



Darwin Turf Club

Annual Monitoring Report

Darwin Turf Club Inc.

2020 - 2021



→ The Power of Commitment

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1. Introduction

1.1 Background information

GHD Pty Ltd (GHD) was engaged by Darwin Turf Club Incorporated (DTC) to prepare an Annual Report summarising the ongoing groundwater and air-toxics environmental monitoring at the Darwin Turf Club (the Site). Darwin Turf Club Racecourse covers an area of approximately 47 hectares and is situated approximately 4 km north of Darwin CBD.

The Site is located off Dick Ward Drive, Fannie Bay, NT. The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east, Playford Street and Wells Street to the south and west. Residential properties are located on the opposite sides of Douglas Street, Playford Street and Wells Street facing the Site.

DTC hold an Environmental Protection Licence (EPL) which permits the application of oil to the racecourse surface, as part of soil conditioning and track maintenance works. Northern Territory Environmental Protection Authority (NT EPA) conditions contained within the EPL (EPL 218) require DTC to undertake routine environmental monitoring of groundwater and air quality before, during, and after the application of oil to the track surface.

GHD has undertaken the routine monitoring on behalf of DTC since April 2020, amounting to seven groundwater monitoring events (GMEs) and three air quality monitoring events (AQMEs). The air quality sampling is part of a three-year reporting programme at the site to comply with EPL 218. Primarily, this programme involves a review of key air quality measurements during the three years of operations of the Site.

The GMEs and AQMEs were undertaken in accordance with the EPL and DTC Environmental Management Plan (GHD, 2012).

The results of the monitoring are reported to DTC at the conclusion of each monitoring event. The monitoring reports from August 2020, October 2020 and April 2021 have been incorporated into this annual report.

1.2 Purpose and scope

As part of NT EPA reporting requirements, DTC is required to submit an Annual Monitoring Report within 10 days of the anniversary of the creation of EPL 218 each year. GHD was engaged by DTC to develop this report on their behalf.

This report summarises the results and outcomes of the monitoring between 01 July 2020 through to June 30 2021. Further detail on the individual monitoring events during this period can be found within the following Monitoring Reports previously supplied to DTC and NT EPA:

- GHD, 2020. *Darwin Turf Club – EPL Monitoring Dry Season GME Report*, (August 2020).
- GHD, 2020. *Darwin Turf Club – EPL Monitoring GME and Air Monitoring Report*, (October 2020).
- GHD, 2021. *Darwin Turf Club – EPL Monitoring GME and Air Monitoring Report*, (May 2021).

The following scope of work was undertaken during the individual monitoring events:

- Collection of groundwater samples at seven groundwater wells as specified in EPL 218. The second event occurred within 48 hours of the track conditioning activities.
- Air-toxics monitoring, during track conditioning activities, at three locations specified in EPL 218.

The environmental monitoring was carried out in general accordance with:

- Australian and New Zealand Guidelines for Water Quality: Sampling, AS/NZS 5667.1, 1998.
- National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM).
- National Environment Protection Council (NEPC) National Environment Protection (Air Toxics) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM).
- NT EPA, 2018. *Guideline for Reporting on Environmental Monitoring*, (May 2016).

1.3 Limitations

This report: has been prepared by GHD for Darwin Turf Club Inc. and may only be used and relied on by Darwin Turf Club Inc. for the purpose agreed between GHD and Darwin Turf Club Inc. as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Inc. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Darwin Turf Club Inc. and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Methodology

2.1 Groundwater monitoring program

In accordance with EPL requirements, the GMEs are undertaken on dates surrounding oil application events. For each application event, one GME is undertaken within two weeks prior to application, and a second GME is undertaken with 48 hours after the application.

An additional GME was undertaken on 4 August 2020 as a conservative additional monitoring event outside the oil application period.

The purpose of the GMEs is to measure standing water level (SWL) and collect groundwater samples for laboratory analysis from the seven existing on site monitoring bores. The bore locations are presented in Figure 1 (attached at the end of the report). The GMEs during this annual reporting period were undertaken on the following dates:

- 4 August 2020 (GME 3)
- 8 September 2020 (GME 4)
- 16 September 2020 (GME 5)
- 20 April 2021 (GME 6)
- 28 April 2021 (GME 7)

Specific details on the methodologies implemented for each GME are described within the individual monitoring reports attached as Appendix A. A summary of the typical groundwater sampling programme and testing schedule is described in Table 1.

Table 1 Groundwater sampling programme 2020-2021

Sample ID	Location (in relation to track)	Contaminants of potential concern (CoPC)	Context of sampling
MW01	North	– Total recoverable hydrocarbons (TRH) – Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) – Dissolved Metals¹	Capture the quality of groundwater assumed to be exiting the site to the north.
MW02	North		
MW03	Northwest		
MW04	Northeast		
MW05	East		Capture the quality of groundwater to the east of the site.
MW06	South		Capture the quality of groundwater to the south of the site (assumed to be the background reference site).
MW07	West (inside track)		Capture the quality of groundwater to the west of the site.

¹ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc

2.1.1 Groundwater sampling

During each GME, the following activities were completed at each groundwater bore location:

- Each bore was visually inspected, and the bore condition was noted.
- The bore cap was removed, and the headspace was immediately monitored using a calibrated photoionisation detector (PID).
- An initial SWL reading was measured using a calibrated interface probe.
- Groundwater sampling was undertaken using low flow sampling techniques comprising a peristaltic pump and flow cell with calibrated YSI Pro DSS water quality meter.

- Purging was undertaken until the field water quality parameters listed in Table 2 stabilised.
- Samples were collected into laboratory-supplied containers with appropriate preservatives required for each analyte.
- Samples for metals analysis were field-filtered to <0.45 µm using a disposable in-line filter.
- The samples were placed in chilled storage containers and transported under Chain of Custody (COC) documentation to ALS Environmental for laboratory analysis.
- Additional quality assurance / quality control (QAQC) samples were collected to maintain data quality.

2.1.2 Groundwater assessment criteria

The EMP (GHD, 2012) prescribes several groundwater assessment criteria to determine the acceptability and investigation limits of individual analytes in groundwater at the Site. Where exceedances to these criteria are reported from field water quality measurements or laboratory results, a discussion is presented within the individual monitoring reports. EPL 218 requires notification of these exceedances to NT EPA in accordance with EPL Clause 34.

These acceptance criteria have been summarised in Table 2.

Table 2 EPL 218 Groundwater acceptance criteria values

Parameters	Units	Acceptance Limit
Field water quality parameters		
pH	pH units	6.0 – 8.0
Temperature	°C	N/A
Turbidity	NTU	2 – 15
Electrical conductivity	µS/cm	20 – 250
Dissolved Oxygen	% saturation	80 – 110
Photo ionisation detector reading	ppm	50
Laboratory parameters		
Heavy metals		
Arsenic	mg/L	0.094
Cadmium	mg/L	0.0004
Chromium	mg/L	0.006
Copper	mg/L	0.0018
Lead	mg/L	0.0056
Mercury	mg/L	0.0019
Nickel	mg/L	0.013
Zinc	mg/L	0.015
BTEX		
Benzene	mg/L	0.3
Toluene	mg/L	0.3
Ethylbenzene	mg/L	0.005
Xylenes	mg/L	0.075
Total Recoverable Hydrocarbons (TRH)		
Total TRH C10 – C36	mg/L	0.6

2.2 Air quality sampling program

Environmental monitoring of air quality is a requirement under the EPL 218 and is to be carried out during the application of waste oil to the racecourse. As oil is applied to the racecourse twice a year to maintain cohesiveness and reduce erosion to the track, the relevant analytes to be tested from the air quality samples include BTEX.

The programme typically consists of a single round of air sampling undertaken at three locations on the day of oil application. Sample locations are AQM01, AQM02 and AQM03 along the south end of the racecourse, this sampling design aims to capture potential emissions of BTEX from the application of waste oil. A summary of the air quality monitoring locations and analytical suite is presented in Table 3.

Specific details on the methodologies implemented for each AQME are described within the individual monitoring reports attached as Appendix A.

Table 3 Air quality monitoring program 2020-2021

Sample ID	Location (in relation to track)	Contaminants of potential concern (CoPC)	Context of sampling
AQM01	Southwest	BTEX	To determine the quality of the air potentially exiting the Site towards the residential properties in the southwest, south and southeast of the Site.
AQM02	South		
AQM03	Southeast		

2.2.1 Air quality sampling

AQME were undertaken on the two oil application days during this annual reporting period, which were 15 September 2020 and 27 April 2021.

Portable Summa® canisters fitted with flow meters were placed at the three locations at the site to collect a single round of air samples on each application day. The Summa® canister draws a sample under vacuum and the flow meter controls the continuous intake of air for a period of 12 hours.

During each AQME, the following activities were completed at each air quality sampling location:

- Portable canisters were calibrated for an ultra-low-level 12-hour fill time prior to setup.
- The pressure gauges on each of the canisters were checked to ensure a vacuum pressure of approximately - 30 kPa within the canister prior to sampling.
- The canisters were set up at each of the three locations prior to the commencement of oil application.
- At the time of deployment, the weather conditions were noted.
- The sampling used portable 6 L Summa evacuated canisters for sample capture, placed between 1.2 – 1.5 m above ground level.
- Once the canister fill period was complete, the samples were sent to the receiving NATA-accredited laboratory for analysis.
- The samples were transported under COC documentation to ALS Environmental for laboratory analysis.
- In the April 2021 AQME, a weather monitoring station was deployed during the air quality sampling period to provide additional supporting information on wind speed, direction, air pressure and temperature.

2.2.2 Air quality assessment criteria

Air quality assessment criteria specified in the EMP have been derived from the National Environment Protection (Air Toxics) Measure (NEPM). These acceptance limits are summarised in Table 4.

Table 4 EPL 218 Air quality acceptance criteria values

Parameter	Units	Trigger Value
BTEX		
Benzene	ppb ¹	3
Toluene	ppb	1,000
o-Xylene	ppb	250
M & p Xylenes	ppb	250

¹ parts per billion

2.3 Quality control and assurance

2.3.1 Field quality control methods

All field works were undertaken by experienced environmental scientists in accordance with GHD's Standard Field Operating Procedures and in compliance with NEPM requirements.

2.3.2 Blind and split duplicates

A single sample is divided into three separate sampling containers. The parent sample and the blind sample are sent anonymously to the primary project laboratory with the split sample sent to the secondary laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity. Split duplicate samples provide an indication of the repeatability of the results between laboratories.

One set of field duplicate samples (Blind and Split) was collected and analysed as part of the analytical program.

The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD\% = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where **Co** = Analyte concentration of the original sample
Cd = Analyte concentration of the duplicate sample

Nominal acceptance criteria of 30% and 50% were adopted for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations. In the event RPD values exceed these limits, an explanation is provided within the individual monitoring reports attached within Appendix A.

2.3.3 Laboratory quality control methods

In addition to field QAQC procedures, the receiving laboratories also adopt internal QAQC procedures to ensure data quality and reliability. These procedures are required as part of their NATA-accreditation.

The nominated NATA accredited analytical laboratories (ALS Environmental and Eurofins MGT Laboratory) adopted their internal procedures and methods in accordance with their quality assurance systems. Results from these procedures are provided alongside the individual monitoring reports as appendices.

3. Groundwater monitoring results

3.1 Field parameters

The methodologies described in Section 2.1 were implemented during each of the GMEs during this annual reporting period.

Bore conditions were recorded and are presented within each monitoring report. Generally, the bore network is of acceptable condition, however MW01 and MW02 are currently unsuitable for monitoring due to casing damage/blockages.

While gauging the SWL in each of the suitable wells with an interface probe, no non-aqueous phase liquid (NAPL) was detected in any of the monitoring wells. PID readings obtained during gauging were within the acceptable limits.

As described in Section 2.1.1, field water quality parameter measurements were measured in each of the sampled wells during purging using a calibrated YSI Pro DSS water quality meter and flow cell.

Water quality measurements were not collected for MW01 and MW02 during this annual reporting period as there was insufficient water volume present in the well in each of the GMEs. The shallow total depths recorded in these wells suggest that they may be damaged or blocked above the expected groundwater level.

Water quality observations made throughout the GMEs during this monitoring period are available in the individual GME reports from August 2020, October 2020 and April 2021 listed in Section 1.2, attached as Appendix A.

A summary of the water quality parameters and field observations from this annual reporting period are provided in Table 5.

Table 5 Groundwater quality parameters: July 2020 – June 2021

Well ID	Well depth (mbTOC)	SWL (mbTOC)	Physical parameters					Comments and observations
			Temp (°C)	DO (%)	pH	EC (µS/cm)	Turbidity (NTU)	
GME 3 (August 2020)								
MW01	0.777	Well dry						
MW02	1.746	Well dry						
MW03	4.648	2.876	32.8	4.0	5.02	406.4	9.56	No odour or sheen, slightly cloudy.
MW04	6.030	2.605	31.9	11.3	5.11	9,850	4.56	No odour or sheen, clear.
MW05	5.484	3.809	31.0	95.7	6.28	77.4	2.26	No odour or sheen, clear.
MW06	6.595	5.244	31.7	5.9	4.61	109.8	11.02	No odour or sheen, clear.
MW07	6.025	3.605	30.8	6.5	4.81	1651	6.66	No odour or sheen, clear.
GME 4 (September 2020)								
MW01	0.770	Well dry						
MW02	1.748	Well dry						
MW03	4.642	3.040	33.6	0.0	4.81	422.8	1.00	Slightly cloudy, no odour, no sheen.
MW04	-	-	32.5	2.81	4.65	1,8810	301.9	Unable to get interface probe through bend in PVC piping. Water was white-red slightly cloudy, light sheen.
MW05	5.472	3.932	32.3	89.1	5.96	112.0	4.86	Clear, no odour, no sheen.
MW06	6.583	5.481	33.5	7.79	4.35	107.9	7.94	Clear, no odour, no sheen.
MW07	6.013	3.774	32.5	1.30	4.53	2,599	35.96	Clear, no odour, no sheen .
GME 5 (September 2020)								
MW01	0.774	Well dry						
MW02	0.750	Well dry						
MW03	4.634	3.085	33.9	0.0	5.60	529	2197	Initially very light brown cloudy, cleared around 0.5 L. No odour, no sheen.
MW04	5.035*	2.968	33.2	0.0	4.52	20,888	63.10	Water slightly yellow-hazy. No odour, no sheen.
MW05	4.472	3.854	33.1	96.8	6.04	110.4	1.27	Water clear. No odour, no sheen.
MW06	6.601	3.824	34.1	1.43	4.32	103.9	12.10	Water clear. No odour, no sheen.
MW07	6.048	3.824	32.7	1.72	4.07	1710	20.11	Water clear. No odour, no sheen.

GME 6 (April 2021)								
MW01	0.777	Well Dry						
MW02	1.746	1.428	Insufficient water column to sample					
MW03	4.639	2.690	32.8	0.5	5.22	481.1	0.79	Clear, no odour, no sheen, low turbidity
MW04	6.030	2.148	33.5	26.8	5.63	7,055	0.83	Cloudy, yellow in colour. turbid initially clearing after 0.5 L. low turbidity, no odour, no sheen.
MW05	5.471	3.921	32.3	51.8	4.89	230.5	1.96	Clear, no odour, no sheen, no turbidity.
MW06	6.593	4.405	31.6	7.4	4.90	355.0	1.87	Clear, no odour, no sheen, high turbidity initially, cleared after 200 mL no turbidity.
MW07	6.039	2.948	30.3	20.5	4.46	281.8	2.18	Clear, no odour, no sheen, no turbidity
GME 7 (April 2021)								
MW01	0.778	Well Dry						
MW02	1.752	0.229	Insufficient column of water to sample.					
MW03	4.680	2.793	32.8	0.8	5.21	491.5	1.80	Clear, no odour, no sheen, no turbidity.
MW04	6.030	2.297	33.2	20.2	5.53	8,828	1.63	Clear, no odour, no sheen, no turbidity.
MW05	5.464	3.656	31.8	80.7	5.66	99.4	0.67	Clear, no odour, no sheen, no turbidity.
MW06	6.530	4.540	31.2	1.8	4.97	338.3	2.10	Cloudy (yellow brown in colour). Low sediment load, cleared around 0.5 L. No odour, no sheen.
MW07	6.040	3.053	30.4	31.6	4.45	331.4	2.14	Clear, no odour, no sheen, no turbidity.

3.1.1 Water quality results assessment

Generally, the water quality at the Site is indicative of a shallow freshwater aquifer, with the northern bores intersecting an area of seawater intrusion into this aquifer. This is expected considering the close proximity of the Site to the coastline towards the north and west. This is demonstrated by the regular occurrences of higher electrical conductivity (EC) values observed in the groundwater from bores MW04 and MW07.

pH values observed in groundwater are slightly to moderately acidic, which is common in Top End groundwaters.

Turbidity values are relatively low at the conclusion of purging the wells, which typically accumulate some sediment between GMEs while the wells are undisturbed. This trend is observed during sampling, where the initial groundwater water quality readings during pumping show high turbidity values, decreasing as groundwater purging continues. The full trends of groundwater purge parameters are presented within the individual monitoring reports.

3.2 Laboratory results

The results of the groundwater analysis are summarised in the appendices of the individual monitoring reports attached as Appendix A. These results are provided both in the raw laboratory report documentation and summarised within the individual reports for reference.

The majority of heavy metals, BTEX, and TRH have been consistently recorded below the laboratory limit of reporting (LOR). Results detected above the LOR are generally below the acceptance criteria. In particular, the dissolved metals have been detected at concentrations above the Australian Drinking Water Guidelines (ADWG) limits for Freshwater ecosystems, and occasionally above the limit for Drinking Water.

Specific exceedances reported during each monitoring event are presented in the relevant monitoring report, attached as Appendix A. The laboratory analytical results are presented against the relevant exceedance criteria in Appendix B of the monitoring event-dedicated reports.

4. Air quality monitoring results

Two AQMEs were conducted on the oil application days within this annual reporting period. The dates of oil applications at the Site were:

- 15 September 2020, and;
- 27 April 2021.

The AQMEs were conducted in compliance with the methodologies prescribed in Section 2.2, with the exception of quantitative weather monitoring which commenced in April 2021. Detailed results of these AQMEs are presented within the dedicated monitoring reports for each event, attached as Appendix A.

4.1 September 2020 AQME results

The sampling was carried out starting approximately 06:30 am on the 15 September 2020. At the time of canister deployment, the weather conditions were noted as cool, slightly humid, sunny with calm south easterly winds. Wind from this direction is blowing away from residential properties.

The laboratory analytical results for air quality were below the laboratory LOR for all analytes, with only one detectable concentration of Toluene in AQM03 reported during the September 2020 AQME. These results, with details of this AQME are presented within Appendix A.

Table 6 Air quality monitoring results September 2020

Analyte	Acceptance limit	Sample CoPC concentration			Unit
		AQM01	AQM02	AQM03	
Benzene	0.010	<0.003	<0.003	<0.003	mg/m ³ *
Toluene	3.766	<0.0075	<0.0075	0.029	mg/m ³
o-Xylene	1.085	<0.004	<0.004	<0.004	mg/m ³
m & p Xylenes	2.170	<0.008	<0.009	<0.009	mg/m ³

4.2 April 2021 AQME results

GHD commenced the air quality monitoring program for the April monitoring period on 27 April 2021 using the same methods described above.

The sampling started at approximately 06:00 am on the 27 April 2021. At the time of deployment, the weather conditions were noted as cool, slightly humid, sunny with calm easterly winds. Wind from this direction is blowing away from residential properties.

Commencing in April 2021, temperature, wind speed and wind direction were monitored with a calibrated, portable weather station. The results of this monitoring are presented in Table 7 and within the April 2021 monitoring report attached in Appendix A.

The laboratory sample results for air quality were below the limit of reporting (LOR) for Benzene and o-Xylenes for all locations and no BTEX analytes were detected at AQM03.

Detectable concentrations of Toluene, Ethylbenzene and Xylenes (m & p) were reported from samples taken at AQM01 and AQM02 locations. All analytes were below the acceptance criteria limits as summarised in Table 8 below.

All air quality analytical results reported during this annual reporting period were below the acceptance criteria limits listed in Section 2.2.2.

Table 7 April 2021 AQME weather conditions

Parameter	AQM01	AQM02	AQM03
Deployment			
Time	6:00 am	6:20 am	6:30 am
Wind speed	0.0 m/s		
Wind direction	Easterly		
Temperature	19.0 °C		
Collection			
Time	5:30 pm	5:35 pm	5:40 pm
Wind speed	0.9 m/s		
Wind direction	Easterly		
Temperature	27.0 °C		

Table 8 April 2021 Air-quality monitoring results

Analyte	Acceptance limit	Sample pollutant concentration			Unit
		AQM01	AQM02	AQM03	
Benzene	0.010	<0.003	<0.003	<0.003	mg/m ³
Toluene	3.766	0.043	0.016	<0.0075	mg/m ³
Ethylbenzene	(Not limited)	0.011	0.0047	<0.004	mg/m ³
o-Xylene	1.085	<0.004	<0.004	<0.004	mg/m ³
m & p Xylenes	2.170	0.033	0.012	<0.008	mg/m ³

5. Data quality

5.1 Field QA/QC results assessment

In accordance with NEPM quality control requirements, one pair of duplicate samples were collected and analysed per GME. These samples were collected alongside a nominated primary sample and analysed as a blind duplicate and split duplicate respectively.

Each monitoring report produced during this annual reporting period provides an assessment of both field and laboratory data quality. Laboratory results from duplicate pairs taken during specific GMEs are compared using the RPD method described in Section 2.3, with individual exceedances to the RPD acceptance limits discussed within the relevant monitoring report.

Across this annual reporting period, only one RPD exceedance was reported during the April 2021 monitoring period, from GME 6. A single RPD exceedance generated across five GMEs is considered a positive result and confirms that the dataset is of reliable quality, and that the adopted groundwater sampling procedures are acceptable to maintain data quality and sample integrity.

5.2 Laboratory internal QA/QC results assessment

The analysis of matrix spikes, matrix spike duplicates, laboratory control samples and surrogates were undertaken by the laboratory. A review of laboratory quality control procedures adopted during this monitoring period is summarised below:

- All groundwater and air quality samples were received by the laboratory in acceptable condition, appropriately chilled and within the relevant holding times for the prescribed analysis.
- Samples were extracted and analysed by the laboratory within appropriate holding times.
- All matrix spike recoveries, matrix spike duplicates, surrogate spike recoveries and laboratory control sample recoveries were within acceptable range (laboratory's historical statistical range).

Individual laboratory QA/QC reports are presented within the certified laboratory documentation provided alongside each monitoring report.

6. Assessment of exceedances to acceptance criteria

6.1 Groundwater quality assessment

Throughout this annual reporting period, the groundwater monitoring yielded several results that exceeded the adopted acceptance criteria defined in the EMP and in Section 2.1.2 of this report. These results are summarised within the individual monitoring reports.

EPL 218 Clause 37 defines the non-compliance reporting requirements associated with exceedances to the adopted criteria. This clause requires DTC to notify NT EPA of individual exceedances that are reported three times in consecutive monitoring events (Clause 37.1), or over three times the relevant acceptance limit (Clause 37.2). As such, GHD provides summaries of the individual exceedances within each monitoring report to allow timely non-compliance notification from DTC to NT EPA, where required.

Individual exceedance results are presented in the monitoring reports, with non-compliance notification requirements also defined in each report, attached as Appendix A.

A summary of the non-compliance notifications has been submitted as an Annual Return Form to NT EPA by DTC for this annual reporting period. This Annual Return Form for this annual reporting period is attached as Appendix B.

In summary, the exceedances reported to groundwater quality acceptance limits at the Site generally occur for field water quality parameters (pH, EC, DO and turbidity) and dissolved metals. No exceedances have been reported for TRH or BTEX in groundwater during this annual reporting period.

6.2 Air-quality assessment

The September 2020 and April 2021 AQMEs reported air quality results below the acceptance criteria set in EPL 218. As such, no specific non-compliances have been issued to NT EPA regarding these results.

Further detail on the individual AQME results and a discussion of these is provided in each of the relevant monitoring reports within Appendix A.

7. Conclusion and recommendations

7.1 Conclusion

The groundwater monitoring and air quality monitoring undertaken during this annual reporting period has met the requirements of the EMP and EPL 218. The GME and AQME results from this annual reporting period indicate that the track conditioning activity undertaken at the Darwin Turf Club approved under EPL 218 does not pose a risk to the surrounding environment. Although the surrounding environment exhibits minimal to no impact from the track conditioning activities, groundwater and air quality monitoring will continue to be undertaken as per NT EPA requirements.

Noting the above, some monitoring and reporting objectives have not been achieved during this period. These are summarised against the relevant EPL 218 clauses within SLR's audit report from June 2021 (SLR, 2021). This report provided an assessment of DTC's actions against the clauses of EPL 218 and provided recommendations for maintaining compliance with NT EPA requirements and opportunities for achieving greater compliance.

7.2 Recommendations

It is recommended that the groundwater analytical dataset be reviewed and assessed to determine whether the recorded exceedances are a trend or represent naturally occurring background concentrations (e.g., copper, nickel and zinc). The outcome of this assessment should be considered when evaluating the suitability of the current acceptance criteria.

It is also recommended that elevation data be collected for the monitoring bores, to allow for accurate groundwater flow direction to be determined. Additionally, installing replacement groundwater bores for MW01 and MW02 should be considered to maintain the completeness of the monitoring network, if required.

Further recommendations regarding monitoring and general compliance with EPL 218 and the EMP are presented in the SLR Environmental Audit Report (SLR, 2021).

8. References

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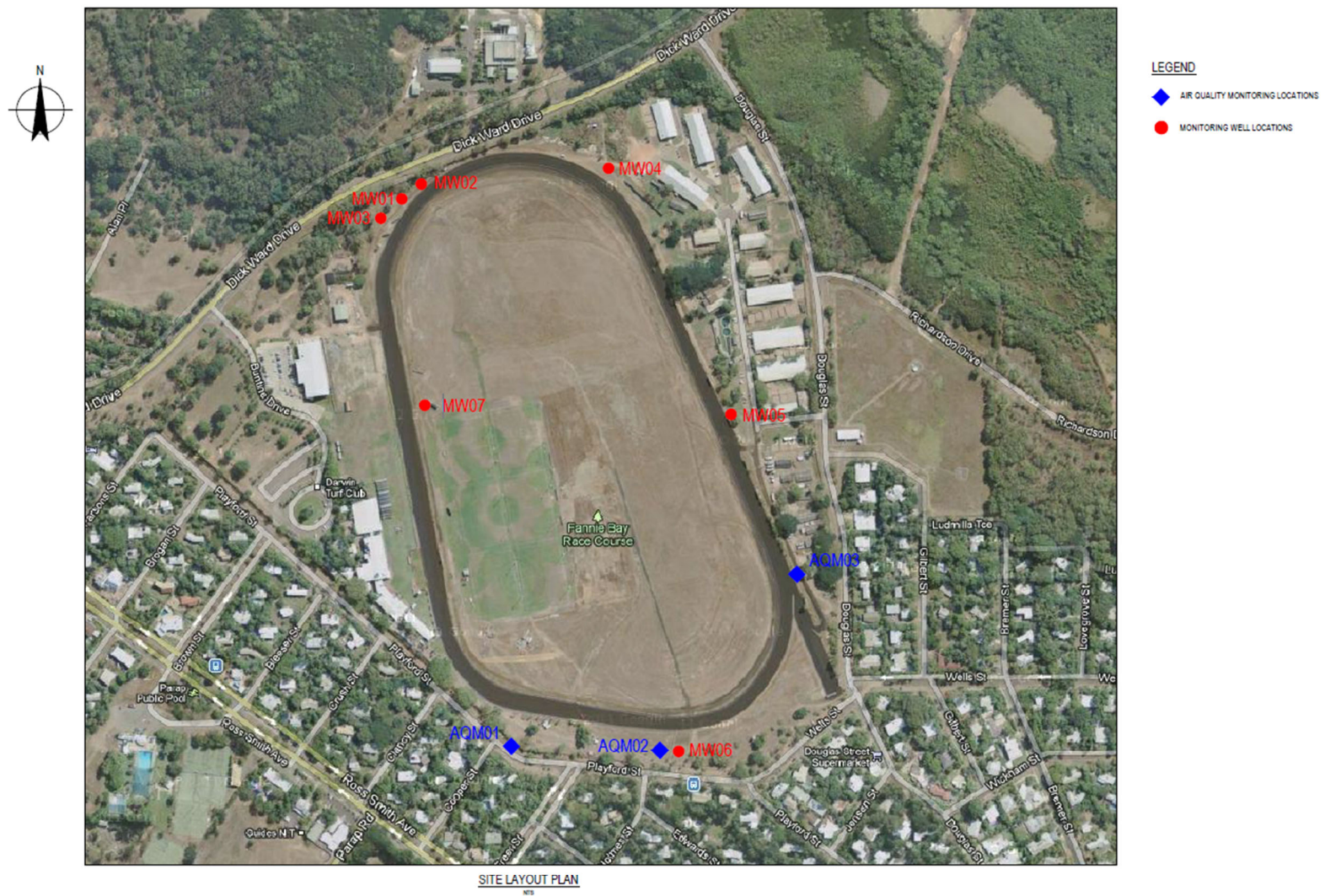
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DARWIN TURF CLUB INCORPORATED
 ENVIRONMENTAL MONITORING
 DARWIN TURF CLUB
 ENVIRONMENTAL
 MONITORING LOCATIONS

Job Number | 43-21851
 Revision | A
 Date | OCT 2011
Figure 01

Level 5, 66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com.au W www.ghd.com.au

Plot Date: 21 October 2011 11:02 AM Plotted by: Ron Fernandez (Darwin) GHD GHD File No: G:\4321851\4321851\Drawings\43-21851-FIGURE_01.dwg

Figure 1 Environmental monitoring locations

Appendices

Appendix A

Monitoring Reports: July 2020 – June 2021



Darwin Turf Club Inc

Darwin Turf Club - EPL Monitoring Dry Season GME Report

August 2020

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1. Introduction

1.1 Background information

GHD Pty Ltd (GHD) was engaged by Darwin Turf Club Incorporated to undertake the ongoing Groundwater Monitoring at the Darwin Turf Club (hereinafter referred to as the Site).

