On Site Technology Pty Ltd
ACN 079 329 025
PO Box 5143
ALBERTON
SA 5014

Telephone 08 8241 2078
Facsimile 08 8241 2079
Mobile 0417 846 826

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Your Order

Report Title **Baseline Analysis of Water and Sediment From Patawalonga Lake System**

Sampling by On Site Technology Pty Ltd

Analysis by Eurofins MGT Environmental

Report by John Waters

Authorized

DipAppSc(Chem), CChem, MRACI, MARPS

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1 Executive Summary

A sampling and analysis program was undertaken for water, sediment and water recovered from the sediment in Basin A and the Diversion Basin of the Patawalonga Lake System (PLS). The program was undertaken to;

1. Establish the 95% upper confidence limit for identified key contaminants in the sediment.
2. Confirm that the current sediment is consistent with the previously analysed sediment with respect to potential contaminants that were not detected in previous investigations.
3. Establish the baseline levels of key contaminants and water quality parameters in the water currently present in the PLS.
4. Determine the level of key contaminants in the water recovered from the sediment.

It is proposed that the sediment recovered from a dredging and de-watering project will be disposed through beneficial re-use at a licensed composting facility. The sampling and analysis program has established that the levels of contaminants in the sediment are within the limits approved by the EPA for the proposed project. These results are consistent with previous investigations.

Analysis of water and water recovered from the sediment confirms that the water recovered during the de-watering process is suitable for return to the PLS by;

1. Return to Basin B for water recovered from sediment removed from Basin A
2. Return to the Diversion Basin for water recovered from the sediment removed from the Diversion Basin.

It is expected that this approach will result in improved water quality in the case of pH (in Basin A), Turbidity, Dissolved Oxygen and zinc.

pH (in the Diversion Basin), copper and Total Petroleum Hydrocarbons already meet the Environment Protection (Water Quality) Policy criteria. The proposed dredging and de-watering is not expected to change this situation.

The proposed dredging and de-watering is expected increase the salinity in Basins A and B, however the increase is expected to result in salinity that is well within the normal range present over a full year in the PLS.

2 Introduction

Various water bodies, including the Sturt River and Brown Hill Creek, flow into the Patawalonga Lake System (PLS) catchment. Large amounts of sediment and debris accumulate in both Basin A and the Diversion Basin The basins are known to become extremely turbid during storm-water flushing and, in periods of little or no water flow, are stagnant with insufficient dissolved oxygen to support aquatic flora and fauna.

A significant amount of historical data has been collected on the accumulated sediment, a summary of which has been provided in a previous report (On Site Technology report 13020A, provided as Appendix 1). The majority of the historical data is derived from work undertaken prior to 2008 and questions have been raised concerning the relevance of that data to the sediment currently in the PLS.

The SA-EPA has approved a sampling and analysis program (provided as Appendix 2) to collect representative samples from the sediment currently deposited in the Diversion Basin and Basin A. This report aims to provide the following information;

5. Establish the 95% upper confidence limit for identified key contaminants in the sediment. This is primarily to support the proposed beneficial reuse of the recovered sediment as compost feed stock. Key contaminants have been identified as Total Petroleum Hydrocarbons, Copper and Zinc.

6. Confirm that the current sediment is consistent with the previously analysed sediment with respect to potential contaminants that were not detected in previous investigations. These contaminants include the full list of compounds and elements listed in the SA-EPA Waste Derived Fill Standard.

7. Establish the baseline levels of key contaminants and water quality parameters in the water currently present in the PLS. Because the PLS water quality is significantly degraded this baseline data is required to establish limits for compliance with the Environment Protection (Water Quality) Policy.

8. Determine the level of key contaminants in the water recovered from the sediment. This data is required to support the proposed return of water recovered (by the sediment de-watering process) to the PLS.

3 Sampling Locations

Sample locations are provided in Figure 1.

Sediment sample locations were co-located with the water samples except for location W10. Sediment seemed (based on probing with a PVC pipe) to be absent from the bottom at location W10. The bottom appeared to be rough stones or concrete, it is hypothesised that sediment is scoured from the Diversion basin adjacent to Weir 1 when there are high storm water flows. A separate sediment sampling location S10 was used.

