mg/kg	105	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	109	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	107	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	116	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	109	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	111	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	103	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3125726)							
EB1325875-002	10-6C	EG035T: Mercury	7439-97-6	5.0 mg/kg	93.2	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3125778)							
EB1325948-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	500 mg/kg	# Not Determined	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3125779)							
EB1325948-001	Anonymous	EK067G: Total Phosphorus as P	----	100 mg/kg	# Not Determined	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 3125716)							
EB1325875-002	10-6C	EP068: 4.4`-DDT	50-29-3	2 mg/kg	79.8	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125554)							
EB1325653-002	Anonymous	EP080: C6 - C9 Fraction	----	8 mg/kg	78.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125696)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125696) - continued							
EB1325676-004	Anonymous	EP071: C10 - C14 Fraction	----	312 mg/kg	108	70	130
		EP071: C15 - C28 Fraction	----	500 mg/kg	105	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125554)							
EB1325653-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	8 mg/kg	78.9	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125696)							
EB1325676-004	Anonymous	EP071: >C10 - C16 Fraction	>C10_C16	413 mg/kg	110	70	130
		EP071: >C16 - C34 Fraction	----	360 mg/kg	107	70	130
EP080: BTEXN (QCLot: 3125554)							
EB1325653-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	84.8	70	130
		EP080: Toluene	108-88-3	2 mg/kg	87.8	70	130
EP090: Organotin Compounds (QCLot: 3125702)							
EB1325875-002	10-6C	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# Not Determined	35	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	76.4	20	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	94.6	20	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125554)										
EB1325653-002	Anonymous	EP080: C6 - C9 Fraction	----	8 mg/kg	78.0	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125554)										
EB1325653-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	8 mg/kg	78.9	----	70	130	----	----
EP080: BTEXN (QCLot: 3125554)										
EB1325653-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	84.8	----	70	130	----	----
		EP080: Toluene	108-88-3	2 mg/kg	87.8	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3125696)										
EB1325676-004	Anonymous	EP071: C10 - C14 Fraction	----	312 mg/kg	108	----	70	130	----	----
		EP071: C15 - C28 Fraction	----	500 mg/kg	105	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3125696)										
EB1325676-004	Anonymous	EP071: >C10 - C16 Fraction	>C10_C16	413 mg/kg	110	----	70	130	----	----
		EP071: >C16 - C34 Fraction	----	360 mg/kg	107	----	70	130	----	----
EP090: Organotin Compounds (QCLot: 3125702)										

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP090: Organotin Compounds (QCLot: 3125702) - continued										
EB1325875-002	10-6C	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# Not Determined	----	35	130	----	----
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	76.4	----	20	130	----	----
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	94.6	----	20	130	----	----
EP068A: Organochlorine Pesticides (OC) (QCLot: 3125716)										
EB1325875-002	10-6C	EP068: 4.4`-DDT	50-29-3	2 mg/kg	79.8	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3125725)										
EB1325875-002	10-6C	EG005T: Arsenic	7440-38-2	50 mg/kg	105	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	25 mg/kg	109	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	107	----	70	130	----	----
		EG005T: Copper	7440-50-8	50 mg/kg	116	----	70	130	----	----
		EG005T: Lead	7439-92-1	50 mg/kg	109	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	111	----	70	130	----	----
		EG005T: Zinc	7440-66-6	50 mg/kg	103	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3125726)										
EB1325875-002	10-6C	EG035T: Mercury	7439-97-6	5.0 mg/kg	93.2	----	70	130	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3125778)										
EB1325948-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	500 mg/kg	# Not Determined	----	70	130	----	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3125779)										
EB1325948-001	Anonymous	EK067G: Total Phosphorus as P	----	100 mg/kg	# Not Determined	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB1325875**	Page	: 1 of 8
Client	: BMT WBM GROUP LTD	Laboratory	: Environmental Division Brisbane
Contact	: DR MARKUS BILLERBECK	Contact	: Customer Services
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: markus.billerbeck@bmtwbm.com.au	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 3831 6744	Telephone	: +61 7 3243 7222
Facsimile	: +61 07 3832 3627	Facsimile	: +61 7 3243 7218
Project	: B20259 POB Sediments	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 23-OCT-2013
Sampler	: Conor Jones	Issue Date	: 12-NOV-2013
Order number	: ----		
		No. of samples received	: 2
Quote number	: BN/450/13	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