Environmental monitoring of groundwater and air toxics is a requirement under the Site's Environment Protection Licence (Ref: EPL 218).

Darwin Turf Club Racecourse comprises approximately 47 hectares and is situated approximately 4 km north of Darwin CBD.

The site is located off Dick Ward Drive, Fannie Bay. The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east, Playford and Wells Street to the south and east. Residential properties bound Douglas Street, Playford Street and Wells Street.

1.2 Purpose of this report

This report documents the environmental monitoring activities carried out by GHD at the Darwin Turf Club in relation to dry season conditions in accordance with the Environment Protection Licence (EPL) 218 requirements for the site.

1.3 Scope

In accordance with EPL 218 requirements, the following scope of works was undertaken by GHD:

- One dry season representative groundwater sampling event at all seven groundwater wells present on site at the locations specified in EPL 218.

The environmental monitoring works were carried out in general accordance with:

- Australian and New Zealand Guidelines for Water Quality: Sampling, AS/NZS 5667.1, 1998.
- National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM).
- National Environment Protection Council (NEPC) National Environment Protection (Air Toxics) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM).

1.4 Limitations

This report: has been prepared by GHD for Darwin Turf Club Inc and may only be used and relied on by Darwin Turf Club Inc for the purpose agreed between GHD and the Darwin Turf Club Inc as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Inc arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Darwin Turf Club Inc and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Sampling and analytical programme

2.1 Groundwater sampling programme

GHD performed the groundwater monitoring event (GME) to measure standing water level and collect samples for laboratory analysis at seven existing monitoring bores located at the Darwin Turf Club Racecourse. The GME was undertaken on the 4 August 2020 in accordance with the EPL requirements.

The weather during the fieldwork was sunny with a temperature of 30.9°C, rainfall was not recorded on the two days prior to the monitoring event.

Table 1 Groundwater sampling programme

Well ID	Location (in relation to race track)	Contaminants of particular concern (CoPC)	Context of sampling
MW01	North	TRH/BTEX/8 Metals*	Assess the quality of groundwater assumed to be exiting the site to the north.
MW02	North		
MW03	Northwest		
MW04	Northeast		
MW05	East		Assess the quality of groundwater to the east of the site.
MW06	South		Assess the quality of groundwater to the south of the site (assumed to be the background reference site).
MW07	West (inside track)		Assess the quality of groundwater to the west of the site.

*Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc

2.1.1 Groundwater trigger values

The EPL 218 trigger values for groundwater are summarised in Table 2.

Table 2 EPL 218 Groundwater trigger values

Parameter	Units	Trigger Value
Field Parameter		
pH	pH units	6.0 – 8.0
Temperature	°C	N/A
Turbidity	NTU	2 - 15
Electrical conductivity	µS/cm	20 - 250
Dissolved oxygen	% saturation	80-110
Laboratory Parameter		
Heavy Metals (dissolved)		
Arsenic	mg/L	0.094
Cadmium	mg/L	0.0004
Chromium	mg/L	0.006
Copper	mg/L	0.0018
Lead	mg/L	0.0056
Mercury	mg/L	0.0019
Nickel	mg/L	0.013
Zinc	mg/L	0.015

Parameter	Units	Trigger Value
BTEX		
Benzene	mg/L	0.3
Toluene	mg/L	0.3
Ethylbenzene	mg/L	0.005
Xylenes	mg/L	0.075
Total Recoverable Hydrocarbons (TRH)		
Total TRH C10 – C36	mg/L	0.6

2.1.2 Groundwater monitoring

After inspection of the individual bores, static water levels were measured with an interface probe at the seven bores, the field data is provided in Appendix A.

Prior to sampling, all bores were purged, using a peristaltic pump, until the water quality reading stabilised (three consecutive readings within a set range e.g. difference in readings of 10%). Field water quality measurements were taken during purging operations using a calibrated YSI Pro DSS water quality meter. Physical parameters recorded were:

- pH
- Dissolved oxygen (DO)
- Electrical conductivity (EC)
- Temperature
- Turbidity

Post purging, groundwater samples were collected and placed in laboratory-supplied containers with appropriate preservatives for the required analysis. The samples were cooled on ice for storage and transported under Chain of Custody (COC) documentation to ALS analytical laboratory.

Samples for metals analysis were field-filtered to <0.45 µm using a disposable filter before being placed in to an appropriate preserved sample container.

2.2 Quality control and assurance

2.2.1 Field quality control methods

All fieldwork was undertaken by experienced environmental scientists in accordance with GHD's Standard Field Operating Procedures.

Field quality control (QC) procedures used during the project comprised the collection and analysis of the following quality control samples:

Blind and split duplicates: Comprise a single sample that is split into three separate samples (parent, blind and split). The parent and blind samples are sent anonymously to the primary project laboratory with the split sample sent to the secondary laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity. Split duplicate samples provide an indication of the repeatability of the results between laboratories.

One set of field duplicate samples (Blind and Split) was collected and analysed as part of the analytical program.

The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD\% = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where C_o = Analyte concentration of the original sample
 C_d = Analyte concentration of the duplicate sample

GHD adopts nominal acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations.

2.3 Laboratory program

The nominated NATA accredited analytical laboratories (ALS laboratory group and Eurofins MGT Laboratory group) adopted their internal procedures and methods in accordance with their quality assurance systems.

2.3.1 Laboratory quality control

Laboratory quality control procedures used during the project were:

Laboratory duplicate samples: The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result.

Spiked Samples: An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory Control Sample: A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

Surrogate Standard/Spikes: These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Method Blank: Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The laboratory is required to provide this information to GHD. The individual testing laboratories conduct an assessment of the laboratory QC program, internally however, the results will also be independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPDs within the NEPM acceptance criteria of 30%. Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery, although dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix; should normally range from about 70 – 130%. Method (laboratory) blanks should return analyte concentrations as 'below practical quantitation limit (PQL)'.

3. Groundwater monitoring results

3.1 Physico-chemical field parameters

Field water quality measurements were taken during purging operations using a calibrated YSI Pro DSS water quality meter.

Water quality measurements were unable to be collected for MW01 and MW02 as there was insufficient water volume present in the well.

Recorded water quality measurements are provided in Table 4.

Table 3 Groundwater physical characteristics

Well ID	Well depth (mbTOC)	SWL (mbTOC)	Physical parameters					Comments/ observations
			Temp (°C)	DO (%)	pH	EC (µS/cm)	Turbidity (NTU)	
MW01	0.777	Dry	-	-	-	-	-	Well dry/Blocked
MW02	1.746	Dry	-	-	-	-	-	Well Dry.
MW03	4.648	2.876	32.8	4.0	5.02	406.4	9.56	No odour or sheen, slightly cloudy.
MW04	6.030	2.605	31.9	11.3	5.11	9850	4.56	No odour or sheen, clear.
MW05	5.484	3.809	31.0	95.7	6.28	77.4	2.26	No odour or sheen, clear.
MW06	6.595	5.244	31.7	5.9	4.61	109.8	11.02	No odour or sheen, clear.
MW07	6.025	3.605	30.8	6.5	4.81	1651	6.66	No odour or sheen, clear.

3.1.1 Temperature

Groundwater temperatures ranged from 30.8 to 32.8 °C with the northern most bores recording the highest temperatures.

3.1.2 Dissolved Oxygen (DO)

DO concentrations ranged from 4.0 to 11.3 percent with the exception of MW05 with 95.7 percent.

3.1.3 pH

Field pH data indicates groundwater at the site was slightly acidic, ranging from 4.61 to 5.11 with 6.28 at MW05.

3.1.4 Turbidity

Turbidity field results ranged from 2.26 – 11.02 NTU.

3.1.5 Electrical Conductivity (EC)

With the exception of MW04 and MW07 (to the north of the site), EC values ranged from 77.4 to 406.4 µS/cm indicating a predominately freshwater environment. EC of 9850 and 1651 µS/cm were recorded in MW04 and MW07 respectively. The higher levels of EC indicate marine influence on the groundwater.

3.2 Laboratory results

The results of the groundwater analysis are summarised in Appendix B. Copies of the certified laboratory reports are presented in Appendix C.

The majority of metals, BTEX, and TRH were recorded below the laboratory Limit of Reporting (LOR). Detectable concentrations above the LOR and below the trigger values were returned for the following metals:

- Arsenic – MW07
- Cadmium – MW07
- Lead – MW04 and MW07.
- Nickel – MW03, MW05, MW06 and MW07

3.2.1 Trigger value exceedances

Those metals recorded above the trigger values, were returned for the following metals:

- Cadmium (0.0005 mg/L) was identified above the trigger value of 0.0004 mg/L in MW04.
- Copper was identified above the trigger value of 0.0018 mg/L in all wells sampled, with results ranging from 0.002 to 0.011 mg/L.
- Nickel (0.066 mg/L) was identified above the trigger value of 0.013 mg/L in MW04.

Zinc was identified above the licence criteria of 0.015 mg/L in all wells sampled, except MW06, with results ranging from 0.040 to 0.291 mg/L.

3.3 Field quality control

To augment laboratory quality procedures, one set of field QC samples was collected and analysed. This sample was collected as a duplicate and triplicate and analysed as a blind duplicate and split duplicate respectively. Details are provided in Table 5. Relative Percentage Difference (RPD) calculations are presented in Appendix B.

Table 4 QC duplicate/triplicate samples

Parent sample	Duplicate sample	Triplicate sample	Laboratory	Analysis
MW06	QC104_200804	-	ALS	TRH/BTEX/ Metals
MW06	-	QC204_200804	ALS	

The analytes had RPD values below the nominated data quality indicators. Due to an error on the CoC the triplicate sample was not forwarded to the secondary laboratory and was analysed by the primary laboratory instead.

The duplicate RPD is displayed in Appendix B

3.4 Laboratory QA/QC results

The analysis of matrix spikes, matrix spike duplicates and surrogates was undertaken by the laboratory. A review of laboratory quality control is summarised below:

- All samples were received by the laboratory in good condition and chilled and within appropriate holding times for analysis.
- Samples were extracted and analysed within appropriate holding times.
- The RPDs of the internal duplicate samples met the acceptable limits for all analytes.

- All matrix spike duplicates and surrogate spike recoveries were within acceptable range (laboratory's historical statistical range).
- All matrix spike recoveries with the exception of copper (background level greater than 4 x the spike level), and control sample recoveries with the exception of PAH/Phenols and TRH – Semi volatile fraction for both Laboratory duplicates and matrix spike, were within acceptable range (laboratory's historical statistical range).

Laboratory QA/QC are presented within the certified laboratory reports in Appendix C.

4. Trigger value exceedances

4.1 Groundwater

During this round of monitoring, the following parameters/analytes exceeded the trigger value as they were greater than three times the standard trigger value as per EPL 128 licence condition 37.2;

- Copper – All wells sampled except MW06.
- Nickel – MW04
- Zinc – MW04, MW05 and MW07.
- EC – In MW04 and MW07 for both GMEs (note also now 3 consecutive readings above trigger values for MW04)

Licence condition 37.1 stipulates that three consecutive exceedances result in a non-compliance. The following parameters/analytes have recorded exceedances in three consecutive monitoring events:

- pH – MW03, MW04, MW06 and MW07
- DO – MW03, and MW06
- EC – MW03 and MW04
- Copper – All wells sampled
- Nickel – MW04
- Zinc – MW04 and MW05

Under condition 35 of EPL 218 the above exceedances are notifiable to the NT EPA.

The field measured physical parameters for pH, EC and DO for monitoring wells MW03, MW04 and MW07 and pH and DO for monitoring well MW06 were non-compliant with the specified trigger values in EPL 218.

In addition to the notifiable exceedances (due to three time the trigger value) listed above, Copper and Zinc exceeded the trigger value in all wells sampled and Cadmium exceeded the trigger value in MW04.

5. Conclusions

The groundwater monitoring was undertaken as per the scope of works on 4 August 2020 using the peristaltic pump sampling method, with the exception of two wells which were dry.

The physico-chemical field parameters measured, Table 4, were consistent with previous measurements for the site. The laboratory analysis results were below the laboratory LOR for the majority of analytes, with detection only recorded for metals.

Notifiable non-compliance exceedances detailed in Table 8 and Table 9 are summarised in Table 7 below.

Table 5 Summary of notifiable exceedances

Well ID	Three consecutive exceedance of trigger values	Exceedance by three times trigger value
MW03	pH, DO, EC and Copper	Copper
MW04	pH, EC, Copper, Nickel and Zinc	EC Copper, Nickel and Zinc
MW05	Copper and Zinc	Copper and Zinc
MW06	pH, DO and Copper	Nil
MW07	pH and Copper	EC, Copper and Zinc

Table 6 Notifiable exceedances values for three consecutive exceedances of trigger value

Well ID	Parameter/ Analyte	pH	DO	EC	Copper	Nickel	Zinc
	Trigger value	6.0-8.0	80-110	20-250	0.0018 mg/L	0.013 mg/L	0.005 mg/L
MW03	GME 1	4.76	13.2	582	0.008 mg/L	Nil	Nil
	GME 2	4.67	5.0	586	0.002 mg/L		
	Dry season GME	5.02	4.0	406.4	0.009 mg/L		
MW04	GME 1	5.23	Nil	6,273	0.005 mg/L	0.021 mg/L	0.093 mg/L
	GME 2	5.18		6,729	0.007 mg/L	0.030 mg/L	0.140 mg/L
	Dry season GME	5.11		9850	0.011 mg/L	0.066 mg/L	0.291 mg/L
MW05	GME 1	Nil	Nil	Nil	0.009 mg/L	Nil	0.039 mg/L
	GME 2				0.003 mg/L		0.062 mg/L
	Dry season GME				0.007 mg/L		0.061 mg/L
MW06	GME 1	4.63	4.7	Nil	0.011 mg/L	Nil	Nil
	GME 2	4.69	4.6		0.005 mg/L		
	Dry season GME	4.61	5.9		0.002 mg/L		
MW07	GME 1	4.24	Nil	Nil	0.007 mg/L	Nil	Nil
	GME 2	4.17			0.003 mg/L		
	Dry season GME	4.81			0.009 mg/L		

Table 7 Notifiable exceedances values for exceedances of three times the trigger value

Parameter /Analyte	EC	Copper	Nickel	Zinc
Trigger value	20-250 µS/cm	0.0018 mg/L	0.013 mg/L	0.005 mg/L
MW03	Nil	0.009 mg/L	Nil	Nil
MW04	9850 µS/cm	0.011 mg/L	0.066 mg/L	0.291 mg/L
MW05	Nil	0.007 mg/L	Nil	0.061 mg/L
MW07	1651 µS/cm	0.009 mg/L	Nil	0.056 mg/L

Appendices

Appendix A – Field Data



Appendix A Table 1
Groundwater Gauging

Darwin Turf Club
EPL Monitoring

Groundwater

Site	Well ID	Date/Time	Water Depth (mbTOC)	Well Depth (mbTOC)	Method	Dry	Comments
Darwin Turf Club	MW01	17/01/2020 12:30 PM		0.777	Dip	Y	Well Dry
Darwin Turf Club	MW01	23/04/2020 11:21 AM		0.777	Dip	Y	Well Dry
Darwin Turf Club	MW01	28/04/2020 10:58 AM		0.777	Dip	Y	Well Dry
Darwin Turf Club	MW01	4/08/2020 11:58 AM		0.779	Dip	Y	Well Dry
Darwin Turf Club	MW02	17/01/2020 12:31 PM	0.941	1.775	Dip	N	Clear with organic matter, no odour, no sheen - Bail, YSI Pro Plus
Darwin Turf Club	MW02	23/04/2020 11:27 AM	1.346	1.750	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW02	28/04/2020 10:59 AM	1.443	1.750	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW02	4/08/2020 12:00 PM		1.746	Dip	Y	Well Dry
Darwin Turf Club	MW03	17/01/2020 12:29 PM	1.467	4.636	Dip	N	Unable to get bailer down well
Darwin Turf Club	MW03	23/04/2020 10:56 AM	2.157	4.630	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW03	28/04/2020 10:15 AM	2.264	4.630	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW03	4/08/2020 11:21 AM	2.876	4.648	Dip	N	Slightly Cloudy, No odour, No sheen, Clear at 2 L - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW04	17/01/2020 01:00 PM	1.804	6.030	Dip	N	Orange/brown, moderate sediment load, no odour, no sheen - Bail, YSI Pro Plus
Darwin Turf Club	MW04	23/04/2020 12:07 PM	2.081	6.072	Dip	N	Slightly cloudy/milky, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW04	28/04/2020 11:44 AM	1.965	6.072	Dip	N	Slightly cloudy/milky, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW04	4/08/2020 12:05 PM	2.605	6.030	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW05	17/01/2020 01:30 PM	3.325	5.484	Dip	N	Brown, slightly turbid, no odour. no sheen - Bail, YSI Pro Plus
Darwin Turf Club	MW05	23/04/2020 01:08 PM	3.759	5.470	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW05	28/04/2020 12:40 PM	3.781	5.470	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW05	4/08/2020 12:48 PM	3.809	5.484	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW06	17/01/2020 02:10 PM	3.468	6.595	Dip	N	Cloudy brown, moderate sediment load, no odour, no sheen - Bail, YSI Pro Plus
Darwin Turf Club	MW06	23/04/2020 09:03 AM	4.376	6.610	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW06	28/04/2020 08:47 AM	4.418	6.610	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW06	4/08/2020 08:52 AM	5.244	6.595	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW07	17/01/2020 10:40 AM	2.529	6.043	Dip	N	Bore bent, unable to get bailer down well
Darwin Turf Club	MW07	23/04/2020 10:01 AM	2.869	6.050	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW07	28/04/2020 09:36 AM	2.984	6.050	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell
Darwin Turf Club	MW07	4/08/2020 10:02 AM	3.605	6.025	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell



Appendix A Table 2
Stabilisation Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW02	17/01/2020 12:59 PM	12:36:00	1.0	0.951	6.28	609	0.81	11.4	-33.8	33.1	
			12:38:00	2.0	0.959	6.18	647	0.81	11.5	-31.0	33.9	
			12:40:00	3.0	0.959	6.08	506	1.33	29.3	-20.7	34.8	
			12:42:00	4.0	0.959	5.89	498.6	1.91	27.7	1.4	34.8	
			12:45:00	5.0	0.959	5.84	510	1.91	27.6	10.3	34.8	
			12:47:00	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	
Darwin Turf Club	MW02	23/04/2020 11:45 AM	11:35:06	0.5	1.530	6.04	520	1.26	17.9	42.2	34.3	54.67
			11:37:34	1.0	1.483	5.85	531	0.83	11.8	41.2	34.8	29.10
			11:40:35	1.5	1.472	5.56	535	0.41	6.0	59.2	34.8	2.13
			11:42:30	2.0	1.472	5.51	531	0.38	5.4	65.7	34.8	0.39
			11:45:09	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	11:09:43	0.5	1.563	5.78	520	1.23	17.1	44.4	33.9	12.00
			11:13:06	1.0	1.520	5.58	510	0.83	11.8	54.9	34.2	4.70
			11:17:20	1.5	1.515	5.52	504	0.60	8.5	66.3	34.2	-0.91
			11:21:16	2.0	1.516	5.50	497.5	0.59	8.3	74.7	34.2	-2.15
			11:25:16	2.5	1.519	5.47	492.3	0.58	8.3	80.8	34.2	-2.03
			11:29:08	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	11:04:51	0.5	2.158	4.73	581	0.88	12.4	206.9	34.0	22.5
			11:06:38	1.0	2.158	4.75	584	0.93	13.2	209.8	34.0	22.09
			11:08:30	1.5	2.158	4.76	582	0.93	13.2	209.8	34.0	21.61
			11:10:24	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	10:23:55	0.5	2.264	4.61	588	0.75	10.4	236.0	33.9	-3.04
			10:26:21	1.0	2.264	4.63	588	0.53	7.4	236.2	33.8	-2.92
			10:29:49	1.5	2.264	4.66	587	0.40	5.5	236.6	33.8	-3.18
			10:32:34	2.0	2.264	4.65	587	0.37	5.2	237.2	33.8	-3.00
			10:36:02	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	11:36:08	0.5	2.877	5.05	437.0	0.95	13.4	205.4	32.9	33.42
			11:39:03	1.0	2.877	5.03	408.2	0.42	5.8	218.1	32.9	22.22
			11:41:38	1.5	2.877	5.03	406.7	0.34	4.8	221.8	32.8	15.25
			11:43:47	2.0	2.877	5.03	406.4	0.28	3.9	226.1	32.8	10.10
			11:45:25	2.5	2.878	5.02	406.3	0.28	3.8	227.9	32.8	9.31
			11:47:13	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56



Appendix A Table 2
Stabilisation Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW04	17/01/2020 01:20 PM	13:03:00	1.0	2.174	5.41	9691	4.08	56.8	126.9	31.7	
			13:05:00	2.0		5.34	10356	4.17	59.5	137.8	31.8	
			13:07:00	3.0	2.566	5.06	15173	3.12	45.4	156.6	32.0	
			13:09:00	4.0		4.99	17340	2.05	31.9	187.3	32.3	
			13:12:00	6.0	2.830	4.99	13930	2.03	31.0	189.3	32.3	
			13:15:00	8.0		5.06	13225	2.07	32.4	189.3	32.3	
			13:18:00	10		5.09	13025	2.09	32.4	191.7	32.3	
			13:20:00	11		5.11	12521	2.06	32.1	193.3	32.3	
Darwin Turf Club	MW04	23/04/2020 12:41 PM	12:26:40	0.5	1.949	4.83	13350	1.59	23.1	214.6	33.7	87.86
			12:28:49	1.0	1.963	4.97	11288	1.51	21.9	217.4	33.6	85.43
			12:30:50	1.5	1.965	5.05	9530	1.51	21.8	217.5	33.6	85.32
			12:32:28	2.0	1.964	5.08	7500	1.48	21.2	217.3	33.6	85.47
			12:36:24	3.0	1.964	5.18	6430	1.44	20.7	215.4	33.6	53.69
			12:39:04	3.5	1.965	5.20	6366	1.46	20.8	214.2	33.6	50.41
			12:41:01	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	11:55:39	0.5	2.037	4.47	23696	0.63	9.4	237.4	33.2	13.14
			11:58:45	1.0	2.037	4.59	23663	0.53	8.0	246.7	33.3	4.81
			12:02:58	1.5	2.037	4.71	19250	0.57	8.4	251.7	33.3	3.00
			12:06:01	2.0	2.037	4.73	15003	0.62	9.0	249.4	33.3	0.92
			12:09:37	2.5	2.037	4.86	11724	0.69	9.9	245.9	33.3	1.68
			12:12:02	3.0	2.037	4.99	9581	0.78	11.2	241.1	33.3	2.52
			12:15:07	3.5	2.037	5.03	8491	0.82	11.8	237.8	33.3	3.31
			12:18:21	4.0	2.037	5.10	7352	0.93	13.3	234.6	33.3	3.55
			12:20:28	4.5	2.037	5.13	6922	0.95	13.6	232.8	33.3	3.97
			12:22:18	5.0	2.037	5.15	6875	0.98	14.0	231.0	33.3	4.95
			12:24:03	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06



Appendix A Table 2
Stabilisation Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW04	4/08/2020 12:34 PM	12:15:11	0.50	2.753	4.86	16623	2.13	30.2	294.8	32.0	4.01
			12:18:32	1.0	2.796	4.98	13810	2.24	32.1	300.0	31.9	3.62
			12:21:06	1.5	2.834	4.96	13554	1.44	20.5	303.1	31.9	4.35
			12:23:43	2.0	2.875	5.01	12026	1.06	15.1	304.1	31.9	4.06
			12:25:26	2.5	2.888	5.05	11123	0.88	12.3	303.8	31.9	4.13
			12:27:10	3.0	2.897	5.07	10237	0.85	12.0	303.9	31.9	4.18
			12:30:13	3.5	2.899	5.09	10062	0.81	11.6	302.6	31.9	4.25
			12:32:51	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW05	17/01/2020 01:50 PM	13:35:00	2.0	3.705	6.64	157.8	4.65	56.6	143.0	31.1	
			13:37:00	3.0	3.870	6.60	116.0	4.49	61.0	145.2	31.1	
			13:39:00	4.0	4.021	5.97	115.0	4.48	66.7	148.5	31.2	
			13:40:00	5.0	4.121	5.95	110.2	4.52	69.3	150.2	31.2	
			13:42:00	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	
Darwin Turf Club	MW05	23/04/2020 01:28 PM	13:18:41	0.5	3.902	5.67	126.5	6.05	83.6	185.2	32.5	1.06
			13:20:39	1.0	3.961	5.65	102.5	6.05	83.5	190.5	32.5	1.04
			13:22:24	1.5	4.018	5.62	96.2	6.03	83.2	195.7	32.5	-0.80
			13:25:34	2.0	4.077	5.60	95.1	5.95	82.2	201.9	32.5	-0.80
			13:28:09	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
Darwin Turf Club	MW05	28/04/2020 01:14 PM	12:51:41	0.5	3.915	5.80	152.0	6.23	85.9	181.4	32.4	-1.39
			12:54:01	1.0	3.974	5.77	102.3	6.24	86.0	191.0	32.4	-1.71
			12:58:40	1.5	4.064	5.73	92.8	6.22	85.6	198.9	32.4	-1.76
			13:03:09	2.0	4.147	5.71	91.5	6.21	85.7	207.5	32.4	-1.47
			13:08:41	2.5	4.226	5.68	91.5	6.27	86.6	211.6	32.4	-1.35
			13:14:03	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	12:57:58	0.50	3.944	6.36	184.5	7.09	95.4	251.8	31.0	2.08
			13:01:10	1.0	4.063	6.30	79.0	7.13	95.9	258.8	31.0	2.20
			13:03:51	1.25	4.112	6.29	78.3	7.13	95.9	260.3	31.0	2.24
			13:05:27	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
Darwin Turf Club	MW06	17/01/2020 02:30 PM	14:12:14	1.0	3.492	5.44	197.5	4.47	62.4	165.1	32.5	
			14:13:04	2.0	3.495	5.15	203.0	4.30	62.0	189.9	32.4	
			14:14:14	3.0	3.498	5.10	210.6	4.48	62.8	203.3	32.5	