Field duplicate samples were collected and identified with a number ten higher than the original sample such that (for example) “W15” is a field duplicate of sample “W05”

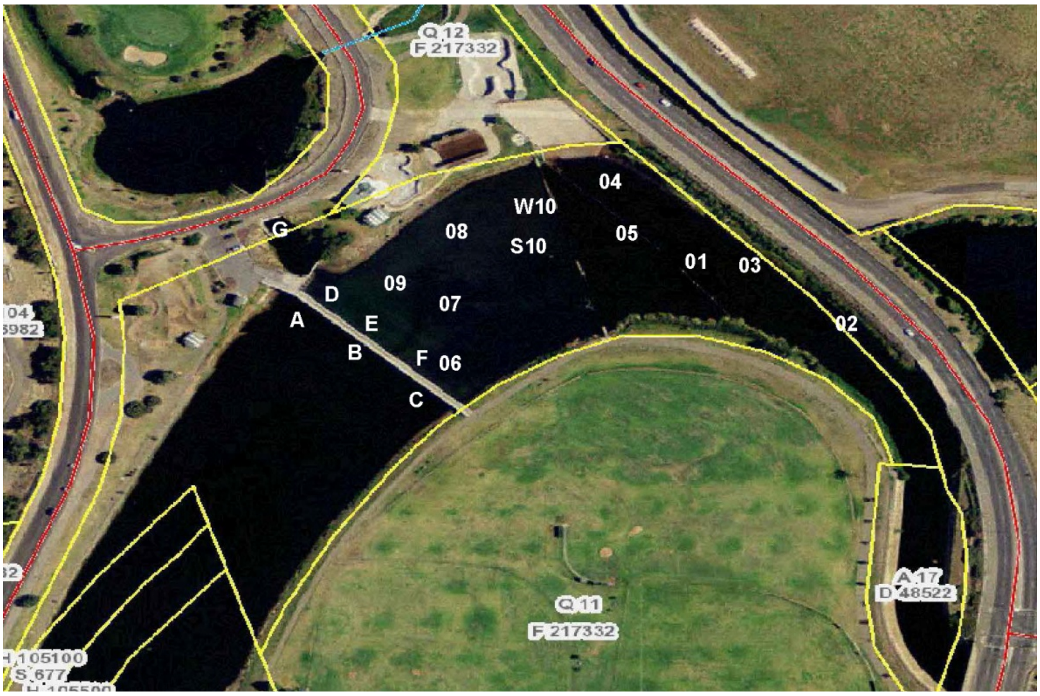

Figure 1 Sample Locations

4 Sample Collection and Analytical Parameters

Measurement of the following water quality parameters was undertaken in situ using a Horiba model U-52 probe, calibration dates (undertaken by the manufacturer) are listed against each parameter;

Parameter	Unit	Calibration	Operational Check
pH	pH units	3/4/14	pH buffer 8.0
Conductivity	mS/cm	2/12/13	
Turbidity	NTU	2/12/13	
DO	% saturation	30/12/13	in air check (100%)
DO	mg/l	30/12/13	

Measurements were taken approximately 15cm below the surface and approximately 15cm above the sediment. In two locations (07 and 09) the water was less than 30cm deep and a single measurement was taken. Locations A to G were tested only for major water quality parameters, namely pH, Turbidity, Electrical Conductivity and Dissolved Oxygen.

Surface water samples (approximately 15cm below the surface) identified as “W01” to “W10” were collected as follows from each location for laboratory analysis;

1. 1 litre unpreserved in glass for Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH)
2. 250ml unpreserved in plastic for Total Dissolved Solids
3. 100ml unfiltered and acidified in plastic for Total copper, lead and zinc

Sediment samples identified as “S01” to “S10” were collected with a stainless steel Van Veen grab sampler or a beaker sampler (when submerged debris prevented the use of the Van Veen). At two locations (S07 and S09) samples were collected using a trowel. Sediment samples were analysed for TPH, TRH, copper, lead and zinc. Four samples were analysed for the full list of potential contaminants listed in the Waste Derived Fill standard.

A duplicate bulk sediment sample (approximately 2kg) was collected from each location so that a “recovered water” sample could be extracted and analysed. These samples were processed by On Site Technology Pty Ltd using settling, filtration and centrifuging to extract a water sample that is considered representative of the recovered water to be returned to the PLS after sediment de-watering.

The recovered water samples identified as “RW01” to “RW10” were submitted to a NATA accredited laboratory for the determination of TPH, TRH, Turbidity, copper, lead and zinc. Total Dissolved Solids, pH, Electrical Conductivity and Dissolved Oxygen were determined by On Site Technology Pty Ltd.