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

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

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

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen (EA033)							
10-6C	**22-OCT-2013**	**28-OCT-2013**	22-OCT-2014	✓	**29-OCT-2013**	26-JAN-2014	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen (EA033)							
10-6C	**22-OCT-2013**	**28-OCT-2013**	22-OCT-2014	✓	**29-OCT-2013**	26-JAN-2014	✓
EA033-A: Actual Acidity							
Snap Lock Bag - frozen (EA033)							
10-6C	**22-OCT-2013**	**28-OCT-2013**	22-OCT-2014	✓	**29-OCT-2013**	26-JAN-2014	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen (EA033)							
10-6C	**22-OCT-2013**	**28-OCT-2013**	22-OCT-2014	✓	**29-OCT-2013**	26-JAN-2014	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen (EA033)							
10-6C	**22-OCT-2013**	**28-OCT-2013**	22-OCT-2014	✓	**29-OCT-2013**	26-JAN-2014	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
6-2C, 10-6C	**22-OCT-2013**	**----**	----	----	**25-OCT-2013**	05-NOV-2013	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
6-2C, 10-6C	**22-OCT-2013**	**25-OCT-2013**	20-APR-2014	✓	**29-OCT-2013**	20-APR-2014	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
6-2C, 10-6C	**22-OCT-2013**	**25-OCT-2013**	19-NOV-2013	✓	**29-OCT-2013**	19-NOV-2013	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK059G)							
10-6C	**22-OCT-2013**	**25-OCT-2013**	20-APR-2014	✓	**29-OCT-2013**	20-APR-2014	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Soil Glass Jar - Unpreserved (EK061G)							
10-6C	**22-OCT-2013**	**25-OCT-2013**	20-APR-2014	✓	**29-OCT-2013**	20-APR-2014	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK067G)							
10-6C	**22-OCT-2013**	**25-OCT-2013**	20-APR-2014	✓	**29-OCT-2013**	20-APR-2014	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003) 6-2C	**22-OCT-2013**	**25-OCT-2013**	19-NOV-2013	✓	**28-OCT-2013**	19-NOV-2013	✓
Snap Lock Bag - frozen (EP003) 10-6C	**22-OCT-2013**	**25-OCT-2013**	20-APR-2014	✓	**28-OCT-2013**	20-APR-2014	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**28-OCT-2013**	04-DEC-2013	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) 6-2C, 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**28-OCT-2013**	04-DEC-2013	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP071) 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**25-OCT-2013**	04-DEC-2013	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**25-OCT-2013**	04-DEC-2013	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**25-OCT-2013**	05-NOV-2013	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**25-OCT-2013**	05-NOV-2013	✓
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090) 6-2C, 10-6C	**22-OCT-2013**	**25-OCT-2013**	05-NOV-2013	✓	**28-OCT-2013**	04-DEC-2013	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	1	1	**100.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	1	**100.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	1	**100.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	2	**50.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	3	**33.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	2	**50.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	2	**50.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP003	2	15	**13.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosporus By Discrete Analyser	EK067G	1	3	**33.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP003	1	15	**6.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosporus By Discrete Analyser	EK067G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP003	1	15	**6.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosporus By Discrete Analyser	EK067G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TKN as N By Discrete Analyser	EK061G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosporus By Discrete Analyser	EK067G	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Gross Alpha and Beta activity in solids	EA250	SOIL	ISO 9697 / CSN 757611. Determination of Gross Alpha and Beta activity in soil and sediment by Thick Source method. An appropriate mass of sample is dried and pulverised prior to direct activity counting. (If required, Potassium may be determined separately and results corrected accordingly for 40K.) Analysis is performed by ALS (Czech Republic) who hold technical accreditation #1163 for Gross alpha and beta activity under CAI. CAI are a European accreditation body, equivalent to NATA in Australila and recognised internationally by NATA under ILAC.
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	SOIL	APHA 21st ed., 4500 NO3- F. Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by Chemical Reduction, and direct colourimetry by Discrete Analyser.
TKN as N By Discrete Analyser	EK061G	SOIL	APHA 21st ed., 4500-Norg-D Soil samples are digested using Kjeldahl digestion followed by determination by Discrete Analyser.
Total Nitrogen as N (TKN + NOx) By Discrete Analyser	EK062G	SOIL	APHA 21st ed., 4500 Norg/NO3- Total Nitrogen is determined as the sum of TKN and Oxidised Nitrrogen, each determined seperately as N.
Total Phosporus By Discrete Analyser	EK067G	SOIL	APHA 21st ed., 4500 P-B&F This procedure involves sulfuric acid digestion and quantification using Discrete Analyser.
Total Organic Carbon	EP003	SOIL	In-house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)