Appendix A Table 2
Stabilisation Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
			14:15:24	4.0	3.502	5.08	220.7	4.41	61.9	211.6	32.5	
			14:16:36	5.0	3.505	5.07	227.3	4.29	57.8	218.6	32.5	
			14:17:53	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	
Darwin Turf Club	MW06	23/04/2020 09:33 AM	09:19:23	0.5	4.380	4.68	356.1	1.76	23.2	169.1	33.2	-1.20
			09:22:45	1.0	4.381	4.64	355.0	0.74	10.2	186.8	33.0	-1.05
			09:24:58	1.5	4.381	4.64	354.4	0.51	7.1	192.0	33.0	-0.90
			09:27:38	2.0	4.381	4.63	353.2	0.43	6.2	198.5	33.0	-0.87
			09:29:24	2.5	4.381	4.63	353.4	0.37	5.2	202.0	33.0	-0.71
			09:31:28	3.0	4.382	4.64	353.3	0.36	5.0	205.4	33.0	-0.61
			09:33:22	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	08:58:36	0.5	4.422	4.71	291.5	0.63	8.7	156.7	32.1	0.46
			09:02:30	1.0	4.422	4.70	289.0	0.48	6.4	176.8	32.3	0.49
			09:05:56	1.5	4.423	4.69	289.8	0.36	5.0	192.1	32.4	0.69
			09:08:24	2.0	4.423	4.69	290.5	0.35	4.9	195.9	32.4	1.10
			09:11:27	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	09:11:00	0.5	5.436	4.63	102.4	0.52	7.1	255.7	31.7	5.20
			09:17:00	1.0	5.565	4.65	102.3	0.43	5.9	268.2	31.7	10.54
			09:23:00	1.25	5.643	4.64	106.7	0.45	6.1	275.3	31.7	10.85
			09:27:00	1.50	5.683	4.62	107.9	0.44	6.0	280.1	31.7	10.95
			09:31:00	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW07	23/04/2020 10:17 AM	10:08:37	0.5	2.921	4.31	195.3	2.53	34.1	208.8	31.3	0.30
			10:10:15	1.0	2.930	4.27	176.6	2.45	32.9	218.9	31.1	0.31
			10:12:33	1.5	2.931	4.26	176.1	2.27	30.6	226.9	31.1	-0.85
			10:15:08	2.0	2.932	4.25	177.7	2.35	31.6	232.0	31.1	-0.9
			10:17:05	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	09:43:53	0.5	3.021	4.21	317.5	1.41	19.2	238.3	31.1	-1.78
			09:46:04	1.0	3.022	4.22	212.0	1.93	26.1	244.1	31.1	-2.62
			09:48:49	1.5	3.022	4.19	188.6	2.10	28.3	250.9	31.1	-2.67
			09:50:54	2.0	3.023	4.18	186.9	2.10	28.3	254.2	31.1	-2.84
			09:53:01	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97



Appendix A Table 2
Stabilisation Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW07	4/08/2020 10:48 AM	10:21:28	0.5	3.760	4.65	1500	1.27	17.1	208.0	30.7	8.33
			10:27:42	1.0	3.846	4.74	1451	1.24	17.1	226.1	30.8	8.75
			10:33:24	1.50	3.931	4.75	1877	1.25	17.7	194.4	30.8	9.28
			10:39:55	2.00	4.095	4.79	1722	0.45	6.1	170.7	30.8	6.29
			10:43:33	2.5	4.193	4.82	1693	0.48	6.4	178.5	30.8	6.12
			10:47:12	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66



Appendix A Table 3
Final Sample Results

Darwin Turf Club
EPL Monitoring

Field Results

Site	Well ID	Sampled Date/Time	Purge Vol	Purge SWL	pH Field	EC Field	DO Field	DO Field	OPR Field	Temp Field	Turbidity Field
			L	m bTOC	pH Units	µS/cm	mg/L	%S	mV	°C	NTU
Darwin Turf Club	MW02	17/01/2020 12:59 PM	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	
Darwin Turf Club	MW02	23/04/2020 11:45 AM	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW04	17/01/2020 01:20 PM	11	2.830	5.11	12521	2.06	32.1	193.3	32.3	
Darwin Turf Club	MW04	23/04/2020 12:41 PM	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
Darwin Turf Club	MW04	4/08/2020 12:34 PM	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW05	17/01/2020 01:50 PM	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	
Darwin Turf Club	MW05	23/04/2020 01:28 PM	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
Darwin Turf Club	MW05	28/04/2020 01:14 PM	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
Darwin Turf Club	MW06	17/01/2020 02:30 PM	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	
Darwin Turf Club	MW06	23/04/2020 09:33 AM	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW07	23/04/2020 10:17 AM	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66

Appendix B - Results Tables



Appendix B Table 1 Grondwater Results

Darwin Turf Club EPL Monitoring

Well ID	MW02				MW03				MW04				MW05				MW06				MW07			
	Field ID				Field ID				Field ID				Field ID				Field ID				Field ID			
	Date	17/01/2020	23/04/2020	28/04/2020	23/04/2020	28/04/2020	28/04/2020	4/08/2020	17/01/2020	23/04/2020	28/04/2020	4/08/2020	17/01/2020	23/04/2020	28/04/2020	4/08/2020	17/01/2020	23/04/2020	28/04/2020	4/08/2020	23/04/2020	28/04/2020	4/08/2020	23/04/2020
Field Parameters	pH (Field)	8.0 - 8.2	5.96	5.46	5.46	5.45	4.76	4.67	5.02	5.11	5.23	5.16	5.11	5.59	5.59	5.97	6.28	5.05	4.63	4.69	4.61	4.34	4.17	4.91
	Electrical conductivity (Field)	20 - 250	505	509	450.1	562	596	406.4	12521	6.273	6.729	6.729	9.850	107.3	85.1	83.6	77.4	232.2	353.4	299.9	109.8	176.4	186.4	1.651
	DO (FS) (Field)	50 - 110	27.4	3.9	3.3	12.2	5	14.6	38.4	11.2	14.6	14.6	11.2	61.7	85.3	95.7	23.2	4.7	4.6	4.6	3.1	30.8	30.8	4.5
	Redox (Field)	mV		11.3	69.0	84.1	204.4	236.7	229.0	193.3	213.1	229.2	302.6	153.5	205.4	217.1	252.4	221.5	208.1	201.9	283.1	236.0	296.7	179.9
	Temperature (Field)	°C		34.6	34.6	34.2	34.0	33.8	32.8	33.3	31.9	31.2	32.5	32.4	31.0	32.5	31.0	32.5	31.0	31.7	31.1	31.1	31.1	30.8
	Turbidity	NTU	0.1	2 - 15	36.1	9.16	9.21	34.1	8	9.56	22.96	22.96	8.16	4.56	9.4	9.4	1.96	2.26	3.96	1.96	4.86	11.02	9	6.66
	Metals																							
	Arsenic (Filtered)	mg/L	0.001	0.004	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004
	Cadmium (Filtered)	mg/L	0.0001	0.0004	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0002	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
	Chromium (B-VI) (Filtered)	mg/L	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper (Filtered)	mg/L	0.001	0.010	<0.001	0.001	0.002	0.004	0.009	0.004	0.004	0.004	0.004	0.001	<0.001	0.004	0.003	0.007	<0.001	0.001	0.006	0.006	0.002	0.004
	Lead (Filtered)	mg/L	0.001	0.006	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004
	Mercury (Filtered)	mg/L	0.0001	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nickel (Filtered)	mg/L	0.001	0.013	<0.001	0.010	<0.001	0.009	0.002	0.005	0.016	0.021	0.096	0.066	0.006	0.009	0.009	<0.001	0.010	0.001	0.002	0.008	0.002	0.008
	Zinc (Filtered)	mg/L	0.005	0.016	0.007	0.011	0.007	0.046	0.010	0.040	0.067	0.063	0.140	0.201	<0.005	0.009	0.002	0.061	<0.005	0.006	0.011	0.006	0.012	0.002
	BTEXN																							
	Benzene	µg/L	1	300	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Toluene	µg/L	2	500	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Ethylbenzene	µg/L	2	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene (o)	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene (m & p)	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene Total	µg/L	2	75	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Naphthalene	µg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	BTEX (Sum of Total) - Lab Calc	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tet - NEPM 2013	F1 (C8-C10 minus BTEX)	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	C8-C10 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	F2 (C10-C16 minus Naphthalene)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	>C10-C16 Fraction	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	F3 (C16-C24 Fraction)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	F4 (C24-C40 Fraction)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	>C10-C40 (Sum of Total)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100



Appendix B Table 2
RPD Table

Darwin Turf Club
EPL Monitoring

	Unit	EQL	Date		4/08/2020		4/08/2020		4/08/2020		RPD
			Field ID	MW06_200804	QC204_200804	MW06_200804	QC104_200804				
			Lab Report No.	ES2026813	ES2026813	ES2026813	ES2026813				
			Matrix Type	water	water	water	water				
Metals											
Arsenic (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	<0.001	0	
Cadmium (filtered)	mg/L	0.0001		<0.0001	<0.0001	0	<0.0001	<0.0001	<0.0001	0	
Chromium (III+VI) (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	<0.001	0	
Copper (filtered)	mg/L	0.001		0.002	0.006	100	0.002	<0.001	<0.001	67	
Lead (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	<0.001	0	
Mercury (filtered)	mg/L	0.0001		<0.0001	<0.0001	0	<0.0001	<0.0001	<0.0001	0	
Nickel (filtered)	mg/L	0.001		0.002	0.006	100	0.002	0.001	0.001	67	
Zinc (filtered)	mg/L	0.005		0.011	0.027	84	0.011	0.006	0.006	59	
BTEXN											
Benzene	µg/L	1		<1	<1	0	<1	<1	<1	0	
Toluene	µg/L	2		<2	<2	0	<2	<2	<2	0	
Ethylbenzene	µg/L	2		<2	<2	0	<2	<2	<2	0	
Xylene (o)	µg/L	2		<2	<2	0	<2	<2	<2	0	
Xylene (m & p)	µg/L	2		<2	<2	0	<2	<2	<2	0	
Xylene Total	µg/L	2		<2	<2	0	<2	<2	<2	0	
BTEX (Sum of Total) - Lab Calc	µg/L	1		<1	<1	0	<1	<1	<1	0	
TRH - NEPM 2013											
F1 (C6-C10 minus BTEX)	µg/L	20		<20	<20	0	<20	<20	<20	0	
C6-C10 Fraction	µg/L	20		<20	<20	0	<20	<20	<20	0	
F2 (>C10-C16 minus Naphthalene)	µg/L	100		<100	<100	0	<100	<100	<100	0	
>C10-C16 Fraction	µg/L	100		<100	<100	0	<100	<100	<100	0	
F3 (>C16-C34 Fraction)	µg/L	100		<100	<100	0	<100	<100	<100	0	
F4 (>C34-C40 Fraction)	µg/L	100		<100	<100	0	<100	<100	<100	0	
>C10-C40 (Sum of Total)	µg/L	100		<100	<100	0	<100	<100	<100	0	
TRH - NEPM 1999											
C6-C9 Fraction	µg/L	20		<20	<20	0	<20	<20	<20	0	
C10-C14 Fraction	µg/L	50		<50	<50	0	<50	<50	<50	0	
C15-C28 Fraction	µg/L	100		<100	<100	0	<100	<100	<100	0	
C29-C36 Fraction	µg/L	50		<50	<50	0	<50	<50	<50	0	
C10-C36 (Sum of Total)	µg/L	50		<50	<50	0	<50	<50	<50	0	
PAHs - standard 16											
Naphthalene	µg/L	5		<5	<5	0	<5	<5	<5	0	

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 200 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix C – Laboratory Reports



CHAIN OF CUSTODY

ALS Laboratory; please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0950 E: adelaide@alsglobal.comBRISBANE 2 Byth Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.comGLADSTONE 46 Callamondah Drive Clinton QLD 4680
Ph: 07 7471 5800 E: gladstone@alsglobal.comMACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4644 0177 E: mackay@alsglobal.comMELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9890 E: samples.melbourne@alsglobal.comMUDGEE 129 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee@alsglobal.comNEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.comNOWRA 4/3 Greary Place North Nowra NSW 2541
Ph: 02 4423 2063 E: nowra@alsglobal.comPERTH 10 Rod Way Malaga WA 6000
Ph: 08 6209 7855 E: samples.perth@alsglobal.comSYDNEY 277-239 Woodcock Road Smithfield NSW 2164
Ph: 02 8784 6550 E: samples.sydney@alsglobal.comTOWNSVILLE 14-15 Deanna Court Bohle QLD 4819
Ph: 37 4796 0800 E: townsville.environmental@alsglobal.comWOLLONGONG 50 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☒ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)		☐ Non Standard or urgent TAT (List due date):	
OFFICE: Darwin	PROJECT NO.: 12526136	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: ① 2 3 4 5 6 7 OF: ① 2 3 4 5 6 7	
ORDER NUMBER:	PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No ☒ ☐ Free ice / frozen ice bricks present upon receipt? Yes No ☒ ☐ Random Sample Temperature on Receipt: °C Other comment: 0175 13.4	
PROJECT MANAGER: Tim Murphy	CONTACT PH:	RELINQUISHED BY: T. Murphy	RECEIVED BY: [Signature]	RECEIVED BY: [Signature]
SAMPLER: Tim Murphy	SAMPLER MOBILE: 0499056068	DATE/TIME: 4/8/2020 13:50	DATE/TIME: 09/08/21 13:50	DATE/TIME: [Signature]
COC Emailed to ALS? (YES/ NO)	EDD FORMAT (or default):	Email Reports to (will default to PM if no other addresses are listed): t.m.murphy@ghd.com		
Email Invoice to (will default to PM if no other addresses are listed): t.m.murphy@ghd.com		Email Reports to (will default to PM if no other addresses are listed): t.m.murphy@ghd.com		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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											Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
						WS	W26T										
1	MW06-200804	4/8/20	W	P, AG, V	5	X											
2	QC104-200804	4/8/20	W	P, AG, V	5	X											
3	QC204-200804	4/8/20	W	P, AG, V	5	X											
4	MW07-200804	4/8/20	W	P, AG, V	5	X											
5	MW03-200804	4/8/20	W	P, AG, V	5	X											
6	MW04-200804	4/8/20	W	P, AG, V	5	X											
7	MW05-200804	4/8/20	W	P, AG, V	5	X											
8	QC304-200804	4/8/20	W	P, AG, V	4		X										
extra 9	Trip Blank			1 vial													
TOTAL																	
Environmental Division Sydney Work Order Reference ES2026813																	
																	
Telephone : + 61-2-8784 8666																	
LAB OF ORIGIN:																	

Environmental Division
SydneyWork Order Reference
ES2026813

Telephone: 61-2-8784 8555

LAB OF ORIGIN:
DARWIN

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; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2026813

Client : GHD PTY LTD Contact : MR TIM MURPHY Address : LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800 E-mail : tim.murphy@ghd.com Telephone : +61 08 89820151 Facsimile : +61 08 89821075 Project : 12526136 Order number : ---- C-O-C number : ---- Site : ---- Sampler : TIM MURPHY, Zoe Abbott	Laboratory : Environmental Division Sydney Contact : Angus Harding Address : 277-289 Woodpark Road Smithfield NSW Australia 2164 E-mail : Angus.Harding@ALSGlobal.com Telephone : +61 2 8784 8555 Facsimile : +61-2-8784 8500 Page : 1 of 2 Quote number : ES2018GHDSE0025 (EN/005/19) QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 05-Aug-2020 11:00	Issue Date : 05-Aug-2020
Client Requested Due Date : 12-Aug-2020	Scheduled Reporting Date : 12-Aug-2020

Delivery Details

Mode of Delivery : Client Drop Off	Security Seal : Not Available
No. of coolers/boxes : 1	Temperature : 13.4 - Ice present
Receipt Detail :	No. of samples received / analysed : 9 / 9

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample Trip Blank (ALS #9) received extra, to be analysed for TPH C6-C9/BTEX.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

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

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER TRH/BT	WATER TRH/C6	WATER TRH/BT
ES2026813-001	04-Aug-2020 00:00	MW06_200804	✓		
ES2026813-002	04-Aug-2020 00:00	QC104_200804	✓		
ES2026813-003	04-Aug-2020 00:00	QC204_200804	✓		
ES2026813-004	04-Aug-2020 00:00	MW07_200804	✓		
ES2026813-005	04-Aug-2020 00:00	MW03_200804	✓		
ES2026813-006	04-Aug-2020 00:00	MW04_200804	✓		
ES2026813-007	04-Aug-2020 00:00	MW05_200804	✓		
ES2026813-008	04-Aug-2020 00:00	QC304_200804			✓
ES2026813-009	04-Aug-2020 00:00	Trip Blank		✓	

Email tim.murphy@ghd.com

CERTIFICATE OF ANALYSIS

Work Order : **ES2026813**
Client : **GHD PTY LTD**
Contact : **MR TIM MURPHY**
Address : **LEVEL 5 66 SMITH STREET**
DARWIN NT, AUSTRALIA 0800
Telephone : **+61 08 89820151**
Project : **12526136**
Order number : **----**
C-O-C number : **----**
Sampler : **TIM MURPHY, Zoe Abbott**
Site : **:**
Quote number : **EN/005/19**
No. of samples received : **9**
No. of samples analysed : **9**

Page : **1 of 8**
Laboratory : **Environmental Division Sydney**
Contact : **Angus Harding**
Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**
Telephone : **+61 2 8784 8555**
Date Samples Received : **05-Aug-2020 11:00**
Date Analysis Commenced : **06-Aug-2020**
Issue Date : **12-Aug-2020 18:19**



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: Filtered Zinc results for samples ES2026813-#003 and #007 have been confirmed by reanalysis.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				MW06_200804	QC104_200804	QC204_200804	MW07_200804	MW03_200804
Client sampling date / time				04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	ES2026813-001	ES2026813-002	ES2026813-003	ES2026813-004	ES2026813-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	0.004	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	0.006	0.009	0.009
Nickel	7440-02-0	0.001	mg/L	0.002	0.001	0.006	0.008	0.005
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.004	<0.001
Zinc	7440-66-6	0.005	mg/L	0.011	0.006	0.027	0.062	0.040
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				MW06_200804	QC104_200804	QC204_200804	MW07_200804	MW03_200804
Client sampling date / time				04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00
Compound	CAS Number	LOR	Unit	ES2026813-001	ES2026813-002	ES2026813-003	ES2026813-004	ES2026813-005
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	103	91.0	97.0	104	90.4
Toluene-D8	2037-26-5	2	%	110	99.2	96.8	111	98.6
4-Bromofluorobenzene	460-00-4	2	%	106	89.9	96.8	107	93.9



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				MW04_200804	MW05_200804	QC304_200804	Trip Blank	----
Client sampling date / time				04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	----
Compound	CAS Number	LOR	Unit	ES2026813-006	ES2026813-007	ES2026813-008	ES2026813-009	-----
				Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0005	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	0.011	0.007	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.066	0.009	----	----	----
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.291	0.061	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	----	----	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	----	----	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	----	----	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	<0.0001	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	----	----	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	----	----	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	----	----	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	----	----	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	----	----	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	----	----	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	----	----	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	----	----	<1.0	----	----
Benzo(a)anthracene	56-55-3	1.0	µg/L	----	----	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	----	----	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	----	----	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	----	----	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	----	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	----	----	<1.0	----	----

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW04_200804	MW05_200804	QC304_200804	Trip Blank	----
Client sampling date / time				04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	----	
Compound	CAS Number	LOR	Unit	ES2026813-006	ES2026813-007	ES2026813-008	ES2026813-009	-----	
				Result	Result	Result	Result	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	----	----	<1.0	----	----	
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L	----	----	<1.0	----	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	----	----	<0.5	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	----	----	<0.5	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----	
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	----	
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----	
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%	----	----	21.7	----	----	
2-Chlorophenol-D4	93951-73-6	1.0	%	----	----	62.9	----	----	
2,4,6-Tribromophenol	118-79-6	1.0	%	----	----	51.5	----	----	
EP075(SIM)T: PAH Surrogates									



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				MW04_200804	MW05_200804	QC304_200804	Trip Blank	----
Client sampling date / time				04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	04-Aug-2020 00:00	----
Compound	CAS Number	LOR	Unit	ES2026813-006	ES2026813-007	ES2026813-008	ES2026813-009	-----
				Result	Result	Result	Result	----
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	1.0	%	----	----	91.4	----	----
Anthracene-d10	1719-06-8	1.0	%	----	----	90.0	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	----	----	88.6	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	96.5	99.7	98.0	101	----
Toluene-D8	2037-26-5	2	%	101	112	107	108	----
4-Bromofluorobenzene	460-00-4	2	%	97.8	105	101	103	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: ES2026813	Page	: 1 of 6
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Contact	: Angus Harding
Address	: LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89820151	Telephone	: +61 2 8784 8555
Project	: 12526136	Date Samples Received	: 05-Aug-2020
Order number	: ----	Date Analysis Commenced	: 06-Aug-2020
C-O-C number	: ----	Issue Date	: 12-Aug-2020
Sampler	: TIM MURPHY, Zoe Abbott		
Site	:		
Quote number	: EN/005/19		
No. of samples received	: 9		
No. of samples analysed	: 9		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3187843)									
ES2026813-003	QC204_200804	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.006	0.005	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.027	0.027	0.00	No Limit
ES2026253-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3187833)									
EN2005229-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	6.60	6.80	2.97	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.003	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.072	0.074	3.23	0% - 50%
ES2026253-004	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	0.004	0.00	No Limit

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 Work Order : ES2026813
 Client : GHD PTY LTD
 Project : 12526136



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 3187833) - continued									
ES2026253-004	Anonymous	EG020A-T: Copper	7440-50-8	0.001	mg/L	0.005	0.004	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3187845)									
ES2026767-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2026813-006	MW04_200804	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3187305)									
ES2024748-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2027066-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3185255)									
ES2026604-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2026813-001	MW06_200804	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3185255)									
ES2026604-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2026813-001	MW06_200804	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3185255)									
ES2026604-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES2026813-001	MW06_200804	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3187843)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.9	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	93.9	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.7	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	92.0	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.0	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.5	81.0	117
EG020T: Total Metals by ICP-MS (QCLot: 3187833)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	93.9	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.5	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	97.0	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.0	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.5	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.7	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	93.4	79.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3187845)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.2	83.0	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3187305)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	91.4	77.0	111
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3183266)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	77.7	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	95.2	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	102	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	89.0	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	80.2	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	88.4	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	95.9	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	93.0	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	92.0	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	86.0	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	76.6	61.7	119
	205-82-3							
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	87.6	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	98.6	63.3	117



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP075(SIM): Polynuclear Aromatic Hydrocarbons (QCLot: 3183266) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	76.2	59.9	118
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	73.1	61.2	117
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	82.6	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3183267)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	73.2	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	87.2	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	81.5	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3185255)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	99.7	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3183267)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	91.4	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	80.7	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	84.1	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3185255)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	106	75.0	127
EP080: BTEXN (QCLot: 3185255)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	91.0	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	81.9	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	82.7	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	82.9	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	83.7	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	89.3	70.0	120

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: **WATER**

Laboratory sample ID				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Recovery Limits (%)	
					MS	Low	High
Client sample ID	Method: Compound	CAS Number					
EG020F: Dissolved Metals by ICP-MS (QCLot: 3187843)							
ES2026253-005	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	95.1	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	98.9	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.1	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	93.1	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	103	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	93.0	70.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3187843) - continued							
ES2026253-005	Anonymous	EG020A-F: Zinc	7440-66-6	1 mg/L	95.8	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 3187833)							
EN2005229-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	91.4	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	95.4	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	94.0	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	# Not Determined	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	84.5	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	90.4	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	89.7	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3187845)							
ES2026767-004	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	88.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3187305)							
ES2025604-181	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	89.7	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3185255)							
ES2026604-003	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	125	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3185255)							
ES2026604-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	118	70.0	130
EP080: BTEXN (QCLot: 3185255)							
ES2026604-003	Anonymous	EP080: Benzene	71-43-2	25 µg/L	88.6	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	82.6	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	83.3	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	83.7	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	82.8	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	96.6	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2026813	Page	: 1 of 7
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Telephone	: +61 2 8784 8555
Project	: 12526136	Date Samples Received	: 05-Aug-2020
Site	:	Issue Date	: 12-Aug-2020
Sampler	: TIM MURPHY, Zoe Abbott	No. of samples received	: 9
Order number	: ----	No. of samples analysed	: 9

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG020T: Total Metals by ICP-MS	EN2005229--002	Anonymous	Copper	7440-50-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW06_200804, QC104_200804, QC204_200804, MW07_200804, MW03_200804, MW04_200804, MW05_200804	04-Aug-2020	----	----	----	08-Aug-2020	31-Jan-2021	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) QC304_200804	04-Aug-2020	08-Aug-2020	31-Jan-2021	✓	08-Aug-2020	31-Jan-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)		04-Aug-2020	----	----	----	10-Aug-2020	01-Sep-2020	✔
MW06_200804,	QC104_200804,							
QC204_200804,	MW07_200804,							
MW03_200804,	MW04_200804,							
MW05_200804								
EG035T: Total Recoverable Mercury by FIMS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)		04-Aug-2020	----	----	----	10-Aug-2020	01-Sep-2020	✔
QC304_200804								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))		04-Aug-2020	06-Aug-2020	11-Aug-2020	✔	08-Aug-2020	15-Sep-2020	✔
QC304_200804								
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)		04-Aug-2020	06-Aug-2020	11-Aug-2020	✔	08-Aug-2020	15-Sep-2020	✔
MW06_200804,	QC104_200804,							
QC204_200804,	MW07_200804,							
MW03_200804,	MW04_200804,							
MW05_200804,	QC304_200804							
Amber VOC Vial - Sulfuric Acid (EP080)		04-Aug-2020	10-Aug-2020	18-Aug-2020	✔	10-Aug-2020	18-Aug-2020	✔
MW06_200804,	QC104_200804,							
QC204_200804,	MW07_200804,							
MW03_200804,	MW04_200804,							
MW05_200804,	QC304_200804,							
Trip Blank								
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)		04-Aug-2020	06-Aug-2020	11-Aug-2020	✔	08-Aug-2020	15-Sep-2020	✔
MW06_200804,	QC104_200804,							
QC204_200804,	MW07_200804,							
MW03_200804,	MW04_200804,							
MW05_200804,	QC304_200804							
Amber VOC Vial - Sulfuric Acid (EP080)		04-Aug-2020	10-Aug-2020	18-Aug-2020	✔	10-Aug-2020	18-Aug-2020	✔
MW06_200804,	QC104_200804,							
QC204_200804,	MW07_200804,							
MW03_200804,	MW04_200804,							
MW05_200804,	QC304_200804,							
Trip Blank								



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
MW06_200804, QC204_200804, MW03_200804, MW05_200804, Trip Blank	QC104_200804, MW07_200804, MW04_200804, QC304_200804,	04-Aug-2020	10-Aug-2020	18-Aug-2020	✔	10-Aug-2020	18-Aug-2020	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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)							
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	12	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	12	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

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Client : GHD PTY LTD
Project : 12526136



Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Appendix D – Calibration Certificates

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 348885



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	8.8V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by:

Jamie Duggan

Calibration date: 20/07/2020

Next calibration due: 18/09/2020

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105897



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 ev			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	1157335		99.9ppm

Calibrated by:  Jamie Duggan

Calibration date: 22-Jun-20

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 20F1622172



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		329027	2.76mS
2. Temp		15			15.2
3. pH 4		pH 4.00		330734	pH 4.00
4. pH 7		pH 7.00		330737	pH 7.00
6. DO		0.0ppm		10465	0.0ppm
7. ORP		245mV		333082/329762	245 mV
8. Turbidity		0NTU		Dist.H2O	0.0NTU
9. Turbidity		100NTU		332244	100NTU
10. Turbidity		1000NTN		20A20030022	1000NTU

Calibrated by:  Joseph Tomas

Calibration date: 24/07/2020

Next calibration due: 23/08/2020

GHD

Level 7

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Darwin Turf Club Inc

Darwin Turf Club - EPL Monitoring GME and Air Monitoring Report

October 2020

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1. Introduction

1.1 Background information

GHD Pty Ltd (GHD) were engaged by Darwin Turf Club Inc to undertake the ongoing Groundwater and Air-Toxics Environmental Monitoring at the Darwin Turf Club (hereinafter referred to as the Site). Environmental monitoring of groundwater and air-toxics is a requirement under the Site's Environment Protection Licence (Ref: EPL 218).

Darwin Turf Club Racecourse comprises approximately 47 hectares and is situated approximately 4 km north of the Darwin CBD.

The site is located off Dick Ward Drive, Fannie Bay. The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east, Playford and Wells Street to the south and west. Residential properties bound Douglas Street, Playford Street and Wells Street.