It was anticipated that the sediment would contain significant amounts of biogenic hydrocarbons originating primarily from decaying plant matter which makes up a major proportion of the sediment. For this reason samples were analysed for both TRH (including biogenic hydrocarbons) and TPH (containing petroleum hydrocarbons). TPH are the contaminant of primary environmental concern.

5 Results and Discussion (Water)

Water quality data collected in the field (or in the case of Recovered Water, by On Site Technology when the samples were separated from the sediment) is provided in Appendix 3.

Copies of the Eurofins MGT Environmental Laboratory reports (including quality control and chain of custody documentation) are provided in Appendix 4 (report 405249 dealing with water samples), Appendix 5 (report 405436 dealing with sediment) and Appendix 6 (report 405600 dealing with Recovered Water).

5.1 In Situ Water Quality Parameters

The average, standard deviation and 95% range for the water quality parameters measured in-situ are provided in Tables 1 to 3. The same data for Recovered Water samples is provided in Table 4. It is important to note that the 95% range represents the lower and upper limits between which 95% of samples are expected to fall. This metric has been used in preference to the more usual 95% confidence interval for the estimation of the mean because the lateral and vertical variability of the water combined with the stagnation (particularly in Basin A) that currently exists preclude the assumption that the samples are drawn from a single (homogenous) population.

Basin A		Average	Std Dev	Range 95% of Data	
Parameter	Unit			Minimum	Maximum
pH		9.39	0.15	9.10	9.69
EC	mS/cm	2.08	0.28	1.53	2.64
Turbidity	NTU	72.3	98.6	0.0	265
DO	mg/l	0.95	1.26	0.00	3.42
DO	%	11.0	14.7	0.0	39.9
TDS	mg/l	962	133	701	1224

Table 1 In Situ Waters Quality Results, Basin A

Diversion Basin		Average	Std Dev	Range 95% of Data	
Parameter	Unit			Minimum	Maximum
pH		7.94	0.05	7.84	8.04
EC	mS/cm	56.8	1.6	53.7	59.9
Turbidity	NTU	16.7	4.0	8.9	24.4
DO	mg/l	4.49	0.67	3.18	5.80
DO	%	66.6	10.7	45.6	87.6
TDS	mg/l	36205	4340	27699	44711

Table 2 In Situ Water Quality Results, Diversion Basin

Low Rainfall Input Waters to Barcoo Outlet					
Parameter	Unit	Average	Std Dev	Range 95% of Data	
				Minimum	Maximum
pH		8.08	0.19	7.71	8.45
EC	mS/cm	56.9	2.9	51.1	62.7
Turbidity	NTU	12.1	5.1	2.0	22.2
DO	mg/l	4.12	1.01	2.13	6.10
DO	%	57.8	13.6	31.2	84.4
TDS	mg/l	36275	1872	32606	39945

Table 3 In Situ Water Quality Results, Barcoo Inlet Waters

The turbidity value for location "C" has been excluded from the statistical analysis. However the measured turbidity of 247NTU is consistent with observations of the Barcoo intake when the Weir 2 gates are open.

The bottom Total Dissolved Solids or TDS (26584 mg/l) and EC (41.7mS/cm) results for location "G" have been excluded from the statistical analysis. This location is most likely impacted by fresh to brackish water entering from the Basin to the North of the Road. It should be noted that over a full year the salinity of water entering the Barcoo outlet will range from fresh rain water (at times of high storm water flows) to sea water (when no stormwater flows).

At times of high flow rate (due either to the opening of Weir 2 gates or high storm water flows) the Total Suspended Solids (represented by Turbidity) will be considerably higher than the values recorded in Tables 1 to 3. At these times it is also expected that the Dissolved Oxygen (DO) will be significantly higher and probably approach 100% saturation.

These observations are relevant because the Barcoo outlet is the route through which any environmental degradation from dredging will impact on the environment external to the approved work area. Any impact on Basin A and the Diversion Basin will be temporary and result in an overall improvement of the PLS environment.

5.2 Recovered Water Quality Parameters

A statistical summary of the Water quality parameters for the recovered water samples is provided in Table 4.