Analytical Methods	Method	Matrix	Method Descriptions
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (2013) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 501)
Organotin Analysis	EP090	SOIL	(USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.
Organotin Sample Preparation	ORG35	SOIL	In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP066: Polychlorinated Biphenyls (PCB)	3727242-008	----	**Total Polychlorinated biphenyls**	----	136 %	68-118%	**Recovery greater than upper control limit**
EP068A: Organochlorine Pesticides (OC)	3727242-002	----	**4.4`-DDE**	72-55-9	122 %	67-121%	**Recovery greater than upper control limit**
EP090: Organotin Compounds	3727230-002	----	**Monobutyltin**	78763-54-9	124 %	36-118%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser	EB1325948-001	Anonymous	**Total Kjeldahl Nitrogen as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK067G: Total Phosphorus as P by Discrete Analyser	EB1325948-001	Anonymous	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP090: Organotin Compounds	EB1325875-002	10-6C	**Monobutyltin**	78763-54-9	Not Determined	----	**Matrix spike recovery not determined due to sample matrix interference.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

BMT WBM Bangalow
6/20 Byron Street, Bangalow 2479
Tel +61 2 6687 0466 Fax +61 2 66870422
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Brisbane
Level 8, 200 Creek Street, Brisbane 4000
PO Box 203, Spring Hill QLD 4004
Tel +61 7 3831 6744 Fax +61 7 3832 3627
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Denver
8200 S. Akron Street, #B120
Centennial, Denver Colorado 80112 USA
Tel +1 303 792 9814 Fax +1 303 792 9742
Email denver@bmtwbm.com
Web www.bmtwbm.com

BMT WBM London
International House, 1st Floor
St Katharine's Way, London E1W 1AY
Email london@bmtwbm.co.uk
Web www.bmtwbm.com

BMT WBM Mackay
Suite 1, 138 Wood Street, Mackay 4740
PO Box 4447, Mackay QLD 4740
Tel +61 7 4953 5144 Fax +61 7 4953 5132
Email mackay@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Melbourne
Level 5, 99 King Street, Melbourne 3000
PO Box 604, Collins Street West VIC 8007
Tel +61 3 8620 6100 Fax +61 3 8620 6105
Email melbourne@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Newcastle
126 Belford Street, Broadmeadow 2292
PO Box 266, Broadmeadow NSW 2292
Tel +61 2 4940 8882 Fax +61 2 4940 8887
Email newcastle@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Perth
Suite 6, 29 Hood Street, Subiaco 6008
Tel +61 8 9328 2029 Fax +61 8 9486 7588
Email perth@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Sydney
Level 1, 256-258 Norton Street, Leichhardt 2040
PO Box 194, Leichhardt NSW 2040
Tel +61 2 8987 2900 Fax +61 2 8987 2999
Email sydney@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Vancouver
Suite 401, 611 Alexander Street
Vancouver British Columbia V6A 1E1 Canada
Tel +1 604 683 5777 Fax +1 604 608 3232
Email vancouver@bmtwbm.com
Web www.bmtwbm.com