1.2 Purpose of this report

This report documents the environmental monitoring activities carried out by GHD at the Darwin Turf Club in relation to the track conditioning activities undertaken in September 2020 in accordance with the Environment Protection Licence (EPL) 218 requirements for the site.

1.3 Scope

In accordance with EPL 218 requirements, the following scope of works was undertaken by GHD:

- Two groundwater sampling events at all seven groundwater wells present on site at the locations specified in EPL 218, with one event occurring within the two weeks preceding and the second within 48 hours of the track conditioning activities.
- One air-toxics sampling event on site at the three locations as specified in EPL 218 during track conditioning activities.

The environmental monitoring works were carried out in general accordance with:

- Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC, January 1992)
- Australian and New Zealand Guidelines for Water Quality: Sampling, AS/NZS 5667.1, 1998
- National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM)
- National Environment Protection Council (NEPC) National Environment Protection (Air Toxics) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM)

1.4 Limitations

This report: has been prepared by GHD for Darwin Turf Club Inc and may only be used and relied on by Darwin Turf Club Inc for the purpose agreed between GHD and the Darwin Turf Club Inc as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Inc arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Darwin Turf Club Inc and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Sampling and analytical programme

2.1 Groundwater sampling programmes

GHD performed two groundwater monitoring events (GME) to collect standing water level and samples for laboratory analysis at seven existing monitoring bores located at the Darwin Turf Club Racecourse. These GMEs were undertaken on 8th September (GME 4) and 16th September (GME 5) 2020 in accordance with the EPL requirements.

The weather at the times of fieldwork sampling were:

- GME 4 – sunny with a temperature of 37.0° C,
- GME 5 – sunny with a temperature of 34.3° C.

Rainfall was not recorded on the two days prior to both monitoring rounds.

Table 1 Groundwater sampling programme

Sample ID	Location (in relation to track)	Contaminants of particular concern (CoPC)	Context of sampling
MW01	North	TRH/BTEX/ 8 Metals*	Capture the quality of groundwater assumed to be exiting the site to the north.
MW02	North		
MW03	Northwest		
MW04	Northeast		
MW05	East		Capture the quality of groundwater to the east of the site.
MW06	South		Capture the quality of groundwater to the south of the site (assumed to be the background reference site).
MW07	West (inside track)		Capture the quality of groundwater to the west of the site.

*Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc

2.1.1 Groundwater trigger values

The EPL 218 trigger values for groundwater have been summarised in Table 2.

Table 2 EPL 218 Groundwater trigger values

Parameter	Units	Trigger Value
Field Parameter		
pH	pH units	6.0 – 8.0
Temperature	°C	N/A
Turbidity	NTU	2 - 15
Electrical conductivity	µS/cm	20 - 250
Dissolved Oxygen	% saturation	80-110
Laboratory Parameter		
Heavy Metals		
Arsenic	mg/L	0.094
Cadmium	mg/L	0.0004
Chromium	mg/L	0.006
Copper	mg/L	0.0018
Lead	mg/L	0.0056
Mercury	mg/L	0.0019

Parameter	Units	Trigger Value
Nickel	mg/L	0.013
Zinc	mg/L	0.015
BTEX		
Benzene	mg/L	0.3
Toluene	mg/L	0.3
Ethylbenzene	mg/L	0.005
Xylenes	mg/L	0.075
Total Recoverable Hydrocarbons (TRH)		
Total TRH C10 – C36	mg/L	0.6

2.1.2 Groundwater sampling

After inspection of the individual bores, which involves the visual inspection of the bore condition followed by the measurement of the well headspace using a PID immediately upon the removal of the well cap (with the nominated trigger for additional investigation set at 50 ppm), the static water levels (SWL) were measured with an interface probe at the seven monitoring wells prior to any sampling being conducted. The field data is provided in Appendix A.

Prior to sampling, all monitoring wells were purged, using a peristaltic pump and the low flow sampling technique, until the water quality reading stabilised (three consecutive readings within a set range e.g. difference in readings of 10%), the SWL was recorded at the same time as each water quality reading. Field water quality measurements were measured during purging operations using a calibrated YSI Pro DSS water quality meter with a flow cell. Physical parameters recorded include:

- pH
- Dissolved oxygen (DO)
- Electrical conductivity (EC)
- Temperature
- Turbidity

Post purging, samples were collected and placed in laboratory-supplied containers with appropriate preservatives required for analytes. The samples were cooled on ice for storage and transported under Chain of Custody (COC) documentation to ALS analytical laboratory.

Samples for metals analysis were field-filtered to <0.45 µm using a disposable in-line filter before being placed in to an appropriate preserved sample container.

2.2 Air-toxics sampling programme

2.2.1 Purpose of the air-toxics sampling program

The air-toxics sampling is part of a three year reporting programme at the site to comply with EPL 218. Primarily, this programme involves a review of key air toxics measurements during the three years of operations of the site.

2.2.2 Sampling protocol

The programme consists of a single round of air sampling conducted at three locations in canisters that were calibrated for an ultra low-level 8 hour fill time. Air sampling will be conducted twice a year over a three year period to determine concentrations of BTEX at

breathing height. The sampling is conducted using portable 6 L Summa evacuated canisters for sample capture, placed between 1.2 – 1.5 m above ground level.

Sample locations are AQM01, AQM02 and AQM03 along the south end of the racecourse, this sampling design aims to capture potential emissions of BTEX from the application of waste oil.

Subsequent analysis using gas chromatography - mass spectrometry (GC-MS) techniques. As consistent with the NEPM Air Toxics monitoring framework, the analysis is conducted using the USEPA TO-15 analytical methodology (USEPA, 1998) using a laboratory that is NATA accredited for the method.

2.2.3 Analytes and air-toxics trigger values

Environmental monitoring of air-toxics is a requirement under the EPL 218, and is to be carried out during the application of waste oil to the racecourse. Oil is applied to the racecourse twice a year to maintain cohesiveness and reduce erosion to the track. Analytes tested will be Benzene, Toluene, o-Xylene and M & p Xylenes.

Trigger values specified in the EMP have been derived from the National Environment Protection (Air Toxics) Measure (NEPM).

The EMP trigger values for air-toxics are summarised in Table 3.

Table 3 EPL 218 Air-toxics trigger values

Parameter	Units	Trigger Value
BTEX		
Benzene	ppb	3
Toluene	ppb	1,000
o-Xylene	ppb	250
M & p Xylenes	m ppb g/L	250

2.3 Quality control and assurance

2.3.1 Field quality control methods

All field works were conducted by experienced environmental scientists in accordance with GHD's Standard Field Operating Procedures.

Field quality control procedures used during the project comprised the collection and analysis of the following for groundwater sampling:

Blind and split duplicates: Comprise a single sample that is divided into three separate sampling containers. The parent sample and the blind sample are sent anonymously to the primary project laboratory with the split sample sent to the secondary laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity. Split duplicate samples provide an indication of the repeatability of the results between laboratories.

One set of field duplicate samples (Blind and Split) was collected and analysed as part of the analytical program.

The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD\% = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where **Co** = Analyte concentration of the original sample
Cd = Analyte concentration of the duplicate sample

GHD adopts nominal acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations.

2.4 Laboratory program

The nominated NATA accredited analytical laboratories (ALS laboratory group and Eurofins MGT Laboratory group) adopted their internal procedures and methods in accordance with their quality assurance systems.

2.4.1 Laboratory quality control

Laboratory quality control procedures used during the project were:

Laboratory duplicate samples: The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result.

Spiked Samples: An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory Control Sample: A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

Surrogate Standard/Spikes: These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Method Blank: Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The laboratory is required to provide this information to GHD. The individual testing laboratories conduct an assessment of the laboratory QC program, internally however, the results will also be independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPDs within the NEPM acceptance criteria of 30%. Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery, although dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix; should normally range from about 70 – 130%. Method (laboratory) blanks should return analyte concentrations as 'below practical quantitation limit (PQL)'.

3. Groundwater sampling results

3.1 Physio-chemical field parameters

Field water quality measurements were measured during purging operations using a calibrated YSI Pro DSS water quality meter and flow cell.

Water quality measurements were unable to be collected for MW01 and MW02 as there was insufficient water volume present in the well.

While gauging the wells with an interface probe, no hydrocarbons were detected in any of the monitoring wells.

Recorded water quality measurements for GME 4 and GME 5 are provided in Table 4.

Table 4 Groundwater physical characteristics

Well ID	Well depth (mbTOC)	SWL (mbTOC)	Physical parameters					Comments/ observations
			Temp (°C)	DO (%)	pH	EC (µS/cm)	Turbidity (NTU)	
GME 4								
MW01	0.770		Well Dry					
MW02	1.748		Well Dry					
MW03	4.642	3.040	33.6	-3.7	4.81	422.8	1.00	Slightly cloudy, No odour, no sheen.
MW04	-	-	32.5	2.81	4.65	18810	301.9	Unable to get IP probe through bend in PVC piping. Water was white-red slightly cloudy, light sheen.
MW05	5.472	3.932	32.3	89.1	5.96	112.0	4.86	Clear, No odour, No sheen
MW06	6.583	5.481	33.5	7.79	4.35	107.9	7.94	Clear, No odour, no sheen
MW07	6.013	3.774	32.5	1.30	4.53	2599	35.96	Clear, No odour, no sheen
GME 5								
MW01	0.774		Well Dry					
MW02	0.750		Well Dry					
MW03	4.634	3.085	33.9	-0.30	5.60	529	2197	Initially very light brown cloudy, cleared around 0.5 L. No odour, No sheen.
MW04	5.035*	2.968	33.2	-0.16	4.52	20888	63.10	Water slightly yellow-hazy. No odour, no sheen.
MW05	4.472	3.854	33.1	96.8	6.04	110.4	1.27	Water clear. No odour, no sheen.
MW06	6.601	3.824	34.1	1.43	4.32	103.9	12.10	Water clear. No odour, no sheen.
MW07	6.048	3.824	32.7	1.72	4.07	1710	20.11	Water clear. No odour, no sheen.

* This reading doesn't take into consideration the presence of bailer, which was stuck at the bottom of the well

3.1.1 Temperature

GME 4

Groundwater temperatures ranged from 32.3 to 33.6° C.

GME 5

Groundwater temperatures ranged from 32.7 to 34.1° C.

3.1.2 Dissolved Oxygen (DO)

GME 4

DO concentrations ranged from -3.7 to 89.1 percent.

GME 5

DO concentrations ranged from -0.30 to 96.8 percent.

3.1.3 pH

GME 4

Field pH data indicates groundwater at the site was slightly acidic, ranging from 4.35 to 5.96.

GME 5

Field pH data indicates groundwater at the site was slightly acidic, ranging from 4.07 to 6.04.

3.1.4 Turbidity

GME 4

Turbidity field results ranged from 1.0 to 301.9 NTU. The highest turbidity level was recorded at MW04 with the lowest level at MW03.

GME 5

Turbidity field results ranged from 1.27 to 2197 NTU. The highest turbidity level was recorded at MW03 with the lowest level at MW05.

3.1.5 Electrical Conductivity (EC)

GME 4

EC values ranged from 107.9 to 422.8 µS/cm indicating a predominately freshwater environment, with the exception of MW04 which recorded an EC of 18,810 µS/cm and MW07 which recorded an EC of 2,599 µS/cm. The higher levels of EC indicate marine influence on the groundwater.

GME 5

EC values ranged from 103.9 to 529 µS/cm indicating a predominately freshwater environment, with the exception of MW04 which recorded an EC of 20,888 µS/cm and MW07 which recorded an EC of 1,710 µS/cm. The higher levels of EC indicate marine influence on the groundwater.

3.2 Laboratory results

The results of the groundwater analysis are summarised in Appendix B. Copies of the certified laboratory reports are presented in Appendix D.

The majority of heavy metals, BTEX, and TRH were recorded below the Limit of Reporting (LOR) with majority of those above the LOR still below the licence criteria with the exception of the following:

GME 4

- Cadmium was identified above the licence criteria of 0.0004 mg/L at MW04, which reported cadmium at 0.0009 mg/L
- Copper was identified above the licence criteria of 0.0018 mg/L at all wells sampled, with copper results ranging from 0.007 mg/L to 0.016 mg/L
- Nickel was identified above the licence criteria of 0.013 mg/L at MW04, which reported 0.099 mg/L
- Zinc was identified above the licence criteria of 0.015 mg/L at all wells sampled, with results ranging from 0.020 mg/L to 0.430 mg/L

GME 5

- Cadmium was identified above the licence criteria of 0.0004 mg/L at MW04, which reported cadmium at 0.0015 mg/L
- Copper was identified above the licence criteria of 0.0018 mg/L at all wells sampled, with copper results ranging from 0.007 mg/L to 0.018 mg/L
- Lead was identified above the licence criteria of 0.0056 mg/L at MW07, which reported lead at 0.011 mg/L
- Nickel was identified above the licence criteria of 0.013 mg/L at MW04, which reported 0.142 mg/L
- Zinc was identified above the licence criteria of 0.015 mg/L at all wells sampled, with results ranging from 0.026 mg/L to 0.571 mg/L

3.3 Field quality control

To augment laboratory quality procedures one set of field QC samples were collected and analysed per GME. This sample was collected as a duplicate and triplicate and analysed as a blind duplicate and split duplicate respectively. Details are provided in Table 5. Relative Percentage Difference (RPD) calculations are presented in Appendix B.

Table 5 QC duplicate/triplicate samples

Parent sample	Duplicate sample	Triplicate sample	Laboratory	Analysis
GME 4				
MW07	Field Duplicate	-	ALS	TRH/BTEX/8 Metals
MW07	-	Field Triplicate	Eurofins	
GME 5				
MW03	Field Duplicate	-	ALS	TRH/BTEX/8 Metals
MW03	-	Field Triplicate	Eurofins	

The analytes had RPD values below the nominated data quality indicators for both GME 4 and GME 5.

The duplicate RPD is displayed in Appendix B

3.4 Laboratory QA/QC results

The analysis of matrix spikes, matrix spike duplicates and surrogates was undertaken by the laboratory. A review of laboratory quality control is summarised below:

- All samples were received by the laboratory in good condition and chilled and within appropriate holding times for analysis
- Samples were extracted and analysed within appropriate holding times
- The RPDs of the internal duplicated samples met the acceptable limits for all analytes
- All matrix spike recoveries, matrix spike duplicates, surrogate spike recoveries and control sample recoveries were within acceptable range (laboratory's historical statistical range)

Laboratory QA/QC are presented within the certified laboratory reports in Appendix C.

4. Air-toxics sampling results

4.1 Summary of air-toxic data

GHD commenced the air-toxics monitoring program on 15 September 2020. Portable summa canisters were placed at the three locations at the site to collect a single round of air samples. The summa canister draws a sample under vacuum and is fitted with a flow meter to control the continuous intake of air for a period of 8-hrs. The summa canister is then dispatched for analysis to a NATA accredited laboratory.

The sampling was carried out for an 8-hour period starting approximately 06:30 am on the 15th of September 2020. At the time of deployment the weather conditions were noted as: Cool, slightly humid, Sunny with calm south easterly winds. Wind from this direction is blowing away from residential properties. Table 6 summarises these results.

The laboratory sample results for air-toxics were below the limit of reporting (LOR) for the majority of the analytes, with only one detectable concentration of Toluene in AQM03

Notwithstanding, all analytes were below the trigger value as summarized in Table 6 below.

Table 6 Air-toxics results April 2020

Analyte	Trigger value (NEPM)	Sample pollutant concentration			Unit
		AQM01	AQM02	AQM03	
Benzene	0.010	<0.003	<0.003	<0.003	mg/m ³ *
Toluene	3.766	<0.0075	<0.0075	0.029	mg/m ³
o-Xylene	1.085	<0.004	<0.004	<0.004	mg/m ³
M & p Xylenes	2.170	<0.008	<0.009	<0.009	mg/m ³

* Trigger values converted from parts per billion (ppb) to milligrams per m³ (mg/m³)

5. Trigger value exceedances

5.1 Groundwater

During this round of monitoring, the following parameters/analytes exceeded the trigger value as they were greater than three times the standard trigger value as per EPL 128 licence condition 37.2;

- EC – MW04 and MW07 in GME 4 and GME 5
- Turbidity – MW03 and MW04 in GME 4, and MW04 in GME 5
- Cadmium – MW04 in GME 5
- Copper – All wells sampled
- Nickel – MW04 and MW06 in GME 4, and MW06 in GME 5
- Zinc – MW04 in GME 4 and GME 5

Licence condition 37.1 states that three consecutive exceedances result in a non-compliance. The following parameters/analytes have recorded exceedances in three consecutive monitoring events:

- pH – MW03, MW04, MW06 and MW07
- DO – MW03, MW04, MW06 and MW07
- EC – MW03, MW04 and MW07
- Cadmium – MW04
- Copper – All wells sampled
- Nickel – MW04
- Zinc – MW03, MW04, MW05 and MW07

Under condition 35 of EPL 218 these exceedances listed above are notifiable to the NT EPA.

In addition to the notifiable exceedances (due to three times the trigger value) listed above, turbidity exceeded the trigger value in both GMEs at MW03, MW04 and MW07.

As such one further exceedance of the above parameters will constitute a notifiable non-compliance, therefore attention should be paid to these levels in the succeeding monitoring round.

5.2 Air-toxics

The September air-toxics monitoring program returned all results below trigger values set in the Licence EPL 218, therefore no further investigations into BTEX results has been conducted.

6. Conclusions and recommendations

6.1 Conclusion

The groundwater monitoring was undertaken as per the scope of works on 8 September 2020 and 16 September 2020 using the peristaltic pump sampling method, with the exception of two wells which were dry, likely due to low groundwater recharge associated with dry season environmental conditions.

The physico-chemical field parameters measured, Table 4, were consistent with previous measurements for the site. The laboratory analysis results were below the laboratory LOR for the majority of analytes, with detection only recorded for metals.

While recent damage to the PVC casing of well MW04 has resulted in a restriction in the casing preventing the bailer from being removed, the well is still fit for purpose, as the bailer is at the base of the well, with the top of the bailer at approximately 5 m bTOC. The current sampling method has the sampling tube positioned within 1 m of the recorded SWL. The deepest recorded SWL to date is 3 m bTOC.

The air-toxics monitoring was carried out on 15 September 2020, coinciding with the application of the waste oil mixture to the track. Air-toxics monitoring program returned the result of a detectable concentration of Toluene in AQM03 being recorded at 0.029 mg/m³. This is below the trigger value in the NEPM guideline of 3.776 mg/m³. This indicates that there are no impacts to residents in relation to the air quality during the oil application/tiling practices within the vicinity of the Darwin Turf Club. As such, no further investigation is needed into the presence of BETX.

The groundwater and air monitoring results indicate that the track conditioning activity undertaken at the Darwin Turf Club approved under EPL218 does not pose an environmental risk to the surrounding environment. With the exception of a minor detection of toluene at AQM03 (<1% of the trigger value) no other hydrocarbons were detected.

Notifiable non-compliance exceedances are summarised in Table 7 and detailed in Table 8 and Table 9 below.

Table 7 Summary of notifiable exceedances

Well ID	Three consecutive exceedance of trigger values	Exceedance by three times trigger value	
		GME 4	GME 5
MW03	pH, DO, EC, copper, zinc	DO, copper	DO, turbidity, copper
MW04	pH, DO, EC, cadmium, copper, nickel, zinc	DO, EC, turbidity, copper, nickel, zinc	DO, EC, turbidity, cadmium, copper, nickel, zinc
MW05	Copper, zinc	Copper	Copper
MW06	pH, DO, copper	DO, copper, zinc	DO, copper
MW07	pH, DO, EC, copper, zinc	DO, EC, Copper	DO, EC, copper

Table 8 Notifiable exceedances values for three consecutive exceedances of trigger value

Well ID	Parameter /Analyte	pH	DO	EC	Cadmium	Copper	Nickel	Zinc
	Trigger value	6.0-8.0	80-110	20-250	0.0004 mg/L	0.0018 mg/L	0.013 mg/L	0.005 mg/L
MW03	GME 3*	5.02	4.0	406.4	Nil	0.009	Nil	0.040
	GME 4	4.81	-3.7	422.8		0.007		0.039
	GME 5	5.60	-0.3	529		0.012		0.038
MW04	GME 3*	5.11	11.3	3,850	0.0005	0.011	0.066	0.291
	GME 4	4.65	2.8	18,810	0.0009	0.009	0.099	0.430
	GME 5	4.52	-2.3	20,088	0.0015	0.018	0.142	0.571
MW05	GME 3*	Nil	Nil	Nil	Nil	0.007	Nil	0.061
	GME 4					0.007		0.021
	GME 5					0.007		0.026
MW06	GME 3*	4.61	5.9	Nil	Nil	0.002	Nil	Nil
	GME 4	4.35	7.7			0.016		
	GME 5	4.32	20.2			0.007		
MW07	GME 3*	4.81	6.5	1,651	Nil	0.009	Nil	0.062
	GME 4	4.53	1.3	2,599		0.006		0.020
	GME 5	4.07	25.6	1,710		0.007		0.031

* GME 3 refers to the dry season GME conducted on 4th August 2020

Table 9 Notifiable exceedances values for exceedances of three times the trigger value

Parameter /Analyte	Turbidity		EC		Cadmium	Copper		Nickel		Zinc	
	GME 4	GME 5	GME 4	GME 5	GME 5	GME 4	GME 5	GME 4	GME 5	GME 4	GME 5
Trigger value	2 – 15 NTU		20 – 250 µS/cm		0.0004 mg/L	0.0018 mg/L		0.013 mg/L		0.015 mg/L	
MW03	Nil	2,197	Nil	Nil	Nil	0.007	0.012	Nil	Nil	Nil	Nil
MW04	301.9	63.10	18,810	20,888	0.0015	0.009	0.018	0.099	0.142	0.430	0.571
MW05	Nil	Nil	Nil	Nil	Nil	0.007	0.007	Nil	Nil	Nil	Nil
MW06	Nil	Nil	Nil	Nil	Nil	0.016	0.007	Nil	Nil	0.060	Nil
MW07	Nil	Nil	2,599	1,710	Nil	0.006	0.007	Nil	Nil	Nil	Nil

6.2 Recommendations

It is recommended that the groundwater analytical dataset be reviewed and assessed to determine whether the recorded exceedances are a trend or represent naturally occurring background concentrations (e.g. copper, nickel and zinc), with the outcome of this assessment to be applied to evaluate the suitability of the current trigger levels.

It is also recommended elevation data be collected for the monitoring bores, to allow for accurate groundwater flow direction to be determined.

Appendices

Appendix A – Field Data

Site	Well ID	Date/Time	Water Depth (mbTOC)	Well Depth (mbTOC)	Method	Dry	Comments	PID (ppm)
Darwin Turf Club	MW01	17/01/2020 12:30 PM	-	0.777	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	23/04/2020 11:21 AM	-	0.777	Dip	Y	Well Dry	0.1
Darwin Turf Club	MW01	28/04/2020 10:58 AM	-	0.777	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	4/08/2020 11:58 AM	-	0.779	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	8/09/2020 10:00 AM	-	0.770	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	16/09/2020 09:33 AM	-	0.774	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	17/01/2020 12:31 PM	0.941	1.775	Dip	N	Clear with organic matter, mo odour, no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW02	23/04/2020 11:27 AM	1.346	1.750	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW02	28/04/2020 10:59 AM	1.443	1.750	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW02	4/08/2020 12:00 PM	-	1.746	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	8/09/2020 10:05 AM	-	1.748	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	16/09/2020 09:35 AM	-	0.750	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW03	17/01/2020 12:29 PM	1.467	4.636	Dip	N	Unable to get bailer down well	0.0
Darwin Turf Club	MW03	23/04/2020 10:56 AM	2.157	4.630	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW03	28/04/2020 10:15 AM	2.264	4.630	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	1.2
Darwin Turf Club	MW03	4/08/2020 11:21 AM	2.876	4.648	Dip	N	Slightly Cloudy, No odour, No sheen, Clear at 2 L - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW03	8/09/2020 11:37 AM	3.040	4.642	Dip	N	Slightly Cloudy, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW03	16/09/2020 09:30 AM	3.085	4.634	Dip	N	Initially very light brown cloudy, cleared around 0.5 L, No odour, No sheen - Peristaltic, YSI Pro DSS	0.1
Darwin Turf Club	MW04	17/01/2020 01:00 PM	1.804	6.030	Dip	N	Orange/brown, moderate sediment load, no odour, no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW04	23/04/2020 12:07 PM	2.081	6.072	Dip	N	Slightly cloudy/milky, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.3
Darwin Turf Club	MW04	28/04/2020 11:44 AM	1.965	6.072	Dip	N	Slightly cloudy/milky, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW04	4/08/2020 12:05 PM	2.605	6.030	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW04	8/09/2020 11:37 AM	-	-	Dip	N	Unable to get IP probe through bend in PVC piping. Water was white-red slightly cloudy, light sheen.	0.0
Darwin Turf Club	MW04	16/09/2020 11:07 AM	2.968	5.035	Dip	N	Water slightly yellow-hazy, No odour, No sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW05	17/01/2020 01:30 PM	3.325	5.484	Dip	N	Brown, slightly turbid, no odour. no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW05	23/04/2020 01:08 PM	3.759	5.470	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	28/04/2020 12:40 PM	3.781	5.470	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW05	4/08/2020 12:48 PM	3.809	5.484	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	8/09/2020 12:11 PM	3.932	5.472	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	16/09/2020 09:20 AM	3.854	4.472	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW06	17/01/2020 02:10 PM	3.468	6.595	Dip	N	Cloudy brown, moderate sediment load, no odour, no sheen - Bail, YSI Pro Plus	0.2
Darwin Turf Club	MW06	23/04/2020 09:03 AM	4.376	6.610	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	28/04/2020 08:47 AM	4.418	6.610	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW06	4/08/2020 08:52 AM	5.244	6.595	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	8/09/2020 12:55 PM	5.481	6.583	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	16/09/2020 09:15 AM	3.824	6.601	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW07	17/01/2020 10:40 AM	2.529	6.043	Dip	N	Bore bent, unable to get bailer down well	0.5
Darwin Turf Club	MW07	23/04/2020 10:01 AM	2.869	6.050	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW07	28/04/2020 09:36 AM	2.984	6.050	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW07	4/08/2020 10:02 AM	3.605	6.025	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW07	8/09/2020 13:42 PM	3.774	6.013	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW07	16/09/2020 09:02 AM	3.824	6.048	Dip	N	Clear, No odour, No sheen - Peristaltic, YSI Pro DSS	0.1