The following points are of note when comparing Table 4 to Tables 1 to 3;

The pH of water recovered from the sediment is approximately 1 pH unit lower than the water in Basin A. The potential consequence of this change is the release of metals from the sediment into the recovered water (and consequentially into Basin B). The potential impact of this is discussed (for copper and zinc) below. No such change is noted for the Diversion Basin recovered water.

The Dissolved Oxygen in the recovered water is significantly higher than the Basin water. This is due to aeration of the sample during recovery of the water in the laboratory. It is expected that the de-watering undertaken after the sample dredging will have a similar impact on water discharged into Basin B. The effect replicates the situation during high storm water flow rates. An increase in Dissolved Oxygen is an improvement in water quality.

Turbidity in the recovered water is lower than in the Basin water. This is to be expected since the aim of the dewatering is to produce a return water flow with suspended solids removed. It is clear that in the context of the PLS a turbidity guideline limit of 10NTU is not relevant because the existing turbidity is higher than this (ranging up to 247NTU).

Salinity (expressed at electrical conductivity (EC) or Total Dissolved Solids (TDS) is higher in the recovered water from Basin A sediment than in the Basin A water. This is most obvious when considering the maximum salinity. Although statistically significant, the difference in average salinity between the recovered water and the Basin A water in not considered environmentally significant. It is expected that the natural salinity in Basin A and Basin B could increase above the maximum estimated in Table 4 due to evaporation over the summer period.

Of more significance is the difference in salinity between Basin A (and Basin B) and the Diversion Basin. Over a normal year the salinity in Basins A and B would be expected to vary between that of storm water (i.e. very low) and a maximum of (say) 2,500mg/l due to evaporation in the summer months. The water in Basins A and B would never be saline because of the effective backflow barrier provided by Weir 1. However, the salinity in the Diversion Basin varies from very low in time of high storm water flow to (effectively) sea water during the summer months. This observation is significant because it demonstrates the need to prevent recovered water from the Diversion Basin sediment from being returned to Basin B. It must be returned to the Diversion basin.

Basin A		Average	Std Dev	Range 95% of Data	
				Minimum	Maximum
pH		8.44	0.11	8.22	8.66
EC	mS/cm	3.52	0.67	2.22	4.83
Turbidity	NTU	15.1	5.8	0.0	26.5
DO	%	76.1	8.1	60.2	92.0
DO	mg/l	6.19	0.75	4.73	7.65
TDS	mg/l	1192	445	320	2064
Diversion Basin		Average	Std Dev	Range 95%	
				Minimum	Maximum
pH		7.95	0.09	7.77	8.13
EC	mS/cm	56.2	7.7	41.2	71.2
Turbidity	NTU	5.7	2.5	0.8	10.6
DO	%	75.2	4.5	66.3	84.1
DO	mg/l	5.22	0.30	4.64	5.80
TDS	mg/l	36300	5110	26285	46315

Table 4 Recovered Water Summary Results

5.3 Laboratory Water Analysis

Laboratory water analysis (see Appendices 4 and 6) demonstrates that Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH) are not present at significant levels.

With the exception of three recovered water and one water sample from Basin A recording TRH in the range 0.1 to 0.2mg/l and one water sample from the Diversion Basin recording a TRH of 0.1mg/l all samples recorded “non detect” TRH.

All samples recorded “non detect” for TPH.

Lead was not found in any samples.

Copper was detected in all Basin A samples and Zinc was detected in all samples. Results for copper and zinc are provided in Table 5 and a statistical summary (including 95% confidence interval for the estimation of the mean) presented graphically in Figure 2.

Basin A	Copper	Zinc		Copper	Zinc
W01	0.007	0.078	RW01	0.009	0.079
W02	0.006	0.075	RW02	0.007	0.047
W03	0.006	0.078	RW03	0.005	0.024
W04	0.007	0.078	RW04	0.005	0.025
W14	0.007	0.076			
W05	0.005	0.074	RW05	0.011	0.085
			RW15	0.01	0.078
Average	0.006	0.077		0.007	0.056
Std Dev	0.001	0.002		0.003	0.028
95% CI	0.001	0.001		0.002	0.022
Diversion Basin					
W06	<0.005	0.024	RW06	<0.005	0.019
W07	<0.005	0.017	RW07	<0.005	0.023
W08	<0.005	0.052	RW08	<0.005	0.032
W09	<0.005	0.029	RW09	<0.005	0.029
W10	<0.005	0.017	RW10	<0.005	0.026
Average	<0.005	0.028		<0.005	0.026
Std Dev		0.014			0.005
95% CI		0.013			0.004

Table 5 Copper and Zinc Water Results mg/l

Statistical analysis (using the US-EPA ProUCL v5.0 software) confirms that at the 95% confidence limit there is no difference between the copper and zinc values in the water (W) and recovered water (RW) samples. Statistical tests were conducted using the two tailed t-Test, Wilcoxon-Mann-Whitney and Welch-Satterthwaite tests.

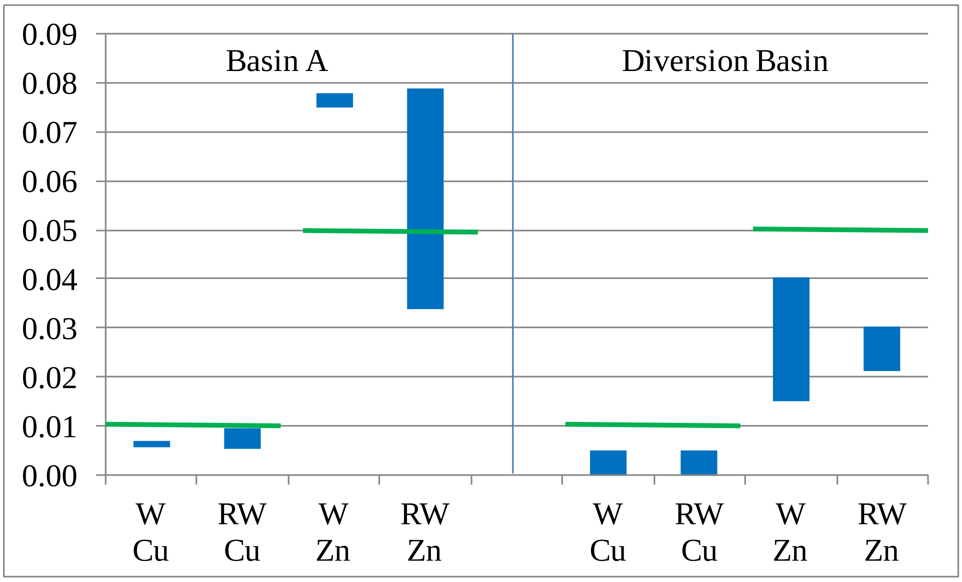

Figure 2 95% Confidence Interval for Copper and Zinc in Water mg/l

The green lines in Figure 1 represent the Environment Protection (Water Quality) Policy criteria for copper and zinc. It is clear that zinc in Basin A does not meet the criteria, however, this is true for both the water in the Basin now and the recovered water destined for return to Basin B. Sampling was not undertaken in basin B, however Basin A and Basin B are a contiguous water body and it is expected that water quality will be comparable in both Basins.

5.4 Summary of Water Results

Table 6 compares the existing and return water parameters with the Environment Protection (Water Quality) Policy criteria for all parameters measured.

Parameter	Unit	Fresh Water Ecosystem			Marine Water Ecosystem		
		Basin A			Diversion Basin		
		Criteria	Existing	Recovered Water	Criteria	Existing	Recovered Water
pH	pH units	6.5 - 9.0	9.06-9.74	8.22-8.66	6.5 - 8.5	7.86-8.07	7.77-8.13
Turbidity	NTU	20	16-370	5.3-27	10	12-24	2.6-9.2
Dissolved Oxygen	mg/l	>6	0-4.54	4.73-5.66	>6	2.94-6.24	4.64-5.80
Salinity	mg/l	10% [1]	820-980	320-2100	ND [2]	24600-46900	26300-46300
TPH	mg/l	10 [3]	<0.1	<0.1	10 [3]	<0.1	<0.1
Copper	mg/l	0.01	0.005-0.007	0.005-0.011	0.01	<0.005	<0.005
Zinc	mg/l	0.05	0.074-0.078	0.024-0.085	0.05	0.017-0.052	0.019-0.032

- Complies with criteria
- Complies with criteria during dredging
- Improved during dredging, but does not comply with criteria
- Does not comply and/or does not improve

Table 6 Water Quality Results Compared to Criteria for Protection of Aquatic Ecosystems

Notes pertaining to Table 6 are;

1. The salinity criteria for Fresh Water ecosystems is for a salinity variation of less than 10% relative. This is not met in the current Basin A water and will not be met during the proposed dredging. However in the Patawalonga Lake System the fresh water salinity varies over a wide range due to evaporation and water column stratification. The expected natural variation in salinity in Basins A and B over a full year is between very low values (during high storm water flow) to (say) 2500mg/l or more in summer due to evaporation. The range of salinity concentration expected during the dredging and de-watering operation is expected to fall within this natural range provided that recovered water from the Diversion Basin sediment is not returned to Basin B.