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW02	17/01/2020 12:59 PM	12:36:00	1.0	0.951	6.28	609	0.81	11.4	-33.8	33.1	
			12:38:00	2.0	0.959	6.18	647	0.81	11.5	-31.0	33.9	
			12:40:00	3.0	0.959	6.08	506	1.33	29.3	-20.7	34.8	
			12:42:00	4.0	0.959	5.89	498.6	1.91	27.7	1.4	34.8	
			12:45:00	5.0	0.959	5.84	510	1.91	27.6	10.3	34.8	
			12:47:00	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	
Darwin Turf Club	MW02	23/04/2020 11:45 AM	11:35:06	0.5	1.530	6.04	520	1.26	17.9	42.2	34.3	54.67
			11:37:34	1.0	1.483	5.85	531	0.83	11.8	41.2	34.8	29.10
			11:40:35	1.5	1.472	5.56	535	0.41	6.0	59.2	34.8	2.13
			11:42:30	2.0	1.472	5.51	531	0.38	5.4	65.7	34.8	0.39
			11:45:09	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	11:09:43	0.5	1.563	5.78	520	1.23	17.1	44.4	33.9	12.00
			11:13:06	1.0	1.520	5.58	510	0.83	11.8	54.9	34.2	4.70
			11:17:20	1.5	1.515	5.52	504	0.60	8.5	66.3	34.2	-0.91
			11:21:16	2.0	1.516	5.50	497.5	0.59	8.3	74.7	34.2	-2.15
			11:25:16	2.5	1.519	5.47	492.3	0.58	8.3	80.8	34.2	-2.03
			11:29:08	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	11:04:51	0.5	2.158	4.73	581	0.88	12.4	206.9	34.0	22.5
			11:06:38	1.0	2.158	4.75	584	0.93	13.2	209.8	34.0	22.09
			11:08:30	1.5	2.158	4.76	582	0.93	13.2	209.8	34.0	21.61
			11:10:24	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	10:23:55	0.5	2.264	4.61	588	0.75	10.4	236.0	33.9	-3.04
			10:26:21	1.0	2.264	4.63	588	0.53	7.4	236.2	33.8	-2.92
			10:29:49	1.5	2.264	4.66	587	0.40	5.5	236.6	33.8	-3.18
			10:32:34	2.0	2.264	4.65	587	0.37	5.2	237.2	33.8	-3.00
			10:36:02	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	11:36:08	0.5	2.877	5.05	437.0	0.95	13.4	205.4	32.9	33.42
			11:39:03	1.0	2.877	5.03	408.2	0.42	5.8	218.1	32.9	22.22
			11:41:38	1.5	2.877	5.03	406.7	0.34	4.8	221.8	32.8	15.25
			11:43:47	2.0	2.877	5.03	406.4	0.28	3.9	226.1	32.8	10.10
			11:45:25	2.5	2.878	5.02	406.3	0.28	3.8	227.9	32.8	9.31
			11:47:13	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW03	8/09/2020 10:28 AM	10:28:00	1	3.046	4.86	417.3	0.25	3.7	206.1	33.5	6.07
			10:33:00	2	3.045	4.84	419.1	-0.12	-1.5	203.7	33.5	15.01
			10:38:00	3	3.049	4.79	423.3	-0.16	-2.1	202.0	33.5	3.8
			10:42:00	4	3.049	4.79	423.5	-0.21	-2.9	200.3	33.5	2.06
			10:46:00	5	3.048	4.8	422	-0.25	-3.5	201.9	33.7	0.54
			10:49:00	6	3.048	4.8	422.9	-0.28	-3.7	201.4	33.7	0.89
			10:53:00	7	3.049	4.81	422.8	-0.29	-3.7	202.1	33.6	1.00
Darwin Turf Club	MW03	16/09/2020 10:08 AM	09:50:00	0.1	3.082	6.00	960	14.3	0.98	-9.3	33.3	2184.11
			09:54:00	0.5	3.083	5.76	921	-4.2	-0.30	-8.3	33.9	911.17
			09:57:00	1	3.085	5.62	896	-4.3	-0.30	-1.8	34.0	489.0
			10:01:00	1.5	3.085	5.59	491	-3.6	-0.25	1.0	33.8	2460
			10:03:00	2	3.085	5.59	510	-3.8	-0.29	0.6	34.0	2301
			10:06:00	2.5	3.085	5.60	529	-4.2	-0.30	-0.2	33.9	2197
Darwin Turf Club	MW04	17/01/2020 01:20 PM	13:03:00	1.0	2.174	5.41	9691	4.08	56.8	126.9	31.7	
			13:05:00	2.0		5.34	10356	4.17	59.5	137.8	31.8	
			13:07:00	3.0	2.566	5.06	15173	3.12	45.4	156.6	32.0	
			13:09:00	4.0		4.99	17340	2.05	31.9	187.3	32.3	
			13:12:00	6.0	2.830	4.99	13930	2.03	31.0	189.3	32.3	
			13:15:00	8.0		5.06	13225	2.07	32.4	189.3	32.3	
			13:18:00	10		5.09	13025	2.09	32.4	191.7	32.3	
			13:20:00	11		5.11	12521	2.06	32.1	193.3	32.3	
Darwin Turf Club	MW04	23/04/2020 12:41 PM	12:26:40	0.5	1.949	4.83	13350	1.59	23.1	214.6	33.7	87.86
			12:28:49	1.0	1.963	4.97	11288	1.51	21.9	217.4	33.6	85.43
			12:30:50	1.5	1.965	5.05	9530	1.51	21.8	217.5	33.6	85.32
			12:32:28	2.0	1.964	5.08	7500	1.48	21.2	217.3	33.6	85.47
			12:36:24	3.0	1.964	5.18	6430	1.44	20.7	215.4	33.6	53.69
			12:39:04	3.5	1.965	5.20	6366	1.46	20.8	214.2	33.6	50.41
			12:41:01	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW04	28/04/2020 12:24 PM	11:55:39	0.5	2.037	4.47	23696	0.63	9.4	237.4	33.2	13.14
			11:58:45	1.0	2.037	4.59	23663	0.53	8.0	246.7	33.3	4.81
			12:02:58	1.5	2.037	4.71	19250	0.57	8.4	251.7	33.3	3.00
			12:06:01	2.0	2.037	4.73	15003	0.62	9.0	249.4	33.3	0.92
			12:09:37	2.5	2.037	4.86	11724	0.69	9.9	245.9	33.3	1.68
			12:12:02	3.0	2.037	4.99	9581	0.78	11.2	241.1	33.3	2.52
			12:15:07	3.5	2.037	5.03	8491	0.82	11.8	237.8	33.3	3.31
			12:18:21	4.0	2.037	5.10	7352	0.93	13.3	234.6	33.3	3.55
			12:20:28	4.5	2.037	5.13	6922	0.95	13.6	232.8	33.3	3.97
			12:22:18	5.0	2.037	5.15	6875	0.98	14.0	231.0	33.3	4.95
Darwin Turf Club	MW04	4/08/2020 12:34 PM	12:24:03	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
			12:15:11	0.50	2.753	4.86	16623	2.13	30.2	294.8	32.0	4.01
			12:18:32	1.0	2.796	4.98	13810	2.24	32.1	300.0	31.9	3.62
			12:21:06	1.5	2.834	4.96	13554	1.44	20.5	303.1	31.9	4.35
			12:23:43	2.0	2.875	5.01	12026	1.06	15.1	304.1	31.9	4.06
			12:25:26	2.5	2.888	5.05	11123	0.88	12.3	303.8	31.9	4.13
			12:27:10	3.0	2.897	5.07	10237	0.85	12.0	303.9	31.9	4.18
			12:30:13	3.5	2.899	5.09	10062	0.81	11.6	302.6	31.9	4.25
			12:32:51	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW04	8/09/2020 11:39 AM	11:18:00	0.1	-	4.59	19058	0.84	12.8	235.1	33.3	330.9
			11:21:00	1	-	4.61	18855	0.32	4.90	238.9	32.7	281.9
			11:25:00	2	-	4.63	18863	0.25	3.70	243.5	32.6	38.9
			11:30:00	3	-	4.45	18450	0.15	2.20	146.4	32.6	385.1
			11:34:00	4	-	4.65	18610	0.17	2.80	247.8	32.5	299.3
			11:37:00	5	-	4.65	18810	0.17	2.81	247.2	32.5	301.9
			10:45:00	0.1	3.039	4.49	21623	7.70	0.52	213.0	33.3	30.72
			10:47:00	0.5	3.115	4.49	21250	3.30	0.21	221.7	33.4	52.41
Darwin Turf Club	MW04	16/09/2020 11:07 AM	10:50:00	1	3.186	4.49	21233	-1.10	-0.08	224.9	33.1	80.71
			10:55:00	1.5	3.218	4.51	21436	-1.70	-0.12	226.0	33.9	62.13
			10:58:00	2	3.244	4.51	21031	-2.30	-0.16	225.3	33.2	90.10
			11:01:00	2.5	3.307	4.52	20977	-2.50	-0.18	224.9	33.2	76.10
			11:05:00	3	3.376	4.52	20888	-2.39	-0.16	225.9	33.2	63.10
			13:35:00	2.0	3.705	6.64	157.8	4.65	56.6	143.0	31.1	
			13:37:00	3.0	3.870	6.60	116.0	4.49	61.0	145.2	31.1	
			13:39:00	4.0	4.021	5.97	115.0	4.48	66.7	148.5	31.2	
Darwin Turf Club	MW05	17/01/2020 01:50 PM	13:40:00	5.0	4.121	5.95	110.2	4.52	69.3	150.2	31.2	
			13:42:00	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	
			13:18:41	0.5	3.902	5.67	126.5	6.05	83.6	185.2	32.5	1.06
			13:20:39	1.0	3.961	5.65	102.5	6.05	83.5	190.5	32.5	1.04
			13:22:24	1.5	4.018	5.62	96.2	6.03	83.2	195.7	32.5	-0.80
Darwin Turf Club	MW05	23/04/2020 01:28 PM	13:25:34	2.0	4.077	5.60	95.1	5.95	82.2	201.9	32.5	-0.80
			13:28:09	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
			12:51:41	0.5	3.915	5.80	152.0	6.23	85.9	181.4	32.4	-1.39
			12:54:01	1.0	3.974	5.77	102.3	6.24	86.0	191.0	32.4	-1.71
			12:58:40	1.5	4.064	5.73	92.8	6.22	85.6	198.9	32.4	-1.76
Darwin Turf Club	MW05	28/04/2020 01:14 PM	13:03:09	2.0	4.147	5.71	91.5	6.21	85.7	207.5	32.4	-1.47
			13:08:41	2.5	4.226	5.68	91.5	6.27	86.6	211.6	32.4	-1.35
			13:14:03	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
			12:57:58	0.50	3.944	6.36	184.5	7.09	95.4	251.8	31.0	2.08
			13:01:10	1.0	4.063	6.30	79.0	7.13	95.9	258.8	31.0	2.20
Darwin Turf Club	MW05	4/08/2020 01:08 PM	13:03:51	1.25	4.112	6.29	78.3	7.13	95.9	260.3	31.0	2.24
			13:05:27	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
			11:58:00	0.1	3.978	6.05	288.6	7.01	98.4	150.6	33.5	2.17
			12:03:00	1	4.285	5.96	102.1	6.84	94.3	165.1	32.3	4.11
Darwin Turf Club	MW05	8/09/2020 12:11 PM	12:07:00	2	4.310	5.96	109.8	6.83	92.0	167.0	32.3	4.81
			12:11:00	3	4.323	5.96	112.0	6.79	89.1	171.0	32.3	4.86
			11:26:00	0.1	3.934	6.11	161.7	6.69	97.1	107.0	33.6	0.92
Darwin Turf Club	MW05	16/09/2020 11:46 AM	11:30:00	0.5	4.089	6.10	96.8	6.67	96.0	121.1	32.4	0.15
			11:35:00	1.0	4.141	6.09	97.7	6.95	96.7	119.8	33.1	2.90
			11:40:00	1.5	4.198	6.04	103.0	6.81	95.9	114.3	33.1	1.80
			11:44:00	2.0	4.219	6.04	110.4	6.95	96.8	116.9	33.1	1.27

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW06	17/01/2020 02:30 PM	14:12:14	1.0	3.492	5.44	197.5	4.47	62.4	165.1	32.5	
			14:13:04	2.0	3.495	5.15	203.0	4.30	62.0	189.9	32.4	
			14:14:14	3.0	3.498	5.10	210.6	4.48	62.8	203.3	32.5	
			14:15:24	4.0	3.502	5.08	220.7	4.41	61.9	211.6	32.5	
			14:16:36	5.0	3.505	5.07	227.3	4.29	57.8	218.6	32.5	
			14:17:53	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	
Darwin Turf Club	MW06	23/04/2020 09:33 AM	09:19:23	0.5	4.380	4.68	356.1	1.76	23.2	169.1	33.2	-1.20
			09:22:45	1.0	4.381	4.64	355.0	0.74	10.2	186.8	33.0	-1.05
			09:24:58	1.5	4.381	4.64	354.4	0.51	7.1	192.0	33.0	-0.90
			09:27:38	2.0	4.381	4.63	353.2	0.43	6.2	198.5	33.0	-0.87
			09:29:24	2.5	4.381	4.63	353.4	0.37	5.2	202.0	33.0	-0.71
			09:31:28	3.0	4.382	4.64	353.3	0.36	5.0	205.4	33.0	-0.61
			09:33:22	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	08:58:36	0.5	4.422	4.71	291.5	0.63	8.7	156.7	32.1	0.46
			09:02:30	1.0	4.422	4.70	289.0	0.48	6.4	176.8	32.3	0.49
			09:05:56	1.5	4.423	4.69	289.8	0.36	5.0	192.1	32.4	0.69
			09:08:24	2.0	4.423	4.69	290.5	0.35	4.9	195.9	32.4	1.10
			09:11:27	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	09:11:00	0.5	5.436	4.63	102.4	0.52	7.1	255.7	31.7	5.20
			09:17:00	1.0	5.565	4.65	102.3	0.43	5.9	268.2	31.7	10.54
			09:23:00	1.25	5.643	4.64	106.7	0.45	6.1	275.3	31.7	10.85
			09:27:00	1.50	5.683	4.62	107.9	0.44	6.0	280.1	31.7	10.95
			09:31:00	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW06	8/09/2020 12:58 PM	12:41:00	0.1	5.625	4.32	107.4	1.91	27.7	220.0	35.3	12.21
			12:47:00	1	5.759	4.36	104.5	0.61	8.60	246.5	33.9	8.16
			12:49:00	1.5	5.75	4.35	106.1	0.60	7.91	251.3	33.7	8.01
			12:52:00	2	5.749	4.35	108.5	0.57	7.8	249.0	33.5	7.92
			12:55:00	2.5	5.745	4.35	107.9	0.57	7.79	245.1	33.5	7.94
Darwin Turf Club	MW06	16/09/2020 12:27 PM	11:57:08	0.1	5.657	4.39	100.1	23.1	1.54	213.1	35.1	5.10
			11:57:40	0.5	5.758	4.38	91.7	26.6	1.80	223.8	35.2	59.11
			11:57:43	1	5.844	4.38	99.3	22.6	1.52	242.1	34.4	69.10
			11:57:46	1.5	5.939	4.35	96.1	18.7	1.39	241.0	34.0	49.80
			11:57:49	2.0	5.981	4.32	97.8	19.0	1.40	236.7	34.0	30.19
			11:57:52	2.5	6.028	4.32	103.9	20.2	1.43	249.8	34.1	12.10
Darwin Turf Club	MW07	23/04/2020 10:17 AM	10:08:37	0.5	2.921	4.31	195.3	2.53	34.1	208.8	31.3	0.30
			10:10:15	1.0	2.930	4.27	176.6	2.45	32.9	218.9	31.1	0.31
			10:12:33	1.5	2.931	4.26	176.1	2.27	30.6	226.9	31.1	-0.85
			10:15:08	2.0	2.932	4.25	177.7	2.35	31.6	232.0	31.1	-0.9
			10:17:05	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	09:43:53	0.5	3.021	4.21	317.5	1.41	19.2	238.3	31.1	-1.78
			09:46:04	1.0	3.022	4.22	212.0	1.93	26.1	244.1	31.1	-2.62
			09:48:49	1.5	3.022	4.19	188.6	2.10	28.3	250.9	31.1	-2.67
			09:50:54	2.0	3.023	4.18	186.9	2.10	28.3	254.2	31.1	-2.84
			09:53:01	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	10:21:28	0.5	3.760	4.65	1500	1.27	17.1	208.0	30.7	8.33
			10:27:42	1.0	3.846	4.74	1451	1.24	17.1	226.1	30.8	8.75
			10:33:24	1.50	3.931	4.75	1877	1.25	17.7	194.4	30.8	9.28
			10:39:55	2.00	4.095	4.79	1722	0.45	6.1	170.7	30.8	6.29
			10:43:33	2.5	4.193	4.82	1693	0.48	6.4	178.5	30.8	6.12
			10:47:12	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66
Darwin Turf Club	MW07	8/09/2020 01:43 PM	13:33:00	0.1	3.891	4.57	2855	1.89	25	100.1	36.0	36.5
			13:35:00	0.5	4.15	4.53	2541	0.09	1.40	186.9	32.7	35.1
			13:37:00	1	4.071	4.53	2561	0.08	1.32	187.1	32.5	35.91
			13:40:00	1.5	4.103	4.52	2614	0.09	1.34	186.1	32.5	36.09
			13:42:00	2	4.121	4.53	2599	0.08	1.30	179.0	32.5	35.96
Darwin Turf Club	MW07	16/09/2020 01:26 PM	11:59:42	0.1	3.914	4.24	2114	14.6	1.02	227.9	34.0	14.10
			12:00:16	0.5	4.050	4.07	1727	16.6	1.20	264.4	32.9	18.57
			12:00:20	1.0	4.138	4.07	1617	22.5	1.62	275.0	32.7	21.19
			12:00:23	1.5	4.198	4.07	1691	24.1	1.67	218.1	32.7	16.18
			13:24:00	2.0	4.263	4.07	1710	25.6	1.72	247.1	32.7	20.11



Appendix A Table 3
Final Sample Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Purge Vol	Purge SWL	pH Field	EC Field	DO Field	DO Field	OPR Field	Temp Field	Turbidity Field
			L	m bTOC	pH Units	µS/cm	mg/L	%S	mV	°C	NTU
Darwin Turf Club	MW02	17/01/2020 12:59 PM	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	
Darwin Turf Club	MW02	23/04/2020 11:45 AM	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW03	8/09/2020 10:53 AM	7	3.049	4.81	422.8	-0.29	-3.7	202.1	33.6	1.00
Darwin Turf Club	MW03	16/09/2020 10:08 AM	2.5	3.085	5.60	529	-4.2	-0.30	-0.2	33.9	2197
Darwin Turf Club	MW04	17/01/2020 01:20 PM	11	2.830	5.11	12521	2.06	32.1	193.3	32.3	
Darwin Turf Club	MW04	23/04/2020 12:41 PM	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
Darwin Turf Club	MW04	4/08/2020 12:34 PM	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW04	8/09/2020 11:37 AM	5	-217.1	4.65	18810	0.17	2.81	247.2	32.5	301.9
Darwin Turf Club	MW04	16/09/2020 11:07 AM	3	3.376	4.52	20888	-2.39	-0.16	225.9	33.2	63.10
Darwin Turf Club	MW05	17/01/2020 01:50 PM	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	
Darwin Turf Club	MW05	23/04/2020 01:28 PM	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
Darwin Turf Club	MW05	28/04/2020 01:14 PM	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
Darwin Turf Club	MW05	8/09/2020 12:11 PM	3	4.323	5.96	112.0	6.80	89.1	171.0	32.3	4.86
Darwin Turf Club	MW05	16/09/2020 11:46 AM	2.0	4.219	6.04	110.4	6.95	96.8	116.9	33.1	1.27
Darwin Turf Club	MW06	17/01/2020 02:30 PM	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	
Darwin Turf Club	MW06	23/04/2020 09:33 AM	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW06	8/09/2020 12:55 PM	2.5	5.745	4.35	107.9	0.57	7.79	245.1	33.5	7.94
Darwin Turf Club	MW06	16/09/2020 12:27 PM	2.5	6.028	4.32	103.9	20.2	1.43	249.8	34.1	12.10
Darwin Turf Club	MW07	23/04/2020 10:17 AM	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66
Darwin Turf Club	MW07	8/09/2020 13:42 PM	2	4.121	4.53	2599	0.08	1.30	179.0	32.5	35.96
Darwin Turf Club	MW07	16/09/2020 01:26 PM	2.0	4.263	4.07	1710	25.6	1.72	247.1	32.7	20.11

Appendix B – Results Tables



Appendix B Table 1
Groundwater Results

			Well ID	MW02			MW03				
			Field ID	MW02_200117	MW02_200423	MW02_200428	MW03_200423	MW03_200428	MW03_200804	MW03_200908	MW03_200916
			Date	17/01/2020	23/04/2020	28/04/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL218)								
Field Parameters											
pH (Field)	pH Units		6.0 - 8.0	5.86	5.46	5.45	4.76	4.67	5.02	4.81	5.60
Electrical conductivity (field)	µS/cm		20 - 250	505	528	490.1	582	586	406.4	422.8	529
DO (%S) (Field)	%S		80 - 110	27.4	5.6	8.3	13.2	5	4.0	-3.7	-0.3
Redox (Field)	mV			11.3	68.0	84.1	209.4	236.7	229.0	202.1	-0.2
Temperature (Field)	°C			34.8	34.8	34.2	34.0	33.8	32.8	33.6	33.9
Turbidity	NTU	0.1	2 - 15	89.1	0.76	0.41	22.1	0	9.56	1.00	2,197
Metals											
Arsenic (filtered)	mg/L	0.001	0.094	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (filtered)	mg/L	0.0001	0.0004	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	0.001	0.0018	<0.001	0.011	0.002	0.008	0.002	0.009	0.007	0.012
Lead (filtered)	mg/L	0.001	0.0056	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Mercury (filtered)	mg/L	0.0001	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.001	0.013	<0.001	0.010	<0.001	0.009	0.002	0.005	0.007	0.005
Zinc (filtered)	mg/L	0.005	0.015	<0.005	0.113	0.007	0.048	0.010	0.040	0.039	0.038
BTEXN											
Benzene	µg/L	1	300	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	2	300	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/L	2	5	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2
Xylene (m & p)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	µg/L	2	75	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5
BTEX (Sum of Total) - Lab Calc	µg/L	1		<1	<1	<1	<1	<1	<1	<1	<1
TRH - NEPM 2013											
F1 (C6-C10 minus BTEX)	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
F3 (>C16-C34 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
F4 (>C34-C40 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100	600	<100	<100	<100	<100	<100	<100	<100	<100



Appendix B Table 1
Groundwater Results

			Well ID	MW04						MW05					
			Field ID	MW04_200117	MW04_200423	MW04_200428	MW04_200804	MW04_200908	MW04_200916	MW05_200117	MW05_200423	MW05_200428	MW05_200804	MW05_200908	MW05_200916
			Date	17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL 218)												
Field Parameters															
pH (Field)	pH Units		6.0 - 8.0	5.11	5.23	5.18	5.11	4.65	4.52	5.93	5.59	5.67	6.28	5.96	6.04
Electrical conductivity (field)	µS/cm		20 - 250	12521	6,273	6,729	9,850	18,810	20,888	107.3	95.1	93.6	77.4	112.0	110.4
DO (%S) (Field)	%S		80 - 110	32.1	20.1	14.8	11.3	2.81	-2.39	69.3	81.7	85.3	95.7	89.1	96.8
Redox (Field)	mV			193.3	213.1	229.2	302.6	247.2	225.9	153.5	205.4	217.1	262.4	171.0	116.9
Temperature (Field)	°C			32.3	33.6	33.3	31.9	32.5	33.2	31.2	32.5	32.4	31.0	32.3	33.1
Turbidity	NTU	0.1	2 - 15	1,160	47.99	8.16	4.56	301.9	63.10	608	0.33	1.79	2.26	4.86	1.27
Metals															
Arsenic (filtered)	mg/L	0.001	0.094	<0.001	<0.001	<0.001	<0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (filtered)	mg/L	0.0001	0.0004	0.0001	0.0001	0.0002	0.0005	0.0009	0.0015	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	0.001	0.0018	<0.001	0.005	0.007	0.011	0.009	0.018	<0.001	0.009	0.003	0.007	0.007	0.007
Lead (filtered)	mg/L	0.001	0.0056	0.004	<0.001	<0.001	0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury (filtered)	mg/L	0.0001	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.001	0.013	0.014	0.021	0.030	0.066	0.099	0.142	<0.001	0.006	0.006	0.009	0.005	0.004
Zinc (filtered)	mg/L	0.005	0.015	0.067	0.093	0.140	0.291	0.430	0.571	<0.005	0.039	0.062	0.061	0.021	0.026
BTEXN															
Benzene	µg/L	1	300	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	2	300	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/L	2	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (m & p)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	µg/L	2	75	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
BTEX (Sum of Total) - Lab Calc	µg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH - NEPM 2013															
F1 (C6-C10 minus BTEX)	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F3 (>C16-C34 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F4 (>C34-C40 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100	600	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100



Appendix B Table 1
Groundwater Results

			Well ID	MW06						MW07				
			Field ID	MW06_200117	MW06_200423	MW06_200428	MW06_200804	MW06_200908	MW06_200916	MW07_200423	MW07_200428	MW07_200804	MW07_200908	MW07_200916
			Date	17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL218)											
Field Parameters														
pH (Field)	pH Units		6.0 - 8.0	5.05	4.63	4.69	4.61	4.35	4.32	4.24	4.17	4.81	4.53	4.07
Electrical conductivity (field)	µS/cm		20 - 250	232.2	353.4	290.9	109.8	107.9	103.9	176.4	186.4	1,651	2,599	1,710
DO (%S) (Field)	%S		80 - 110	60.0	4.7	4.6	5.9	7.79	20.2	31.3	28.3	6.5	1.30	25.6
Redox (Field)	mV			221.5	208.1	201.9	283.1	245.1	249.8	236.0	256.7	179.9	179.0	247.1
Temperature (Field)	°C			32.5	33.0	32.4	31.7	33.5	34.1	31.1	31.1	30.8	32.5	32.7
Turbidity	NTU	0.1	2 - 15	359	1.56	4.66	11.02	7.94	12.10	0	13	6.66	35.96	20.11
Metals														
Arsenic (filtered)	mg/L	0.001	0.094	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.004	0.001
Cadmium (filtered)	mg/L	0.0001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0004
Chromium (III+VI) (filtered)	mg/L	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	0.001	0.0018	<0.001	0.011	0.005	0.002	0.016	0.007	0.007	0.003	0.009	0.006	0.007
Lead (filtered)	mg/L	0.001	0.0056	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.004	0.004	0.011
Mercury (filtered)	mg/L	0.0001	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.001	0.013	<0.001	0.010	0.001	0.002	0.010	0.004	0.008	0.002	0.008	0.007	0.010
Zinc (filtered)	mg/L	0.005	0.015	<0.005	0.065	0.021	0.011	0.060	0.028	0.056	0.012	0.062	0.020	0.031
BTEXN														
Benzene	µg/L	1	300	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	2	300	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/L	2	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (m & p)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	µg/L	2	75	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
BTEX (Sum of Total) - Lab Calc	µg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH - NEPM 2013														
F1 (C6-C10 minus BTEX)	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F3 (>C16-C34 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F4 (>C34-C40 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100	600	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

		Location ID		AQM01		AQM02		AQM03	
		Date		27/04/2020	15/09/2020	27/04/2020	15/09/2020	27/04/2020	15/09/2020
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL218)*						
BTEXN									
Benzene	mg/m ³	0.0016	0.010	<0.003	<0.003	<0.003	<0.003	<0.003	<0.004
Toluene	mg/m ³	0.0075	3.766	0.0096	<0.0075	<0.0075	<0.0075	<0.0075	0.029
Ethylbenzene	mg/m ³	0.0022		<0.004	<0.005	<0.004	<0.003	<0.004	<0.005
Xylene (o)	mg/m ³	0.0022	1.085	<0.004	<0.005	<0.004	<0.003	<0.004	<0.005
Xylene (m & p)	mg/m ³	0.0044	2.170	<0.008	<0.009	<0.009	<0.007	<0.009	<0.01
PAHs									
Naphthalene	mg/m ³	0.0105		<0.021	<0.023	<0.022	<0.017	<0.022	<0.025

* Trigger values converted from ppb to mg/m³



Appendix B Table 3
RPD Table

Darwin Turf Club Inc
EPL Monitoring Darwin Turf Club
September 2020

	Date		8/09/2020		8/09/2020		16/09/2020		16/09/2020		16/09/2020			
	Field ID		MW07_200908	QC105_200908	MW07_200908	QC205_200908	MW03_200916	QC106_200916	MW03_200916	QC206_200916				
	Lab Report No.		ES2031630	ES2031630	ES2031630	743806	ES2032768	ES2032768	ES2032768	745302				
	Unit	EQL												
Metals														
Arsenic (filtered)	mg/L	0.001	0.004	0.004	0	0.004	<0.001	120	<0.001	<0.001	0	<0.001	<0.001	0
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	0	0.0002	<0.0002	0	<0.0001	<0.0001	0	<0.0001	<0.0002	0
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
Copper (filtered)	mg/L	0.001	0.006	0.005	18	0.006	0.004	40	0.012	0.010	18	0.012	0.012	0
Lead (filtered)	mg/L	0.001	0.004	0.004	0	0.004	0.001	120	<0.001	<0.001	0	<0.001	<0.001	0
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Nickel (filtered)	mg/L	0.001	0.007	0.007	0	0.007	0.006	15	0.005	0.003	50	0.005	0.004	22
Zinc (filtered)	mg/L	0.005	0.020	0.020	0	0.020	0.010	67	0.038	0.030	24	0.038	0.033	14
BTEXN														
Benzene	µg/L	1	<1	<1	0	<1	<1	0	<1	<1	0	<1	<1	0
Toluene	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0
Ethylbenzene	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0
Xylene (o)	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0
Xylene (m & p)	µg/L	2	<2	<2	0	<2	<2	0	<2	<2	0	<2	<2	0
Xylene Total	µg/L	2	<2	<2	0	<2	<3	0	<2	<2	0	<2	<3	0
BTEX (Sum of Total) - Lab Calc	µg/L	1	<1	<1	0	<1	-	-	<1	<1	0	<1	-	-
TRH - NEPM 2013														
F1 (C6-C10 minus BTEX)	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0
C6-C10 Fraction	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0
F2 (>C10-C16 minus Naphthalene)	µg/L	50	<100	<100	0	<100	<50	0	<100	<100	0	<100	<50	0
>C10-C16 Fraction	µg/L	50	<100	<100	0	<100	<50	0	<100	<100	0	<100	<50	0
F3 (>C16-C34 Fraction)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0
F4 (>C34-C40 Fraction)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0
>C10-C40 (Sum of Total)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0
TRH - NEPM 1999														
C6-C9 Fraction	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0
C10-C14 Fraction	µg/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0
C15-C28 Fraction	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0
C29-C36 Fraction	µg/L	50	<50	<50	0	<50	<100	0	<50	<50	0	<50	<100	0
C10-C36 (Sum of Total)	µg/L	50	<50	<50	0	<50	<100	0	<50	<50	0	<50	<100	0
PAHs - standard 16														
Naphthalene	µg/L	5	<5	<5	0	<5	<10	0	<5	<5	0	<5	<10	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 200 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix C – Laboratory Reports

CHAIN OF CUSTODY (ALS) COC#: 13806 ALS Laboratory: ES Sydney		RELINQUISHED BY: DATE TIME:	RECEIVED BY: <i>5084/160 ASD</i> DATE TIME: <i>10/9/20 1845</i>	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: GHDSER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Turf Club ORDER NO: PROJECT MANAGER: Kaleb Thomas PRIMARY SAMPLER: Kaleb Thomas EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		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: 82 °C Other comments:	

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW03_200908		08/09/2020 11:33 AM	Water	ALS: 4 Non ALS: 1	No		X		
002	MW04_200908		08/09/2020 12:04 PM	Water	ALS: 4 Non ALS: 1	No		X		
003	MW05_200908		08/09/2020 12:51 PM	Water	ALS: 4 Non ALS: 1	No		X		
004	MW06_200908		08/09/2020 01:31 PM	Water	ALS: 4 Non ALS: 1	No		X		
005	QC105_200908		08/09/2020 02:28 PM	Water	ALS: 4 Non ALS: 1	No		X		
006	QC205_200908	please forward to Eurofins for analysis - same suite as QC105	08/09/2020 02:29 PM	Water	ALS: 4 Non ALS: 1	No		X		
007	MW07_200908		08/09/2020 02:26 PM	Water	ALS: 4 Non ALS: 1	No		X		
008	QC305_200908	rinsate off glove	08/09/2020 01:16 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	QC505	trip blank	08/09/2020 02:57 PM	Water	ALS: 1 Non ALS: 0	No				

Environmental Division
 Sydney
 Work Order Reference
ES2031630



Telephone : + 61-2-8784 8555

Subcon / Forward Lab / Split WO
 Lab / Analysis: Eurofins
 Organised By / Date: _____
 Relinquished By / Date: _____
 Connote / Courier: _____
 WO No: **ES2031630**
 Attach By PO / Internal Sheet: _____

CHAIN OF CUSTODY COC#: 13806 ALS Laboratory: ES Sydney		RELINQUISHED BY:	RECEIVED BY: <i>50844920</i>	RELINQUISHED BY:	RECEIVED BY:
		DATE TIME:	DATE TIME: <i>10/9/201845</i>	DATE TIME:	DATE TIME:
CLIENT: GHDSER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Turf Club ORDER NO: PROJECT MANAGER: Kaleb Thomas PRIMARY SAMPLER: Kaleb Thomas EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		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: <i>8-2</i> °C Other comments:	
		CONTACT PH: SAMPLER MOBILE: QUOTE NO: SY/010/20 / ES2020GHDSER0002			

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	MW03_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067345	Purple	No	
001	MW03_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018406	Red/Green	Yes	
001	MW03_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019097435	Purple	No	
001	MW03_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220003025	Orange	No	
002	MW04_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067374	Purple	No	
002	MW04_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067340	Purple	No	
002	MW04_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220003020	Orange	No	
002	MW04_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018107	Red/Green	Yes	
003	MW05_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018270	Red/Green	Yes	
003	MW05_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067361	Purple	No	
003	MW05_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067470	Purple	No	
003	MW05_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220002961	Orange	No	
004	MW06_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018284	Red/Green	Yes	
004	MW06_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220002936	Orange	No	
004	MW06_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067414	Purple	No	
004	MW06_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067382	Purple	No	
005	QC105_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018293	Red/Green	Yes	
005	QC105_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220003016	Orange	No	
005	QC105_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067315	Purple	No	
005	QC105_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067402	Purple	No	
006	QC205_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019097383	Purple	No	
006	QC205_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067416	Purple	No	
006	QC205_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220002757	Orange	No	
006	QC205_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018307	Red/Green	Yes	
007	MW07_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220002690	Orange	No	
007	MW07_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067395	Purple	No	

CHAIN OF CUSTODY COC#: 13806 ALS Laboratory: ES Sydney		RELINQUISHED BY: DATE TIME:	RECEIVED BY: <i>Scott H</i> DATE TIME: <i>10/9/20 1845</i>	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: GHDSER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Turf Club ORDER NO: PROJECT MANAGER: Kaleb Thomas PRIMARY SAMPLER: Kaleb Thomas EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		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: <i>8-2</i> °C Other comments:	
		CONTACT PH: QUOTE NO: SY/010/20		SAMPLER MOBILE: / ES2020GHDSER0002	

007	MW07_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018430	Red/Green	Yes	
007	MW07_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019097363	Purple	No	
008	QC305_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067400	Purple	No	
008	QC305_200908	Amber VOC Vial - Sulfuric Acid	40 mL	00161019067444	Purple	No	
008	QC305_200908	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00280198018442	Red/Green	No	total metals
008	QC305_200908	Amber Glass Bottle - Unpreserved	100 mL	00400220003037	Orange	No	
009	QC505	Amber VOC Vial - Sulfuric Acid	40 mL	00161019081156	Purple	No	

Total Bottle Count: ALS: 33, Non ALS: 7

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2031630

Client : GHD PTY LTD Contact : KALEB THOMAS Address : LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800 E-mail : kaleb.thomas@ghd.com Telephone : ---- Facsimile : ---- Project : Darwin Turf Club EPL Monitoring Order number : - C-O-C number : 13806 Site : Turf Club Sampler : KALEB THOMAS, Zoe Abbott	Laboratory : Environmental Division Sydney Contact : Angus Harding Address : 277-289 Woodpark Road Smithfield NSW Australia 2164 E-mail : Angus.Harding@ALSGlobal.com Telephone : +61 2 8784 8555 Facsimile : +61-2-8784 8500 Page : 1 of 3 Quote number : ES2020GHDSE0002 (SY/010/20) QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 08-Sep-2020 14:00	Issue Date : 10-Sep-2020
Client Requested Due : 15-Sep-2020	Scheduled Reporting Date : 15-Sep-2020
Date	

Delivery Details

Mode of Delivery : Undefined	Security Seal : Intact.
No. of coolers/boxes : 1	Temperature : 8.2°C - Ice present
Receipt Detail :	No. of samples received / analysed : 9 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample QC205_200908 forwarded to Eurofins as per COC.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

ES2031630-006 : 08-Sep-2020 13:59 : QC205_200908 - please forward to Eurofins for analysis - same suite as QC105

ES2031630-008 : 08-Sep-2020 12:46 : QC305_200908 - rinsate off glove

Summary of Sample(s) and Requested Analysis

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

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) WATER No analysis requested	WATER - W-05 TRH/BTEXN/8 Metals
ES2031630-001	08-Sep-2020 11:03	MW03_200908		✓
ES2031630-002	08-Sep-2020 11:34	MW04_200908		✓
ES2031630-003	08-Sep-2020 12:21	MW05_200908		✓
ES2031630-004	08-Sep-2020 13:01	MW06_200908		✓
ES2031630-005	08-Sep-2020 13:58	QC105_200908		✓
ES2031630-006	08-Sep-2020 13:59	QC205_200908 please...		✓
ES2031630-007	08-Sep-2020 13:56	MW07_200908		✓
ES2031630-008	08-Sep-2020 12:46	QC305_200908 rinsat...		✓
ES2031630-009	08-Sep-2020 14:27	QC505 trip blank	✓	

Proactive Holding Time Report

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

Requested Deliverables

Accounts Payable Australia

- A4 - AU Tax Invoice (INV)

Email accountspayableAU@ghd.com

GHD LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN_ESDAT)

[illegible]

KALEB THOMAS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN_ESDAT)

[illegible]

TIM MURPHY

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN ESDAT)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **ES2031630**
Client : **GHD PTY LTD**
Contact : **KALEB THOMAS**
Address : **LEVEL 5 66 SMITH STREET**
DARWIN NT, AUSTRALIA 0800
Telephone : **----**
Project : **Darwin Turf Club EPL Monitoring**
Order number : **-**
C-O-C number : **13806**
Sampler : **KALEB THOMAS, Zoe Abbott**
Site : **Turf Club**
Quote number : **SY/010/20**
No. of samples received : **9**
No. of samples analysed : **8**

Page : 1 of 9
Laboratory : Environmental Division Sydney
Contact : Angus Harding
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61 2 8784 8555
Date Samples Received : 08-Sep-2020 14:00
Date Analysis Commenced : 11-Sep-2020
Issue Date : 15-Sep-2020 16:31



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				MW03_200908	MW04_200908	MW05_200908	MW06_200908	QC105_200908
Client sampling date / time				08-Sep-2020 11:03	08-Sep-2020 11:34	08-Sep-2020 12:21	08-Sep-2020 13:01	08-Sep-2020 13:58
Compound	CAS Number	LOR	Unit	ES2031630-001	ES2031630-002	ES2031630-003	ES2031630-004	ES2031630-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.002	<0.001	<0.001	0.004
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0009	<0.0001	<0.0001	0.0002
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.007	0.009	0.007	0.016	0.005
Nickel	7440-02-0	0.001	mg/L	0.007	0.099	0.005	0.010	0.007
Lead	7439-92-1	0.001	mg/L	<0.001	0.002	<0.001	0.001	0.004
Zinc	7440-66-6	0.005	mg/L	0.039	0.430	0.021	0.060	0.020
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				MW03_200908	MW04_200908	MW05_200908	MW06_200908	QC105_200908
Client sampling date / time				08-Sep-2020 11:03	08-Sep-2020 11:34	08-Sep-2020 12:21	08-Sep-2020 13:01	08-Sep-2020 13:58
Compound	CAS Number	LOR	Unit	ES2031630-001	ES2031630-002	ES2031630-003	ES2031630-004	ES2031630-005
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	95.1	86.9	94.6	93.4	95.8
Toluene-D8	2037-26-5	2	%	103	92.6	101	99.0	99.5
4-Bromofluorobenzene	460-00-4	2	%	95.1	86.5	93.8	93.4	93.4



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

MW07_200908

Client sampling date / time

08-Sep-2020 13:56

Compound	CAS Number	LOR	Unit	ES2031630-007				
				Result				

EG020F: Dissolved Metals by ICP-MS

Arsenic	7440-38-2	0.001	mg/L	0.004				
Cadmium	7440-43-9	0.0001	mg/L	0.0002				
Chromium	7440-47-3	0.001	mg/L	<0.001				
Copper	7440-50-8	0.001	mg/L	0.006				
Nickel	7440-02-0	0.001	mg/L	0.007				
Lead	7439-92-1	0.001	mg/L	0.004				
Zinc	7440-66-6	0.005	mg/L	0.020				

EG035F: Dissolved Mercury by FIMS

Mercury	7439-97-6	0.0001	mg/L	<0.0001				

EP080/071: Total Petroleum Hydrocarbons

C6 - C9 Fraction		20	µg/L	<20				
C10 - C14 Fraction		50	µg/L	<50				
C15 - C28 Fraction		100	µg/L	<100				
C29 - C36 Fraction		50	µg/L	<50				
^ C10 - C36 Fraction (sum)		50	µg/L	<50				

EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions

C6 - C10 Fraction	C6_C10	20	µg/L	<20				
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20				
>C10 - C16 Fraction		100	µg/L	<100				
>C16 - C34 Fraction		100	µg/L	<100				
>C34 - C40 Fraction		100	µg/L	<100				
^ >C10 - C40 Fraction (sum)		100	µg/L	<100				
^ >C10 - C16 Fraction minus Naphthalene (F2)		100	µg/L	<100				

EP080: BTEXN

Benzene	71-43-2	1	µg/L	<1				
Toluene	108-88-3	2	µg/L	<2				
Ethylbenzene	100-41-4	2	µg/L	<2				
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2				
ortho-Xylene	95-47-6	2	µg/L	<2				
^ Total Xylenes		2	µg/L	<2				
^ Sum of BTEX		1	µg/L	<1				
Naphthalene	91-20-3	5	µg/L	<5				



Analytical Results

Sub-Matrix: **GROUNDWATER**
 (Matrix: **WATER**)

Client sample ID

MW07_200908

Client sampling date / time

08-Sep-2020 13:56

Compound

CAS Number

LOR

Unit

ES2031630-007

Result

EP080S: TPH(V)/BTEX Surrogates

1,2-Dichloroethane-D4	17060-07-0	2	%	96.2	----	----	----	----
Toluene-D8	2037-26-5	2	%	103	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	96.0	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				QC305_200908	----	----	----	----
				rinsate off glove				
Client sampling date / time				08-Sep-2020 12:46	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2031630-008	-----	-----	-----	-----
Result					----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				QC305_200908	----	----	----	----
				rinsate off glove				
Client sampling date / time				08-Sep-2020 12:46	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2031630-008	-----	-----	-----	-----
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	96.6	----	----	----	----
Toluene-D8	2037-26-5	2	%	104	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	98.1	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: ES2031630	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: KALEB THOMAS	Contact	: Angus Harding
Address	: LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 08-Sep-2020
Order number	: -	Date Analysis Commenced	: 11-Sep-2020
C-O-C number	: 13806	Issue Date	: 15-Sep-2020
Sampler	: KALEB THOMAS, Zoe Abbott		
Site	: Turf Club		
Quote number	: SY/010/20		
No. of samples received	: 9		
No. of samples analysed	: 8		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3250804)									
ES2031630-001	MW03_200908	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.039	0.040	0.00	No Limit
ES2031765-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3250805)									
ES2031630-004	MW06_200908	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2031765-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3252433)									
ES2031630-001	MW03_200908	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3252433)									
ES2031630-001	MW03_200908	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3252433)									
ES2031630-001	MW03_200908	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit



Sub-Matrix: WATER				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: 3252433) - continued									
ES2031630-001	MW03_200908	EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3250804)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	93.7	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	91.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	90.2	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.3	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	89.2	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	92.4	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.8	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3250805)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	94.0	83.0	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3251215)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	74.1	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	99.0	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	94.6	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3252433)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	88.1	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3251215)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	77.5	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	104	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	66.8	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3252433)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	90.9	75.0	127
EP080: BTEXN (QCLot: 3252433)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	91.7	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	92.0	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	95.9	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	94.8	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	97.4	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	90.5	70.0	120

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: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3250804)							
ES2031630-003	MW05_200908	EG020A-F: Arsenic	7440-38-2	1 mg/L	91.1	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	91.4	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	89.3	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	90.2	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	91.4	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	90.8	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	92.1	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3250805)							
ES2031630-002	MW04_200908	EG035F: Mercury	7439-97-6	0.01 mg/L	94.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3252433)							
ES2031630-001	MW03_200908	EP080: C6 - C9 Fraction	----	325 µg/L	93.5	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3252433)							
ES2031630-001	MW03_200908	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	91.8	70.0	130
EP080: BTEXN (QCLot: 3252433)							
ES2031630-001	MW03_200908	EP080: Benzene	71-43-2	25 µg/L	91.0	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	87.2	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	89.3	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	88.9	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	90.4	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	98.6	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order : **ES2031630**

Page : 1 of 5

Client : **GHD PTY LTD**
Contact : **KALEB THOMAS**
Project : **Darwin Turf Club EPL Monitoring**
Site : **Turf Club**
Sampler : **KALEB THOMAS, Zoe Abbott**
Order number : **-**

Laboratory : **Environmental Division Sydney**
Telephone : **+61 2 8784 8555**
Date Samples Received : **08-Sep-2020**
Issue Date : **15-Sep-2020**
No. of samples received : **9**
No. of samples analysed : **8**

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	9	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	9	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW03_200908, MW05_200908, QC105_200908, QC305_200908 - rinsate off glove MW04_200908, MW06_200908, MW07_200908	08-Sep-2020	----	----	----	11-Sep-2020	07-Mar-2021	✔
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW03_200908, MW05_200908, QC105_200908, QC305_200908 - rinsate off glove MW04_200908, MW06_200908, MW07_200908	08-Sep-2020	----	----	----	11-Sep-2020	06-Oct-2020	✔
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) MW03_200908, MW05_200908, QC105_200908, QC305_200908 - rinsate off glove MW04_200908, MW06_200908, MW07_200908	08-Sep-2020	11-Sep-2020	15-Sep-2020	✔	14-Sep-2020	21-Oct-2020	✔
Amber VOC Vial - Sulfuric Acid (EP080) MW03_200908, MW05_200908, QC105_200908, QC305_200908 - rinsate off glove MW04_200908, MW06_200908, MW07_200908	08-Sep-2020	14-Sep-2020	22-Sep-2020	✔	14-Sep-2020	22-Sep-2020	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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)							
Dissolved Mercury by FIMS	EG035F	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	9	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	9	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

CHAIN OF CUSTODY QC#: 13806 ALS Laboratory: ES Sydney		RELINQUISHED BY: DATE TIME:	RECEIVED BY: <i>5084/160</i> DATE TIME: <i>10/9/20 1845</i>	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: GHD SER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Turf Club ORDER NO: PROJECT MANAGER: Kaleb Thomas PRIMARY SAMPLER: Kaleb Thomas EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		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: <i>8.2</i> °C Other comments:	
		CONTACT PH: QUOTE NO: SY/010/20		SAMPLER MOBILE: / ES2020GHD SER0002	

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW03_200908		08/09/2020 11:33 AM	Water	ALS: 4 Non ALS: 1	No		X		
002	MW04_200908		08/09/2020 12:04 PM	Water	ALS: 4 Non ALS: 1	No		X		
003	MW05_200908		08/09/2020 12:51 PM	Water	ALS: 4 Non ALS: 1	No		X		
004	MW06_200908		08/09/2020 01:31 PM	Water	ALS: 4 Non ALS: 1	No		X		
005	QC105_200908		08/09/2020 02:28 PM	Water	ALS: 4 Non ALS: 1	No		X		
006	QC205_200908	please forward to Eurofins for analysis - same suite as QC105	08/09/2020 02:29 PM	Water	ALS: 4 Non ALS: 1	No		X		
007	MW07_200908		08/09/2020 02:26 PM	Water	ALS: 4 Non ALS: 1	No		X		
008	QC305_200908	rinsate off glove	08/09/2020 01:16 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	QC505	trip blank	08/09/2020 02:57 PM	Water	ALS: 1 Non ALS: 0	No				

Environmental Division
Sydney
Work Order Reference
ES2031630



Telephone : +61-2-8784 8555

Subcon / Forward Lab / Split WO
 Lab / Analysis: *Eurofins*
 Organised By / Date: *OCBS*
 Relinquished By / Date: *ES2031630*
 Connote / Courier:
 WO No: *ES2031630*
 Attach By PO / Internal Sheet:

11/9
#743806

#AU04_Enviro_Sample_NSW

To: Harry Bacalis
Subject: RE: Eurofins Sample Receipt Advice - Report 743806 : Site DARWIN TURF CLUB EPL MONITORING

From: Kaleb Thomas <Kaleb.Thomas@ghd.com>
Sent: Monday, 21 September 2020 9:07 AM
To: Harry Bacalis <HarryBacalis@eurofins.com>
Cc: Tim Murphy <Tim.Murphy@ghd.com>
Subject: RE: Eurofins Sample Receipt Advice - Report 743806 : Site DARWIN TURF CLUB EPL MONITORING

EXTERNAL EMAIL*

Hey Harry,

Would I be able to get that sample analysed for ALS code W-05 (TRH/BTEXN/8 metals (filtered))?

Thanks!

Kaleb Thomas
Graduate Environmental Scientist

T: +61 8 8982 0166 | M: +61 487 462 472 | V: 430166 | E: kaleb.thomas@ghd.com
Level 7, 24 Mitchell Street, Darwin NT 0800 Australia | <http://www.ghd.com/>

From: HarryBacalis@eurofins.com <HarryBacalis@eurofins.com>
Sent: Friday, 18 September 2020 4:38 PM
To: Kaleb Thomas <Kaleb.Thomas@ghd.com>
Subject: Eurofins Sample Receipt Advice - Report 743806 : Site DARWIN TURF CLUB EPL MONITORING

Hi Kaleb

Are you able to specify what is meant by Groundwater suite in the following COC? Let me know if you need anything else.

Kind regards,

Harry Bacalis
Analytical Services Manager Supervisor (VIC/SA/NT)

Eurofins | Environment Testing
6 Monterey Road
DANDENONG SOUTH VIC 3175
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Email : HarryBacalis@eurofins.com
Website : www.eurofins.com.au/environmental-testing

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Site # 1254 & 14271

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Brisbane

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IANZ # 1327

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

Sample Receipt Advice

Company name: GHD Pty Ltd NT
Contact name: Kaleb Thomas
Project name: DARWIN TURF CLUB EPL MONITORING
Project ID: Not provided
Turnaround time: 1 Day
Date/Time received: Sep 21, 2020 9:07 AM
Eurofins reference: 743806

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Kaleb Thomas - kaleb.thomas@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

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ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 743806
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 21, 2020 9:07 AM
Due: Sep 22, 2020
Priority: 1 Day
Contact Name: Kaleb Thomas

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Metals M8 filtered	Eurofins Suite B1
						X	X
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
Newcastle Laboratory							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	QC205_200908	Sep 08, 2020	2:29PM	Water	S20-Se22622	X	X
Test Counts						1	1

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Kaleb Thomas**

Report **743806-W**
Project name **DARWIN TURF CLUB EPL MONITORING**
Received Date **Sep 21, 2020**

Client Sample ID			QC205_200908
Sample Matrix			Water
Eurofins Sample No.			S20-Se22622
Date Sampled			Sep 08, 2020
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	89
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	0.004
Lead (filtered)	0.001	mg/L	0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	0.006
Zinc (filtered)	0.005	mg/L	0.010

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Sep 22, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Sep 21, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Sep 21, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Sep 22, 2020	
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8 filtered	Sydney	Sep 21, 2020	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
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Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 743806
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Received: Sep 21, 2020 9:07 AM
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Priority: 1 Day
Contact Name: Kaleb Thomas

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Metals M8 filtered	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
Newcastle Laboratory							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	QC205_200908	Sep 08, 2020	2:29PM	Water	S20-Se22622	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	90			70-130	Pass	
TRH C10-C14	%	71			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	77			70-130	Pass	
Toluene	%	83			70-130	Pass	
Ethylbenzene	%	82			70-130	Pass	
m&p-Xylenes	%	83			70-130	Pass	
o-Xylene	%	83			70-130	Pass	
Xylenes - Total*	%	83			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	90			70-130	Pass	
TRH C6-C10	%	76			70-130	Pass	
TRH >C10-C16	%	73			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	95			80-120	Pass	
Cadmium (filtered)	%	92			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)			%	95			80-120	Pass	
Copper (filtered)			%	93			80-120	Pass	
Lead (filtered)			%	95			80-120	Pass	
Mercury (filtered)			%	101			80-120	Pass	
Nickel (filtered)			%	93			80-120	Pass	
Zinc (filtered)			%	87			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S20-Se22024	NCP	%	77			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S20-Se17668	NCP	%	84			70-130	Pass	
Toluene	S20-Se17668	NCP	%	82			70-130	Pass	
Ethylbenzene	S20-Se17668	NCP	%	81			70-130	Pass	
m&p-Xylenes	S20-Se17668	NCP	%	71			70-130	Pass	
o-Xylene	S20-Se17668	NCP	%	90			70-130	Pass	
Xylenes - Total*	S20-Se17668	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S20-Se17668	NCP	%	86			70-130	Pass	
TRH C6-C10	S20-Se22024	NCP	%	79			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S20-Se27558	NCP	%	107			75-125	Pass	
Cadmium (filtered)	S20-Se27558	NCP	%	89			75-125	Pass	
Chromium (filtered)	S20-Se27558	NCP	%	87			75-125	Pass	
Copper (filtered)	S20-Se27558	NCP	%	83			75-125	Pass	
Lead (filtered)	S20-Se27558	NCP	%	87			75-125	Pass	
Mercury (filtered)	S20-Se27558	NCP	%	113			75-125	Pass	
Nickel (filtered)	S20-Se27558	NCP	%	81			75-125	Pass	
Zinc (filtered)	S20-Se27558	NCP	%	83			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S20-Se17616	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S20-Se17616	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S20-Se17616	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S20-Se17616	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S20-Se17616	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S20-Se17616	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S20-Se17616	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S20-Se17616	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S20-Se17616	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	

Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic (filtered)	S20-Se22622	CP	mg/L	< 0.001	0.001	14	30%	Pass
Cadmium (filtered)	S20-Se22622	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass
Chromium (filtered)	S20-Se22622	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Copper (filtered)	S20-Se22622	CP	mg/L	0.004	0.004	3.0	30%	Pass
Lead (filtered)	S20-Se22622	CP	mg/L	0.001	0.001	10	30%	Pass
Mercury (filtered)	S20-Se22622	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Nickel (filtered)	S20-Se22622	CP	mg/L	0.006	0.007	8.0	30%	Pass
Zinc (filtered)	S20-Se22622	CP	mg/L	0.010	0.011	12	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Harry Bacalis	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)



Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

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VOLUME AIR MEASUREMENT CHAIN OF CUSTODY RECORD

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03 8564 5000 EnviroSampleVic@eurofins.com

Eurofins | Environment Testing ABN 50 005 521

Company			GHD			Project No			12526136			Project Manager			Tim Murphy			CoC Submitted (date & sign)																																																																																																																																																																																																																																																																																																																																																																																																										
Address			LEVEL 7, 24 MITCHELL STREET. DARWIN, NT 0800			Project Name			Darwin Turf Club - EPL Monitoring			Eurofins Quote Number						Primary Email for Results			carlosenrique.sylanteng@ghd.com																																																																																																																																																																																																																																																																																																																																																																																																							
Contact Number			+61 477 525 121			Analyses (Note: SUITE code must be used to avoid SUITE pricing) BTEX			VOLUME AIR MEASUREMENT RECORD										Secondary Email for Results			tim.murphy@ghd.com																																																																																																																																																																																																																																																																																																																																																																																																						
Sampler Name			CARLOS E SYLIANTENG						<table><thead><tr><th rowspan="2">Start Time (HH:mm)</th><th rowspan="2">End Time (HH:mm)</th><th rowspan="2">Initial Flow Rate (L/min)</th><th rowspan="2">Check Flow Rate (L/min)</th><th rowspan="2">Final Flow Rate (L/min)</th><th rowspan="2">ΔFlow Rates $\leq 10\%$ (y/n)</th><th colspan="5">Containers</th><th colspan="2">Turnaround Time (TAT) (Default will be 5 days if not ticked)</th><th rowspan="2">Sample Location (or Barcode) / Comments / Media</th></tr><tr><th>Fibre Count Cowl (25mm, MFPM)</th><th>Carbon Tube</th><th>Dust Cassette</th><th>Respirable Membrane</th><th>Inhalable Membrane</th><th>HiVol Filter</th><th>DPM Membrane</th><th>Other (please specify in sample notes)</th><th>☐ Same Day / ASAP Report*</th><th>☐ 1 Day* ☐ 2 Day* ☐ 3 Day* ☒ 5 Day * Surcharges apply</th></tr></thead><tbody><tr><td>1</td><td>AQM01</td><td>15/9/20</td><td>6L0003</td><td>X</td><td></td><td></td><td></td><td>6:43</td><td>15:38</td><td>7 mL/min</td><td>7 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Eurofins | Environment Testing Australia Pty Ltd

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

Australia
Melbourne

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

Sydney

Unit F3, Building F
16 Mars Road
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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