2. There is no salinity criteria for the Marine Ecosystem. However, the salinity in the Diversion Basin naturally varies between very low (during high storm water flow) to greater than sea water due to evaporation in summer. The range of salinity concentration expected during the dredging and de-watering operation is expected to fall within this natural range.

3. Total Petroleum Hydrocarbons (TPH) was measured during this investigation however the criteria is expressed as “oil and grease”.

6 Conclusions (Water)

Samples of water removed from Basin A and the Diversion Basin (prefixed "W") and of Recovered Water (prefixed "RW") extracted from the sediment in Basin A and the Diversion Basin have been analysed for key potential contaminants and water quality parameters to establish baseline values and to estimate the likely impact of a proposed dredging and de-watering project.

The results of the analysis have been compared to the water quality protection criteria listed in the Environment Protection (Water Quality) Policy (referred to in the following text as the "criteria") and are consistent with the following conclusions;

6.1 pH

The water currently in Basin A (and by extension Basin B because the two Basins are a single water body) does not meet the criteria and would not be expected to meet the criteria until the next storm water run-off event. However, the water recovered from the sediment by the proposed dredging and dewatering process (and to be returned to Basin B) is expected to comply.

The water currently in the Diversion Basin does meet the criteria. The water recovered from the sediment by the proposed dredging and dewatering process is also expected to comply.

6.2 Turbidity

The water currently in Basin A (and by extension Basin B) and in the Diversion Basin does not comply with the criteria.
The water recovered from sediment removed from Basin A will not comply with the criteria. However it is expected to be a significant improvement over currently existing conditions when returned to Basin B

Water recovered from the sediment removed from the Diversion Basin is expected to comply with the criteria prior to being returned to the Diversion Basin.

It must be noted that these comment relate to the water recovered by the de-watering process. It is expected that there will be significant local elevations in turbidity near and adjacent to the actual dredging operation, this is an unavoidable consequence of dredging. The monitoring of this impact will be undertaken as part of the project "Water Quality Monitoring Program".

6.3 Dissolved Oxygen

Water in Basin A (and by extension Basin B) and in the Diversion Basin does not comply with the criteria. The water recovered from the sediment removed from Basin A and the Diversion Basin is still unlikely to meet the criteria, however, the quality with respect to Dissolved Oxygen is expected to be significantly improved by the proposed dredging and de-watering process.

6.4 Salinity

The criteria for salinity in a fresh water environment is for the variation to be less than 10% relative. The water in Basin A (and by extension Basin B) does not comply with the criteria. The water recovered from sediment removed from Basin A is unlikely to comply with the criteria and based on bench trials will probably be more saline than the water currently in Basin B. It is expected that the variation in salinity of the water recovered from sediment removed from Basin A will be within the natural variation (over a full year) for salinity in Basin B.

The salinity of water recovered from sediment removed from the Diversion Basin is expected to vary within the range found in the water already in the Diversion Basin. However, it is significantly more saline that the natural variation found in Basin B. For this reason monitoring and engineering controls should be implemented to ensure that saline water recovered from dredged sediment is not returned via Basin B but is returned to the Diversion Basin.

6.5 Total Petroleum Hydrocarbons (TPH)

TPH was not detected in any water samples. The proposed dredging and de-watering are not expected to impact on TPH levels in the Patawalonga Lake System.

6.6 Copper

Copper concentration in all water samples comply with the criteria. The proposed dredging and de-watering are not expected to impact on copper levels in the Patawalonga Lake System.

6.7 Zinc

Zinc levels in the existing Basin A and Diversion Basin water does not meet the criteria. Water recovered from the sediment removed from Basin A is expected to have a lower concentration than the water currently in Basin B, however it will not meet the criteria. The proposed dredging and de-watering project is expected to improve the water quality with respect to zinc.

Water recovered from the sediment removed from the Diversion basin is expected to have a lower concentration than the water currently in Basin B and will not meet the criteria. The proposed dredging and de-watering project is expected to improve the water quality with respect to zinc.