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NATA # 1261 Site # 20794

Perth

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NATA # 1261
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Newcastle

4/52 Industrial Drive
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PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand
Auckland

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

Christchurch

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

Sample Receipt Advice

Company name: GHD Pty Ltd NT
Contact name: Tim Murphy
Project name: DARWIN TURF CLUB-EPL MONITORING
Project ID: 12526136
Turnaround time: 5 Day
Date/Time received: Sep 15, 2020 3:52 PM
Eurofins reference: 744237

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✗ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Tim Murphy - Tim.Murphy@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

Australia

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

Sydney
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IANZ # 1327

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

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: DARWIN TURF CLUB-EPL MONITORING
Project ID: 12526136

Order No.:
Report #: 744237
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 15, 2020 3:52 PM
Due: Sep 22, 2020
Priority: 5 Day
Contact Name: Tim Murphy

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Dilution Factor	Final Pressure (psi)	Receipt Vac./Pressure (in Hg)	BTEXN (T015)
Melbourne Laboratory - NATA Site # 1254 & 14271									
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
Newcastle Laboratory									
External Laboratory									
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID				
1	AQM01	Sep 15, 2020		6L Summa Canister	M20-Se25913	x	x	x	x
2	AQM02	Sep 15, 2020		6L Summa Canister	M20-Se25914	x	x	x	x
3	AQM03	Sep 15, 2020		6L Summa Canister	M20-Se25915	x	x	x	x
Test Counts						3	3	3	3

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Attention: **Tim Murphy**

Report **744237-TO**
Project name **DARWIN TURF CLUB-EPL MONITORING**
Project ID **12526136**
Received Date **Sep 15, 2020**

Client Sample ID			AQM01	AQM02	AQM03
Sample Matrix			6L Summa Canister	6L Summa Canister	6L Summa Canister
Eurofins Sample No.			M20-Se25913	M20-Se25914	M20-Se25915
Date Sampled			Sep 15, 2020	Sep 15, 2020	Sep 15, 2020
Receipt Vac./Pressure (inHg)			12	5.0	13
Final Pressure (psi)			5.0	5.0	5.0
Test/Reference	LOR	Unit			
Dilution Factor	0.1		2.2	1.6	2.4
BTEXN (TO15)					
Benzene	1.6	ug/m3	< 3	< 3	< 4
Ethylbenzene	2.2	ug/m3	< 5	< 3	< 5
m.p-Xylene	4.4	ug/m3	< 9	< 7	< 10
o-Xylene	2.2	ug/m3	< 5	< 3	< 5
Toluene	7.5	ug/m3	< 7.5	< 7.5	29
Naphthalene	10.5	ug/m3	< 23	< 17	< 25
4-Bromofluorobenzene (surr.)	1	%	94	90	96

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description

BTEXN (TO15)

Testing Site

BrisbaneAir

Extracted

Sep 17, 2020

Holding Time

30 Days

- Method: SOP #6 Analysis of Volatile Organic Compounds in Summa Polished Canisters EPA Method TO-15 And Modified EPA Method TO-14A

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ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

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Contact Name: Tim Murphy

Project Name: DARWIN TURF CLUB-EPL MONITORING
Project ID: 12526136

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Dilution Factor	Final Pressure (psi)	Receipt Vac./Pressure (in Hg)	BTEXN (TOL5)
Melbourne Laboratory - NATA Site # 1254 & 14271									
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
Newcastle Laboratory									
External Laboratory									
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID				
1	AQM01	Sep 15, 2020		6L Summa Canister	M20-Se25913	X	X	X	X
2	AQM02	Sep 15, 2020		6L Summa Canister	M20-Se25914	X	X	X	X
3	AQM03	Sep 15, 2020		6L Summa Canister	M20-Se25915	X	X	X	X
Test Counts						3	3	3	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. Dilutions are performed on samples due to the presence of high level target species or the presence of high level non-target species.
3. Results are uncorrected for surrogate recoveries.
4. All QC limit exceedances and affected sample results are noted by flags. Each qualifying flag is defined below in section entitled 'Definition of Data Qualifying Flags' and additionally on individual sample results (where relevant).
5. "100% certification" is defined as evaluating the sampling system with humid zero air/N₂ and humid calibration gases that pass through all active components of the sampling system. The system is "100% certified" if no significant additions or deletions (less than 0.2 ppbv each of target compounds) have occurred when challenged with the test gas stream.
6. The conversion equation from ppbv to g/m³ uses a temperature of 25 °C and an ambient sea level atmospheric pressure of 1 atmosphere (101.325 kPa) is assumed.
7. All canister samples are only analysed once temperature equilibrium with the laboratory has been achieved.
8. Safe Sampling Volume (SSV) - calculated by taking two-thirds of the breakthrough volume (direct method) and Appendix 1 of Method T0-17.
9. Samples were analysed on an 'as received' basis.
10. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
11. This report replaces any interim results previously issued.

Definition of Data Qualifying Flags

Qualifiers may have been used on the data analysis sheets and indicates as follows:

- A01 Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
- A02 Estimated value.
- A03 Exceeds instrument calibration range.
- A04 Saturated peak.
- A05 Exceeds quality control limits.
- A06 Compound analysed for but not detected above the Limit of Reporting (LOR). See data page for project specific U-flag definition.
- A07 Non-detected compound associated with low bias in the CCV.
- A08 The identification is based on presumptive evidence.
- A09 SSV has been exceeded for this compound. It is likely that this compound has been underestimated.
- A10 LORs cited do not take into account sample dilution due to canister pressurisation.
- A11 Naphthalene elutes outside the >C10-C12 range on the system used for sample analysis. As a result, >C10-C12 TRH value is equivalent to the modified F2 value.

Holding Times

Under conditions of normal usage for sampling ambient air, most Volatile Organic Compounds (VOCs) can be recovered from canisters near their original concentrations after storage times of up to thirty days. For thermal desorption tubes (TDT) samples should be refrigerated at <4°C in a clean environment during storage and analysed within 30 days of sample collection (within one week for limonene, carene, bis-chloromethyl ether and labile sulfur or nitrogen containing volatiles).

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

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

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

Units

ppbv: parts per billion by volume

kPa: kilopascal

ug/m³: micrograms per cubic metre

psig: pounds per square inch gauge

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
BTEXN (TO15)							
Benzene	ug/m3	< 1.6			1.6	Pass	
Ethylbenzene	ug/m3	< 2.2			2.2	Pass	
m,p-Xylene	ug/m3	< 4.4			4.4	Pass	
o-Xylene	ug/m3	< 2.2			2.2	Pass	
Toluene	ug/m3	< 7.5			7.5	Pass	
Naphthalene	ug/m3	< 10.5			10.5	Pass	
LCS - % Recovery							
BTEXN (TO15)							
Benzene	%	95			70-130	Pass	
Ethylbenzene	%	89			70-130	Pass	
m,p-Xylene	%	97			70-130	Pass	
o-Xylene	%	95			70-130	Pass	
Toluene	%	95			70-130	Pass	
Naphthalene	%	78			70-130	Pass	

Comments
Sample Integrity

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

Authorised By

Harry Bacalis	Analytical Services Manager
Laurence Hearn	Senior Analyst-Air (QLD)



Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.



CHAIN OF CUSTODY

ALS COC#: 14031 ALS Laboratory: ES Sydney

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: Darwin Turf Club EPL Monitoring

SITE: Turf Club-1

ORDER NO:

PROJECT MANAGER: Kaleb Thomas

PRIMARY SAMPLER: Kaleb Thomas

EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com

EMAIL INVOICES TO: tim.murphy@ghd.com

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Free ice / frozen ice bricks present upon receipt?

Random Sample Temperature on Receipt:

Other comments:

Yes No N/A

Yes No N/A

15.3°C

CONTACT PH:

QUOTE NO: SY/010/20

SAMPLER MOBILE:

/ ES2020GHDSER0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW03_200916		16/09/2020 10:59 AM	Water	ALS: 4 Non ALS: 1	No		X		
002	MW04_200916		16/09/2020 11:48 AM	Water	ALS: 4 Non ALS: 1	No		X		
003	MW05_200916		16/09/2020 12:22 PM	Water	ALS: 4 Non ALS: 1	No		X		
004	MW06_200916		16/09/2020 01:05 PM	Water	ALS: 4 Non ALS: 1	No		X		
005	MW07_200916		16/09/2020 01:54 PM	Water	ALS: 4 Non ALS: 1	No		X		
006	QC306_200916		16/09/2020 09:22 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	QC506		16/09/2020 09:23 AM	Water	ALS: 1 Non ALS: 0	No				
008	QC106_200916		16/09/2020 10:57 AM	Water	ALS: 4 Non ALS: 1	No		X		
009	QC206_200916	please forward to Eurofins for analysis of same suites	16/09/2020 10:58 AM	Water	ALS: 4 Non ALS: 1	No		X		

Subcon / Forward Lab / Split WO

Lab / Analysis: Eurofins

Organised By / Date: QC 206

Relinquished By / Date:

Connote / Courier:

WO No: ES2032768

Attach By PO / Internal Sheet:

Environmental Division
Sydney

Work Order Reference

ES2032768



Telephone : + 61-2-6784 6555

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2032768

Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: KALEB THOMAS	Contact	: Angus Harding
Address	: LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kaleb.thomas@ghd.com	E-mail	: Angus.Harding@ALSGlobal.com
Telephone	: ----	Telephone	: +61 2 8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Darwin Turf Club EPL Monitoring	Page	: 1 of 3
Order number	: -	Quote number	: ES2020GHDSE0002 (SY/010/20)
C-O-C number	: 14031	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Turf Club-1		
Sampler	: KALEB THOMAS, Zoe Abbott		

Dates

Date Samples Received	: 17-Sep-2020 12:30	Issue Date	: 17-Sep-2020
Client Requested Due Date	: 24-Sep-2020	Scheduled Reporting Date	: 24-Sep-2020

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 15.3' C SYD
Receipt Detail	:	No. of samples received / analysed	: 8 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample QC206_200916 forwarded to Eurofins as per COC.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

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

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) WATER No analysis requested	WATER - W-05 TRH/BTEXN/8 Metals
ES2032768-001	16-Sep-2020 10:59	MW03_200916		✓
ES2032768-002	16-Sep-2020 11:48	MW04_200916		✓
ES2032768-003	16-Sep-2020 12:22	MW05_200916		✓
ES2032768-004	16-Sep-2020 13:05	MW06_200916		✓
ES2032768-005	16-Sep-2020 13:54	MW07_200916		✓
ES2032768-006	16-Sep-2020 09:22	QC306_200916		✓
ES2032768-007	16-Sep-2020 09:23	QC506	✓	
ES2032768-008	16-Sep-2020 10:57	QC106_200916		✓

Proactive Holding Time Report

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



Requested Deliverables

Accounts Payable Australia

- A4 - AU Tax Invoice (INV)

Email accountspayableAU@ghd.com

GHD LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN ESDAT)

[illegible]

KALEB THOMAS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN ESDAT)

[illegible]

TIM MURPHY

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN ESDAT)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order	: ES2032768	Page	: 1 of 7
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: KALEB THOMAS	Contact	: Angus Harding
Address	: LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 17-Sep-2020 12:30
Order number	: -	Date Analysis Commenced	: 21-Sep-2020
C-O-C number	: 14031	Issue Date	: 23-Sep-2020 17:21
Sampler	: KALEB THOMAS, Zoe Abbott		
Site	: Turf Club-1		
Quote number	: SY/010/20		
No. of samples received	: 8		
No. of samples analysed	: 7		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				MW03_200916	MW04_200916	MW05_200916	MW06_200916	MW07_200916
Client sampling date / time				16-Sep-2020 10:59	16-Sep-2020 11:48	16-Sep-2020 12:22	16-Sep-2020 13:05	16-Sep-2020 13:54
Compound	CAS Number	LOR	Unit	ES2032768-001	ES2032768-002	ES2032768-003	ES2032768-004	ES2032768-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.003	<0.001	<0.001	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0015	<0.0001	<0.0001	0.0004
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.012	0.018	0.007	0.007	0.007
Nickel	7440-02-0	0.001	mg/L	0.005	0.142	0.004	0.004	0.010
Lead	7439-92-1	0.001	mg/L	<0.001	0.003	<0.001	<0.001	0.011
Zinc	7440-66-6	0.005	mg/L	0.038	0.571	0.026	0.028	0.031
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				MW03_200916	MW04_200916	MW05_200916	MW06_200916	MW07_200916
Client sampling date / time				16-Sep-2020 10:59	16-Sep-2020 11:48	16-Sep-2020 12:22	16-Sep-2020 13:05	16-Sep-2020 13:54
Compound	CAS Number	LOR	Unit	ES2032768-001	ES2032768-002	ES2032768-003	ES2032768-004	ES2032768-005
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	85.0	75.2	77.8	81.2	80.7
Toluene-D8	2037-26-5	2	%	119	94.1	101	104	104
4-Bromofluorobenzene	460-00-4	2	%	115	100	103	105	108



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				QC306_200916	QC106_200916	----	----	----
Client sampling date / time				16-Sep-2020 09:22	16-Sep-2020 10:57	----	----	----
Compound	CAS Number	LOR	Unit	ES2032768-006	ES2032768-008	-----	-----	-----
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	0.010	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	0.003	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	0.030	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----



Analytical Results

Sub-Matrix: **GROUNDWATER**
 (Matrix: **WATER**)

Client sample ID

				QC306_200916	QC106_200916	----	----	----
Client sampling date / time				16-Sep-2020 09:22	16-Sep-2020 10:57	----	----	----
Compound	CAS Number	LOR	Unit	ES2032768-006	ES2032768-008	-----	-----	-----
				Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	83.2	76.9	----	----	----
Toluene-D8	2037-26-5	2	%	110	94.0	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	113	97.3	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: ES2032768	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: KALEB THOMAS	Contact	: Angus Harding
Address	: LEVEL 5 66 SMITH STREET DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 17-Sep-2020
Order number	: -	Date Analysis Commenced	: 21-Sep-2020
C-O-C number	: 14031	Issue Date	: 23-Sep-2020
Sampler	: KALEB THOMAS, Zoe Abbott		
Site	: Turf Club-1		
Quote number	: SY/010/20		
No. of samples received	: 8		
No. of samples analysed	: 7		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3266228)									
ES2032768-005	MW07_200916	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0004	0.0004	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.011	0.011	0.00	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.010	0.010	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.031	0.035	10.3	No Limit
ES2032746-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3266227)									
ES2032747-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2032768-006	QC306_200916	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3264846)									
ES2032666-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2032768-001	MW03_200916	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3264846)									
ES2032666-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2032768-001	MW03_200916	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3264846)									

Page : 3 of 5
 Work Order : ES2032768
 Client : GHD PTY LTD
 Project : Darwin Turf Club EPL Monitoring



Sub-Matrix: **WATER**

				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: 3264846) - continued									
ES2032666-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES2032768-001	MW03_200916	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3266228)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.0	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.5	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.5	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	92.0	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	88.6	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	91.1	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3266227)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	102	83.0	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3262471)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	76.8	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	80.8	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	86.0	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3264846)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	98.0	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3262471)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	73.8	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	87.8	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	69.6	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3264846)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	98.4	75.0	127
EP080: BTEXN (QCLot: 3264846)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	85.8	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	103	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	101	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	98.6	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	103	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	97.4	70.0	120

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: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3266228)							
ES2032746-005	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	91.2	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	94.0	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	89.2	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	94.9	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	82.8	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	89.8	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	91.7	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3266227)							
ES2032745-013	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	83.8	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3264846)							
ES2032666-002	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	108	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3264846)							
ES2032666-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	104	70.0	130
EP080: BTEXN (QCLot: 3264846)							
ES2032666-002	Anonymous	EP080: Benzene	71-43-2	25 µg/L	80.8	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	103	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	103	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	100	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	106	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	84.8	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2032768	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: KALEB THOMAS	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 17-Sep-2020
Site	: Turf Club-1	Issue Date	: 23-Sep-2020
Sampler	: KALEB THOMAS, Zoe Abbott	No. of samples received	: 8
Order number	: -	No. of samples analysed	: 7

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	18	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	----	----	----	21-Sep-2020	15-Mar-2021	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	----	----	----	22-Sep-2020	14-Oct-2020	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	21-Sep-2020	23-Sep-2020	✓	22-Sep-2020	31-Oct-2020	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	22-Sep-2020	30-Sep-2020	✓	22-Sep-2020	30-Sep-2020	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	21-Sep-2020	23-Sep-2020	✔	22-Sep-2020	31-Oct-2020	✔
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	22-Sep-2020	30-Sep-2020	✔	22-Sep-2020	30-Sep-2020	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03_200916, MW05_200916, MW07_200916, QC106_200916	MW04_200916, MW06_200916, QC306_200916,	16-Sep-2020	22-Sep-2020	30-Sep-2020	✔	22-Sep-2020	30-Sep-2020	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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)							
Dissolved Mercury by FIMS	EG035F	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	13	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.



CHAIN OF CUSTODY

ALS COC#: 14031 ALS Laboratory: ES Sydney

CLIENT: GHDSER - GHD PTY LTD
PROJECT: Darwin Turf Club EPL Monitoring

SITE: Turf Club-1

ORDER NO:

PROJECT MANAGER: Kaleb Thomas
PRIMARY SAMPLER: Kaleb Thomas

CONTACT PH:
QUOTE NO: SY/010/20

SAMPLER MOBILE:
/ ES2020GHDSER0002

EMAIL REPORTS TO: tim.murphy@ghd.com; ghdlabreports@ghd.com

EMAIL INVOICES TO: tim.murphy@ghd.com

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

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:

Other comments:

15.3°C

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW03_200916		16/09/2020 10:59 AM	Water	ALS: 4 Non ALS: 1	No		X		
002	MW04_200916		16/09/2020 11:48 AM	Water	ALS: 4 Non ALS: 1	No		X		
003	MW05_200916		16/09/2020 12:22 PM	Water	ALS: 4 Non ALS: 1	No		X		
004	MW06_200916		16/09/2020 01:05 PM	Water	ALS: 4 Non ALS: 1	No		X		
005	MW07_200916		16/09/2020 01:54 PM	Water	ALS: 4 Non ALS: 1	No		X		
006	QC306_200916		16/09/2020 09:22 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	QC506		16/09/2020 09:23 AM	Water	ALS: 1 Non ALS: 0	No				
008	QC106_200916		16/09/2020 10:57 AM	Water	ALS: 4 Non ALS: 1	No		X		
009	QC206_200916	please forward to Eurofins for analysis of same suites	16/09/2020 10:58 AM	Water	ALS: 4 Non ALS: 1	No		X		

Subcon / Forward Lab / Split WO

Lab / Analysis: Eurofins

Organised By / Date: 09/26

Relinquished By / Date:

Connote / Courier:

WO No: ES2032768

Attach By PO / Internal Sheet:

Environmental Division
Sydney

Work Order Reference
ES2032768



Telephone : + 61-2-8784 8555

18/9

#745302 26

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New Zealand
Auckland

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

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

Sample Receipt Advice

Company name: GHD Pty Ltd NT
Contact name: Kaleb Thomas
Project name: DARWIN TURF CLUB EPL MONITORING
Project ID: Not provided
Turnaround time: 5 Day
Date/Time received: Sep 18, 2020 5:29 PM
Eurofins reference: 745302

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Sample placed on hold, please advise analysis.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Kaleb Thomas - kaleb.thomas@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

Australia

Melbourne

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Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney

Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

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

Perth

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

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland

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

Christchurch

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

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 745302
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 18, 2020 5:29 PM
Due: Sep 25, 2020
Priority: 5 Day
Contact Name: Kaleb Thomas

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail

HOLD

Melbourne Laboratory - NATA Site # 1254 & 14271

Sydney Laboratory - NATA Site # 18217

Brisbane Laboratory - NATA Site # 20794

Perth Laboratory - NATA Site # 23736

Newcastle Laboratory

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	
1	QC206_200916	Sep 16, 2020	10:58AM	Water	S20-Se35067	X

Test Counts

1

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Kaleb Thomas**

Report **745302-W**
Project name **DARWIN TURF CLUB EPL MONITORING**
Received Date **Sep 23, 2020**

Client Sample ID			QC206_200916
Sample Matrix			Water
Eurofins Sample No.			S20-Se35067
Date Sampled			Sep 16, 2020
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	91
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	0.012
Lead (filtered)	0.001	mg/L	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	0.004
Zinc (filtered)	0.005	mg/L	0.033

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Sep 23, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Sep 23, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Sep 23, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Sep 23, 2020	
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8 filtered	Sydney	Sep 23, 2020	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
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Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 745302
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 23, 2020 2:23 PM
Due: Sep 30, 2020
Priority: 5 Day
Contact Name: Kaleb Thomas

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Metals M8 filtered	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
Mayfield Laboratory							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	QC206_200916	Sep 16, 2020	10:58AM	Water	S20-Se35067	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	102			70-130	Pass	
TRH C10-C14	%	101			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	102			70-130	Pass	
Toluene	%	99			70-130	Pass	
Ethylbenzene	%	101			70-130	Pass	
m&p-Xylenes	%	97			70-130	Pass	
o-Xylene	%	103			70-130	Pass	
Xylenes - Total*	%	99			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	106			70-130	Pass	
TRH C6-C10	%	107			70-130	Pass	
TRH >C10-C16	%	93			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	88			80-120	Pass	
Cadmium (filtered)	%	88			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)			%	91			80-120	Pass	
Copper (filtered)			%	92			80-120	Pass	
Lead (filtered)			%	92			80-120	Pass	
Mercury (filtered)			%	97			80-120	Pass	
Nickel (filtered)			%	90			80-120	Pass	
Zinc (filtered)			%	89			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S20-Se35075	NCP	%	101			70-130	Pass	
TRH C10-C14	S20-Se38310	NCP	%	78			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S20-Se35075	NCP	%	97			70-130	Pass	
Toluene	S20-Se35075	NCP	%	99			70-130	Pass	
Ethylbenzene	S20-Se35075	NCP	%	98			70-130	Pass	
m&p-Xylenes	S20-Se35075	NCP	%	92			70-130	Pass	
o-Xylene	S20-Se35075	NCP	%	94			70-130	Pass	
Xylenes - Total*	S20-Se35075	NCP	%	93			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S20-Se35075	NCP	%	100			70-130	Pass	
TRH C6-C10	S20-Se35075	NCP	%	106			70-130	Pass	
TRH >C10-C16	S20-Se38310	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S20-Se36680	NCP	%	99			75-125	Pass	
Cadmium (filtered)	S20-Se36680	NCP	%	94			75-125	Pass	
Chromium (filtered)	S20-Se36680	NCP	%	90			75-125	Pass	
Copper (filtered)	S20-Se36680	NCP	%	88			75-125	Pass	
Lead (filtered)	S20-Se36680	NCP	%	92			75-125	Pass	
Mercury (filtered)	S20-Se36680	NCP	%	95			75-125	Pass	
Nickel (filtered)	S20-Se36680	NCP	%	87			75-125	Pass	
Zinc (filtered)	S20-Se36680	NCP	%	88			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S20-Se35079	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S20-Se38320	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S20-Se38320	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S20-Se38320	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S20-Se35079	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S20-Se35079	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S20-Se35079	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S20-Se35079	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S20-Se35079	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S20-Se35079	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	

Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S20-Se35079	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass
TRH C6-C10	S20-Se35079	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass
TRH >C10-C16	S20-Se38320	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass
TRH >C16-C34	S20-Se38320	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass
TRH >C34-C40	S20-Se38320	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic (filtered)	S20-Se36643	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Cadmium (filtered)	S20-Se36643	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass
Chromium (filtered)	S20-Se36643	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Copper (filtered)	S20-Se36643	NCP	mg/L	0.002	0.002	1.0	30%	Pass
Lead (filtered)	S20-Se36643	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Mercury (filtered)	S20-Se36643	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Nickel (filtered)	S20-Se36643	NCP	mg/L	0.003	0.003	6.0	30%	Pass
Zinc (filtered)	S20-Se36643	NCP	mg/L	0.034	0.035	2.0	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Harry Bacalis	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)



Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Appendix D – Calibration Certificates

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	8.4V
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by:

Jamie Duggan

Calibration date:

31/08/2020

Next calibration due:

30/10/2020

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-111101



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 eV			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	1114296	100.0 ppm

Calibrated by:  Jamie Duggan

Calibration date: 31/08/2020

Next calibration due: 27/02/2021

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 20F1622172



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		329027	2.76mS
2. Temp		15			15.2
3. pH 4		pH 4.00		330734	pH 4.00
4. pH 7		pH 7.00		330737	pH 7.00
6. DO		0.0ppm		10465	0.0ppm
7. ORP		245mV		333082/329762	245 mV
8. Turbidity		0NTU		Dist. H2O	0.0NTU
9. Turbidity		100NTU		332244	100NTU
10. Turbidity		1000NTN		20A20030022	1000NTU

Calibrated by: _____ **Joseph Tomas**

Calibration date: 31/08/2020

Next calibration due: 30/09/2020

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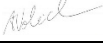
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Darwin Turf Club – EPL Monitoring

GME and Air Monitoring Report

Darwin Turf Club Inc

30 April 2021



➔ **The Power of Commitment**

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1. Introduction

1.1 Background information

GHD Pty Ltd (GHD) were engaged by Darwin Turf Club Inc to undertake the ongoing groundwater and air-toxics environmental monitoring at the Darwin Turf Club (hereinafter referred to as the Site). Environmental monitoring of groundwater and air-toxics is a requirement under the Site's Environment Protection Licence (Ref: EPL 218).

Darwin Turf Club Racecourse comprises approximately 47 hectares and is situated approximately 4 km north of the Darwin CBD.

The site is located off Dick Ward Drive, Fannie Bay. The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east, Playford Street and Wells Street to the south and west. Residential properties align Douglas Street, Playford Street and Wells Street.

1.2 Purpose of this report

This report documents the environmental monitoring activities carried out by GHD at the Darwin Turf Club in relation to the track conditioning activities undertaken in April 2021 in accordance with the Environmental Protection Licence (EPL) 218 requirements for the site.

1.3 Scope

In accordance with EPL 218 requirements, the following scope of works was undertaken by GHD:

- Two on site groundwater sampling events at all seven groundwater wells as specified in EPL 218, The events were one week apart. The second event occurred within 48 hours of the track conditioning activities.
- One on site air-toxics sampling event at the three locations as specified in EPL 218 during track conditioning activities.

The environmental monitoring works were carried out in general accordance with:

- Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC, January 1992)
- Australian and New Zealand Guidelines for Water Quality: Sampling, AS/NZS 5667.1, 1998
- National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM)
- National Environment Protection Council (NEPC) National Environment Protection (Air Toxics) Measure (NEPM), 1999, as amended in 2013 (ASC NEPM)

1.4 limitations

This report: has been prepared by GHD for Darwin Turf Club Inc. and may only be used and relied on by Darwin Turf Club Inc. for the purpose agreed between GHD and Darwin Turf Club Inc. as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Inc. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Darwin Turf Club Inc. and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Sampling and analytical programme

2.1 Groundwater sampling programmes

GHD performed two groundwater monitoring events (GME) to collect standing water level data and samples for laboratory analysis at the seven existing on site monitoring bores. These GMEs were undertaken on 20th April (GME 6) and 28th April (GME 7) 2021 in accordance with the EPL requirements.

The weather at the time of the fieldwork samplings were:

- GME 6 – sunny with a temperature of 33.4° C,
- GME 7 – sunny with a temperature of 32.9° C.

Rainfall was not recorded prior to the events.

Table 1 Groundwater sampling programme

Sample ID	Location (in relation to track)	Contaminants of particular concern (CoPC)	Context of sampling
MW01	North	TRH/BTEX/ 8 Metals*	Capture the quality of groundwater assumed to be exiting the site to the north.
MW02	North		
MW03	Northwest		
MW04	Northeast		
MW05	East		Capture the quality of groundwater to the east of the site.
MW06	South		Capture the quality of groundwater to the south of the site (assumed to be the background reference site).
MW07	West		Capture the quality of groundwater to the west of the site

*Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc

2.1.1 Groundwater trigger values

The EPL 218 trigger values for groundwater have been summarised in **Table 2**.