6.8 Summary

For all of the water quality parameters investigated the quality of the water recovered from the removed sediment will be improved (in most cases) or as a minimum (for salinity) not degraded when compared to the quality of the water currently in the Patawalonga Lake System (PLS).

For Total dissolved Solids (TDS) or salinity the water quality of the recovered water is expected to fall within the range of values naturally experienced in the PLS. Provided that water recovered from the Diversion Basin sediment is not returned to Basin B.

7 Results and Discussion (Sediment)

Ten samples of sediment (five from Basin A and five from the Diversion Basin) were collected and analysed for key potential contaminants identified during previous investigations (see Appendix 1).

Four of these samples (two from Basin A and two from the Diversion Basin) were analysed for all potential contaminants listed in the "Waste Derived Fill Standard".

Copies of the laboratory report and associated quality control information are provided in Appendix 5.

The following potential contaminants were not detected in any sample;

PAH	benzo(a)pyrene
Phenols	OCP
chlordane	DDT
aldrin/dieldrin	heptachlor
PCB	benzene
ethylbenzene	toluene
xylenes	tetrachloroethene
Cr^{6+}	beryllium
mercury	silver
cyanide (total)	

The statistical summary including 95% upper confidence limit for the estimation of the mean (95% UCL determined by ProUCL v5.0) for all detected contaminants is provided in Table 7.

Analyte	Average mg/kg	Std Dev mg/kg	95% UCL mg/kg	Maximum mg/kg
TPH C_{10}-C_{36} (Total)	1041	703	1406	1940
TRH C_6-C_9	<20	NA	<20	<20
Chromium (trivalent)	32	16	46	48
Arsenic	11	8	15	23
Barium	60	36	90	95
Cadmium	0.8	0.3	1.1	1.2
Cobalt	7	2	8	9
Copper	56	31	73	100
Lead	74	38	94	140
Manganese	114	62	165	180
Nickel	15	8	22	24
Zinc	672	359	858	1200

Table 7 Statistical Analysis for Detected Analytes

Copper, zinc and Total Petroleum Hydrocarbons (TPH C_{10}-C_{36}) do not comply with the requirements of the Waste Derived Fill standard. All other analytes comply with the standard.

The proposed disposal option for the de-watered sediment is beneficial reuse as a compost feed stock. Failure to comply with the Waste Derived Fill standard would normally preclude use of the material for compost feedstock. It is understood that the proposed receiver of the de-watered sediment has approval for exceedence in the case of copper, zinc and TPH (refer to a separate submission to the EPA by the composter.

The first round of analysis included only four samples for arsenic because previous investigations did not identify arsenic as a contaminant of concern. Using these four results (taken from Appendix 5) resulted in a 95% upper confidence limit of 24mg/kg which is above the waste derived fill standard. This was due to a single sample returning a result of 23mg/kg.

A further five samples were analysed for arsenic (see Appendix 7), the inclusion of these results provided the 95% upper confidence limit of 15mg/kg listed in Table 7.

8 Conclusions (Sediments)

Ten samples of sediment were collected from the Patawalonga Lake System (PLS), five from Basin A and five from the Diversion Basin.

The samples were analysed for the previously identified key potential contaminants with four samples analysed for all contaminants listed in the Waste Derived Fill standard, nine samples were analysed for arsenic. The results of the analysis confirm that the composition of the sediment currently deposited in Basin A and the diversion Basin is consistent with the results of previous investigations reported elsewhere (see Appendix 1).

With the exception of Total Petroleum Hydrocarbons (TPH C_{10}-C_{36}), copper and zinc all contaminants listed in the Waste Derived Fill standard comply with the standard.

It is understood that the proposed composter has approval to accept the material with Total Petroleum Hydrocarbons (TPH C_{10}-C_{36}), copper and zinc above the Waste Derived Fill standard provided that the concentrations do not exceed the “intermediate landfill cover” criteria. These contaminants do not exceed the “intermediate landfill cover” criteria.

Appendix 1

Previous Report 13020A

Appendix 2

Approved Sampling and Analysis Program

Appendix 3

Field Water Quality Data

Appendix 4

Laboratory Water Report 405249

Appendix 5

Laboratory Sediment Report 405436

Appendix 6

Laboratory Recovered Water Report 405600

Appendix 7

Laboratory Arsenic Report 408111