Table 2 EPL 218 Groundwater trigger values

Parameter	Units	Trigger Value
Field Parameter		
pH	pH units	6.0 – 8.0
Temperature	°C	N/A
Turbidity	NTU	2 - 15
Electrical conductivity	µS/cm	20 - 250
Dissolved Oxygen	% saturation	80-110
Laboratory Parameter		
Heavy metals		
Arsenic	mg/L	0.094
Cadmium	mg/L	0.0004
Chromium	mg/L	0.006
Copper	mg/L	0.0018

Parameter	Units	Trigger Value
Field Parameter		
Lead	mg/L	0.0056
Mercury	mg/L	0.0019
Nickel	mg/L	0.013
Zinc	mg/L	0.015
BTEX		
Benzene	mg/L	0.3
Toluene	mg/L	0.3
Ethylbenzene	mg/L	0.005
Xylenes	mg/L	0.075
Total Recoverable Hydrocarbons (TRH)		
Total TRH C10 – C36	mg/L	0.6

2.1.2 Groundwater sampling

After visual inspection of the condition of the individual bores, the well headspace was measured using a PID immediately upon the removal of the well cap (with the nominated trigger for additional investigation set at 50 ppm). Static water levels (SWL) of each of the seven bores were also measured with an interface probe prior to any sampling being conducted. The field data is provided in **Appendix A**.

Prior to sampling, all monitoring wells were purged, using a peristaltic pump and the low flow sampling technique, until the water quality reading stabilised (three consecutive readings within a set range e.g., difference in readings of 10%). The SWL was recorded at the same time as each water quality reading. Field water quality measurements were measured during purging operations using a calibrated YSI Pro DSS water quality meter with a flow cell. Physical parameters recorded include:

- pH
- Dissolved oxygen (DO)
- Electrical conductivity (EC)
- Temperature
- Turbidity

Post purging, samples were collected and placed in laboratory-supplied containers with appropriate preservatives required for each analyte. Samples for metals analysis were field-filtered to <0.45 µm using a disposable in-line filter before being placed into an appropriate preserved sample container.

The samples were cooled on ice during storage and transported under Chain of Custody (COC) documentation to ALS Environmental for laboratory analysis.

2.2 Air toxics sampling programme

2.2.1 Purpose of the air toxics sampling programme

The air-toxics sampling is part of a three-year reporting programme at the site to comply with EPL 218. Primarily, this programme involves a review of key air toxics measurements during the three years of operations of the site.

2.2.2 Sampling protocol

The programme consists of a single round of air sampling conducted at three locations. The samples were collected in canisters that were calibrated for an ultra-low-level 8 hour fill time.

The sampling was conducted using portable 6 L Summa evacuated canisters for sample capture, placed between 1.2 – 1.5 m above ground level.

Sample locations are AQM01, AQM02 and AQM03 along the south end of the racecourse, this sampling design aims to capture potential emissions of BTEX from the application of waste oil.

Subsequent analysis using gas chromatography - mass spectrometry (GC-MS) techniques. As consistent with the NEPM Air Toxics monitoring framework, the analysis is conducted using the USEPA TO-15 analytical methodology (USEPA, 1998) using a laboratory that is NATA accredited for the method.

Air sampling will be conducted twice a year over a three-year period to determine concentrations of BTEX at breathing height.

2.2.3 Analytes and air-toxics trigger values

Environmental monitoring of air-toxics is a requirement under the EPL 218 and is to be carried out during the application of waste oil to the racecourse. Oil is applied to the racecourse twice a year to maintain cohesiveness and reduce erosion to the track. Analytes tested will be Benzene, Toluene, o-Xylene and M & p Xylenes.

Trigger values specified in the EMP have been derived from the National Environment Protection (Air Toxics) Measure (NEPM).

The EMP trigger values for air-toxics are summarised in **Table 3**.

Table 3 EPL 218 Air-toxics trigger values

Parameter	Units	Trigger Value
BTEX		
Benzene	Ppb	3
Toluene	Ppb	1,000
o-Xylene	Ppb	250
M & p Xylenes	m ppb g/L	250

2.3 Quality control and assurance

2.3.1 Field quality control methods

All field works were conducted by experienced environmental scientists in accordance with GHD's Standard Field Operating Procedures.

Field quality control procedures used during collection and analysis of the groundwater samples comprised of the following.

Blind and split duplicates: A single sample is divided into three separate sampling containers. The parent sample and the blind sample are sent anonymously to the primary project laboratory with the split sample sent to the secondary laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity. Split duplicate samples provide an indication of the repeatability of the results between laboratories.

One set of field duplicate samples (Blind and Split) was collected and analysed as part of the analytical program.

The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD\% = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where C_o = Analyte concentration of the original sample
 C_d = Analyte concentration of the duplicate sample

GHD adopts nominal acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations.

2.4 Laboratory program

The nominated NATA accredited analytical laboratories (ALS Environmental and Eurofins MGT Laboratory) adopted their internal procedures and methods in accordance with their quality assurance systems.

2.4.1 Laboratory quality control

Laboratory quality control procedures used during the project were:

Laboratory duplicate samples: The analytical laboratory collects duplicate sub samples from one sample at a rate equivalent to one in twenty samples per analytical batch. Alternatively, if there are less than twenty samples, one duplicate sub sample is taken. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result.

Spiked Samples: An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory Control Sample: A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

Surrogate Standard/Spikes: These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time). The surrogate compounds are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Method Blank: This is an organic or aqueous solution that is as free as possible of analytes of interest. The same volume is added to all the reagents, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The laboratory is required to provide this information to GHD. The individual testing laboratories conduct an assessment of the laboratory QC program, internally however, the results will also be independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPDs within the NEPM acceptance criteria of 30%. Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery, although dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix; should normally range from about 70 – 130%. Method (laboratory) blanks should return analyte concentrations as 'below practical quantitation limit (PQL)'.

3. Groundwater sampling results

3.1 Physio-chemical field parameters

Field water quality measurements were measured during purging operations using a calibrated YSI Pro DSS water quality meter and flow cell.

Water quality measurements were unable to be collected for MW01 and MW02 as there was insufficient water volume present in the well.

While gauging the wells with an interface probe, no hydrocarbons were detected in any of the monitoring wells. Recorded water quality measurements for GME 6 and GME 7 are provided in **Table 4**.

Table 4 Groundwater physical characteristics

Well ID	Well depth (mbTOC)	SWL (mbTOC)	Physical parameters					Comments/ observations
			Temp (°C)	DO (%)	pH	EC (µS/cm)	Turbidity (NTU)	
GME 6								
MW01	0.777	Well Dry						
MW02	1.746	1.428	Insufficient water column to sample					
MW03	4.639	2.690	32.8	0.5	5.22	481.1	0.79	Clear, no odour, no sheen, low turbidity
MW04	6.030	2.148	33.5	26.8	5.63	7055	0.83	Cloudy, yellow in colour. turbid initially clearing after 0.5 L. low turbidity, no odour, no sheen.
MW05	5.471	3.921	32.3	51.8	4.89	230.5	1.96	Clear, no odour, no sheen, no turbidity.
MW06	6.593	4.405	31.6	7.4	4.90	355.0	1.87	Clear, no odour, no sheen, high turbidity initially, cleared after 200mL no turbidity.
MW07	6.039	2.948	30.3	20.5	4.46	281.8	2.18	Clear, no odour, no sheen, no turbidity
GME 7								
MW01	0.778	Well Dry						
MW02	1.752	0.229	Insufficient column of water to sample.					
MW03	4.680	2.793	32.8	0.8	5.21	491.5	1.80	Clear, no odour, no sheen, no turbidity.
MW04	6.030	2.297	33.2	20.2	5.53	8828	1.63	Clear, no odour, no sheen, no turbidity.
MW05	5.464	3.656	31.8	80.7	5.66	99.4	0.67	Clear, no odour, no sheen, no turbidity.
MW06	6.530	4.540	31.2	1.8	4.97	338.3	2.10	Cloudy (yellow brown in colour). Low sediment load, cleared around 0.5 L. No odour, no sheen.
MW07	6.040	3.053	30.4	31.6	4.45	331.4	2.14	Clear, no odour, no sheen, no turbidity.

3.1.1 Temperature

GME 6

Groundwater temperatures ranged from 30.3 to 33.5° C.

GME 7

Groundwater temperatures ranged from 30.4 to 33.2° C.

3.1.2 Dissolved Oxygen (DO)

GME 6

DO concentrations ranged from 0.5 to 51.88 percent.

GME 7

DO concentrations ranged from 0.8 to 80.79 percent.

3.1.3 pH

GME 6

Field pH data indicates groundwater at the site was slightly acidic, ranging from 4.46 to 5.63.

GME 7

Field pH data indicates groundwater at the site was slightly acidic, ranging from 4.45 to 5.66.

3.1.4 Turbidity

GME 6

Turbidity field results ranged from 100.79 to 102.18 NTU. The highest turbidity level was recorded at MW07 with the lowest level at MW03.

GME 7

Turbidity field results ranged from 100.67 to 102.14 NTU. The highest turbidity level was recorded at MW07 with the lowest level at MW05.

3.1.5 Electrical Conductivity (EC)

GME 6

EC values ranged from 230.5 to 481.1 $\mu\text{S}/\text{cm}$ indicating a predominately freshwater environment, with the exception of MW04 which recorded an EC of 7,055 $\mu\text{S}/\text{cm}$ and MW07. The higher levels of EC indicate marine influence on the groundwater.

GME 7

EC values ranged from 99.4 to 491.5 $\mu\text{S}/\text{cm}$ indicating a predominately freshwater environment, with the exception of MW04 which recorded an EC of 8,828 $\mu\text{S}/\text{cm}$. The higher levels of EC indicate marine influence on the groundwater.

3.2 Laboratory results

The results of the groundwater analysis are summarised in Appendix B. Copies of the certified laboratory reports are presented in **Appendix D**.

The majority of heavy metals, BTEX, and TRH were recorded below the Limit of Reporting (LOR) with majority of those above the LOR still below the licence criteria with the exception of the following:

GME 6

- Copper was identified above the licence criteria of 0.0018 mg/L at all wells sampled, with copper results ranging from 0.005 mg/L to 0.011 mg/L
- Nickel was identified above the licence criteria of 0.013 mg/L at MW04, which reported 0.025 mg/L
- Zinc was identified above the licence criteria of 0.015 mg/L at MW04, which reported 0.095 mg/L

GME 7

- Copper was identified above the licence criteria of 0.0018 mg/L at all wells sampled except MW03, with copper results ranging from 0.009 mg/L to 0.164 mg/L
- Lead was identified above the licence criteria of 0.0056 mg/L at MW06, which reported lead at 0.006 mg/L
- Nickel was identified above the licence criteria of 0.013 mg/L at MW04 and MW06, with results ranging from 0.020 mg/L to 0.022 mg/L
- Zinc was identified above the licence criteria of 0.015 mg/L at MW04 and MW06, with results ranging from 0.074 mg/L to 0.206 mg/L

3.3 Field quality control

To augment laboratory quality procedures one set of field QC samples were collected and analysed per GME. This sample was collected as a duplicate and triplicate and analysed as a blind duplicate and split duplicate respectively. Details are provided in **Table 5**. Relative Percentage Difference (RPD) calculations are presented in Appendix B.

Table 5 QC duplicate/triplicate samples

Parent sample	Duplicate sample	Triplicate sample	Laboratory	Analysis
GME 6				
MW04	Field Duplicate	-	ALS	TRH/BTEX/8 Metals
MW04	-	Field Triplicate	Eurofins	
GME 7				
MW03	Field Duplicate	-	ALS	TRH/BTEX/8 Metals
MW03	-	Field Triplicate	Eurofins	

The analytes had RPD values below the nominated data quality indicators for both GME 6 and GME 7, except for Nickel in GME 6 which returned an RPD of 44. However, the overall dataset can be considered of sufficient quality and reliability to fulfil the requirements of the data quality objectives outlined in section 2.3

The duplicate RPD is displayed in Appendix B

3.4 Laboratory QA/QC results

The analysis of matrix spikes, matrix spike duplicates and surrogates were undertaken by the laboratory. A review of laboratory quality control is summarised below:

- All samples were received by the laboratory in good condition and chilled and within appropriate holding times for analysis
- Samples were extracted and analysed within appropriate holding times
- The RPDs of the internal duplicated samples met the acceptable limits for all analytes
- All matrix spike recoveries, matrix spike duplicates, surrogate spike recoveries and control sample recoveries were within acceptable range (laboratory's historical statistical range)

Laboratory QA/QC are presented within the certified laboratory reports in **Appendix C**.

4. Air-toxics sampling results

4.1 Summary of air-toxic data

GHD commenced the air-toxics monitoring program on 27 April 2021. Portable summa canisters were placed at the three locations at the site to collect a single round of air samples. The summa canister draws a sample under vacuum and is fitted with a flow meter to control the continuous intake of air for a period of 8-hrs. The summa canister is then dispatched for analysis to a NATA accredited laboratory.

The sampling was carried out for an 8-hour period starting approximately 06:00 am on the 27th of April 2021. At the time of deployment, the weather conditions were noted as: Cool, slightly humid, Sunny with calm easterly winds. Wind from this direction is blowing away from residential properties. **Table 7** summarises these results.

Table 6 Weather conditions

	AQM01	AQM02	AQM03
Deployment			
Time	6:00 am	6:20 am	6:30 am
Wind speed	0 m/s		
Wind direction	Easterly		
Temperature	19°C		
Collection			
Time	5:30 pm	5:35 pm	5:40 pm
Wind speed	0.9 m/s		
Wind direction	Easterly		
Temperature	27°C		

The laboratory sample results for air-toxics were below the limit of reporting (LOR) for Benzene and M & p Xylenes for all locations and o-Xylene at AQM03, with detectable concentrations of Toluene, Ethylbenzene and Xylene (m & p) for all locations and o-Xylene at AQM01 and AQM02.

Notwithstanding, all analytes were below the trigger value as summarized in **Table 7** below.

Table 7 Air-toxics results April 2021

Analyte	Trigger value (NEPM)*	Sample pollutant concentration			Unit
		AQM01	AQM02	AQM03	
Benzene	0.010	<0.003	<0.003	<0.003	mg/m3*
Toluene	3.766	0.043	0.016	<0.0075	mg/m3
o-Xylene	1.085	0.011	0.0047	<0.004	mg/m3
M & p Xylenes	2.170	0.033 004	0.012 004	<0.008	mg/m3

* Trigger values converted from parts per billion (ppb) to milligrams per m3 (mg/m3)

5. Trigger value exceedances

5.1 Groundwater

During this round of monitoring, the following parameters/analytes exceeded the trigger value as they were greater than three times the standard trigger value as per EPL 128 licence condition 37.2.

- EC – MW04 in GME 6 and GME 7
- Copper – MW03, MW04, MW05 and MW07 in GME 6 and MW04, MW05, MW06 and MW07 in GME 7
- Zinc – MW04 in GME 6, and MW04 and MW06 in GME 7

Licence condition 37.1 states that three consecutive exceedances result in a non-compliance. The following parameters/analytes have recorded exceedances in three consecutive monitoring events:

- pH – MW03, MW04, MW06 and MW07
- DO – MW03, MW04, MW06 and MW07
- EC – MW03, MW04 and MW07
- Turbidity – MW03, MW04 and MW05
- Copper – MW04, MW05, MW06 and MW07
- Nickel – MW04
- Zinc – MW04

Under condition 35 of EPL 218 these exceedances listed above are notifiable to the NT EPA.

5.2 Air-toxics

The April air-toxics monitoring program returned all results below trigger values set in the Licence EPL 218, therefore no further investigations into BTEX results have been conducted.

6. Conclusions and recommendations

6.1 Conclusion

The groundwater monitoring was undertaken as per the scope of works on 20 April and 28 April 2021 using the peristaltic pump sampling method, with the exception of two wells which were dry.

The physio-chemical field parameters measured, Table 4, were consistent with previous measurements for the site. The laboratory analysis results were below the laboratory LOR for the majority of analytes, with detection only recorded for metals.

The air-toxics monitoring was carried out on 27 April 2021, coinciding with the application of the waste oil mixture to the track. Air-toxics monitoring program returned the result of a detectable concentration in AQM01 and AQM02 of Toluene, Ethylbenzene and Xylene (m & p). This is below the trigger values in the NEPM guidelines. This indicates that there are no impacts to residents in relation to the air quality during the oil application/tiling practices within the vicinity of the Darwin Turf Club. As such, no further investigation is needed into the presence of BTEX.

The groundwater and air monitoring results indicate that the track conditioning activity undertaken at the Darwin Turf Club approved under EPL218 does not pose an environmental risk to the surrounding environment. With the exception of a minor detections of Toluene, Ethylbenzene and Xylene (m & p). at AQM01 and AQM02 ($\leq 1\%$ of the trigger value) no other hydrocarbons were detected.

Notifiable non-compliance exceedances are summarised in **Table 8** and detailed in **Table 9** and **Table 10** below.

Table 8 Summary of notifiable exceedances

Well ID	Three consecutive exceedance of trigger values	Exceedance by three times trigger value	
		GME 6	GME 7
MW03	pH, DO, EC, Turbidity	DO, Copper	DO
MW04	pH, DO, EC, Turbidity, Copper, Nickel, Zinc	EC, Copper, Zinc	DO, EC, Copper, Zinc
MW05	Turbidity, Copper	Copper	Copper
MW06	pH, DO, Copper	DO	DO, Copper, Zinc
MW07	pH, DO, EC, Copper	DO, Copper	Copper

Table 9 *Notifiable exceedances values for three consecutive exceedances of trigger value*

Well ID	Parameter/Analyte	pH	DO	EC	Turbidity	Copper	Nickel	Zinc
	Trigger value	6.0-8.0 pH units	80-110 %	20-250 µS/cm	2 – 15 NTU	0.0018 mg/L	0.013 mg/L	0.005 mg/L
MW03	GME 5	5.60	529	-0.3	2,197	Nil	Nil	Nil
	GME 6	5.22	481.1	0.5	0.79			
	GME 7	5.21	491.5	0.8	1.8			
MW04	GME 5	4.52	20,888	-2.39	63.1	0.018	0.142	0.571
	GME 6	5.63	7,055	26.8	0.83	0.010	0.025	0.095
	GME 7	5.53	8,828	20.2	1.63	0.013	0.020	0.074
MW05	GME 5	Nil	Nil	Nil	1.27	0.007	Nil	Nil
	GME 6				1.96	0.011		
	GME 7				0.67	0.009		
MW06	GME 5	4.32	Nil	20.2	Nil	0.007	Nil	Nil
	GME 6	4.90		7.4		0.005		
	GME 7	4.97		1.8		0.164		
MW07	GME 5	4.07	1,710	25.6	Nil	0.007	Nil	Nil
	GME 6	4.46	281.8	20.5		0.010		
	GME 7	4.45	331.4	31.6		0.010		

Table 10 *Notifiable exceedances values for exceedances of three times the trigger value*

Parameter /Analyte	EC		DO		Copper		Zinc	
	GME 6	GME 7	GME 6	GME 7	GME 6	GME 7	GME 6	GME 7
Trigger value	20 – 250 µS/cm		80 – 110 %		0.0018 mg/L		0.015 mg/L	
MW03	Nil	Nil	0.5	0.8	0.0117	Nil	Nil	Nil
MW04	7,055	8,828	Nil	20.2	0.01	0.013	0.095	0.074
MW05	Nil	Nil	Nil	Nil	0.011	0.009	Nil	Nil
MW06	Nil	Nil	7.4	1.8	0.005	0.164	Nil	0.206
MW07	Nil	Nil	20.5	Nil	0.01	0.01	Nil	Nil

6.2 Recommendations

It is recommended that the groundwater analytical dataset be reviewed and assessed to determine whether the recorded exceedances are a trend or represent naturally occurring background concentrations (e.g., copper, nickel and zinc). The outcome of this assessment should be considered when evaluating the suitability of the current trigger levels.

It is also recommended elevation data be collected for the monitoring bores, to allow for accurate groundwater flow direction to be determined.

Appendices

Appendix A

Field Data



Appendix A Table 3
Final Sample Results

Darwin Turf Club
EPL Monitoring

Site	Well ID	Sampled Date/Time	Purge Vol	Purge SWL	pH Field	EC Field	DO Field	DO Field	OPR Field	Temp Field	Turbidity Field
			L	m bTOC	pH Units	µS/cm	mg/L	%S	mV	°C	NTU
Darwin Turf Club	MW02	17/01/2020 12:59 PM	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	-
Darwin Turf Club	MW02	23/04/2020 11:45 AM	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW03	8/09/2020 10:53 AM	7	3.049	4.81	422.8	-0.29	-3.7	202.1	33.6	1.00
Darwin Turf Club	MW03	16/09/2020 10:08 AM	2.5	3.085	5.60	529	-4.2	-0.30	-0.2	33.9	2197
Darwin Turf Club	MW03	20/04/2021 1:15 PM	2.5	4.696	5.22	481.1	0.03	0.5	183.2	32.8	0.79
Darwin Turf Club	MW03	28/04/2021 12:15 PM	3.5	2.793	5.21	491.5	0.06	0.8	204.2	32.8	1.8
Darwin Turf Club	MW04	17/01/2020 01:20 PM	11	2.830	5.11	12521	2.06	32.1	193.3	32.3	-
Darwin Turf Club	MW04	23/04/2020 12:41 PM	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
Darwin Turf Club	MW04	4/08/2020 12:34 PM	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW04	8/09/2020 11:37 AM	5	-153.5	4.65	18810	0.17	2.81	247.2	32.5	301.9
Darwin Turf Club	MW04	16/09/2020 11:07 AM	3	3.376	4.52	20888	-2.39	-0.16	225.9	33.2	63.10
Darwin Turf Club	MW04	20/04/2021 12:20 PM	4	2.280	5.63	7055	1.89	26.8	145.9	33.5	0.83
Darwin Turf Club	MW04	28/04/2021 11:30 AM	4.5	2.408	5.53	8828	1.42	20.2	229.3	33.2	1.63
Darwin Turf Club	MW05	17/01/2020 01:50 PM	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	-
Darwin Turf Club	MW05	23/04/2020 01:28 PM	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
Darwin Turf Club	MW05	28/04/2020 01:14 PM	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
Darwin Turf Club	MW05	8/09/2020 12:11 PM	3	4.323	5.96	112.0	6.80	89.1	171.0	32.3	4.86
Darwin Turf Club	MW05	16/09/2020 11:46 AM	2.0	4.219	6.04	110.4	6.95	96.8	116.9	33.1	1.27
Darwin Turf Club	MW05	20/04/2021 11:40 AM	2.5	4.404	4.89	230.5	3.76	51.8	241.4	32.3	1.96
Darwin Turf Club	MW05	28/04/2021 10:50 AM	2.5	4.076	5.66	99.4	5.91	80.7	212.6	31.8	0.67
Darwin Turf Club	MW06	17/01/2020 02:30 PM	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	-
Darwin Turf Club	MW06	23/04/2020 09:33 AM	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW06	8/09/2020 12:55 PM	2.5	5.745	4.35	107.9	0.57	7.79	245.1	33.5	7.94
Darwin Turf Club	MW06	16/09/2020 12:27 PM	2.5	6.028	4.32	103.9	20.2	1.43	249.8	34.1	12.10
Darwin Turf Club	MW06	20/04/2021 11:08 AM	4	4.410	4.90	355.0	0.52	7.4	215.5	31.6	1.87
Darwin Turf Club	MW06	28/04/2021 9:22 AM	3.0	4.547	4.97	338.3	0.13	1.8	219.9	31.2	2.10
Darwin Turf Club	MW07	23/04/2020 10:17 AM	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66
Darwin Turf Club	MW07	8/09/2020 13:42 PM	2	4.121	4.53	2599	0.08	1.30	179.0	32.5	35.96
Darwin Turf Club	MW07	16/09/2020 01:26 PM	2.0	4.263	4.07	1710	25.6	1.72	247.1	32.7	20.11
Darwin Turf Club	MW07	20/04/2021 10:32 AM	4.5	3.037	4.46	281.8	1.54	20.5	199.9	30.3	2.18
Darwin Turf Club	MW07	28/04/2021 10:10 AM	4.0	3.399	4.45	331.4	2.32	31.6	233.5	30.4	2.14

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW02	17/01/2020 12:59 PM	12:36:00	1.0	0.951	6.28	609	0.81	11.4	-33.8	33.1	-
			12:38:00	2.0	0.959	6.18	647	0.81	11.5	-31.0	33.9	-
			12:40:00	3.0	0.959	6.08	506	1.33	29.3	-20.7	34.8	-
			12:42:00	4.0	0.959	5.89	498.6	1.91	27.7	1.4	34.8	-
			12:45:00	5.0	0.959	5.84	510	1.91	27.6	10.3	34.8	-
			12:47:00	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	-
Darwin Turf Club	MW02	23/04/2020 11:45 AM	11:35:06	0.5	1.530	6.04	520	1.26	17.9	42.2	34.3	54.67
			11:37:34	1.0	1.483	5.85	531	0.83	11.8	41.2	34.8	29.10
			11:40:35	1.5	1.472	5.56	535	0.41	6.0	59.2	34.8	2.13
			11:42:30	2.0	1.472	5.51	531	0.38	5.4	65.7	34.8	0.39
			11:45:09	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	11:09:43	0.5	1.563	5.78	520	1.23	17.1	44.4	33.9	12.00
			11:13:06	1.0	1.520	5.58	510	0.83	11.8	54.9	34.2	4.70
			11:17:20	1.5	1.515	5.52	504	0.60	8.5	66.3	34.2	-0.91
			11:21:16	2.0	1.516	5.50	497.5	0.59	8.3	74.7	34.2	-2.15
			11:25:16	2.5	1.519	5.47	492.3	0.58	8.3	80.8	34.2	-2.03
			11:29:08	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW03	23/04/2020 11:10 AM	11:04:51	0.5	2.158	4.73	581	0.88	12.4	206.9	34.0	22.5
			11:06:38	1.0	2.158	4.75	584	0.93	13.2	209.8	34.0	22.09
			11:08:30	1.5	2.158	4.76	582	0.93	13.2	209.8	34.0	21.61
			11:10:24	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	10:23:55	0.5	2.264	4.61	588	0.75	10.4	236.0	33.9	-3.04
			10:26:21	1.0	2.264	4.63	588	0.53	7.4	236.2	33.8	-2.92
			10:29:49	1.5	2.264	4.66	587	0.40	5.5	236.6	33.8	-3.18
			10:32:34	2.0	2.264	4.65	587	0.37	5.2	237.2	33.8	-3.00
			10:36:02	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	11:36:08	0.5	2.877	5.05	437.0	0.95	13.4	205.4	32.9	33.42
			11:39:03	1.0	2.877	5.03	408.2	0.42	5.8	218.1	32.9	22.22
			11:41:38	1.5	2.877	5.03	406.7	0.34	4.8	221.8	32.8	15.25
			11:43:47	2.0	2.877	5.03	406.4	0.28	3.9	226.1	32.8	10.10
			11:45:25	2.5	2.878	5.02	406.3	0.28	3.8	227.9	32.8	9.31
			11:47:13	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW03	8/09/2020 10:28 AM	10:28:00	1	3.046	4.86	417.3	0.25	3.7	206.1	33.5	6.07
			10:33:00	2	3.045	4.84	419.1	-0.12	-1.5	203.7	33.5	15.01
			10:38:00	3	3.049	4.79	423.3	-0.16	-2.1	202.0	33.5	3.8
			10:42:00	4	3.049	4.79	423.5	-0.21	-2.9	200.3	33.5	2.06
			10:46:00	5	3.048	4.8	422	-0.25	-3.5	201.9	33.7	0.54
			10:49:00	6	3.048	4.8	422.9	-0.28	-3.7	201.4	33.7	0.89
			10:53:00	7	3.049	4.81	422.8	-0.29	-3.7	202.1	33.6	1.00
Darwin Turf Club	MW03	16/09/2020 10:08 AM	09:50:00	0.1	3.082	6.00	960	14.3	0.98	-9.3	33.3	2184.11
			09:54:00	0.5	3.083	5.76	921	-4.2	-0.30	-8.3	33.9	911.17
			09:57:00	1	3.085	5.62	896	-4.3	-0.30	-1.8	34.0	489.0
			10:01:00	1.5	3.085	5.59	491	-3.6	-0.25	1.0	33.8	2460
			10:03:00	2	3.085	5.59	510	-3.8	-0.29	0.6	34.0	2301
			10:06:00	2.5	3.085	5.60	529	-4.2	-0.30	-0.2	33.9	2197
Darwin Turf Club	MW03	20/04/2021 1:15 PM	01:04:00	0.5	4.695	5.25	492.0	0.09	1.2	166.1	32.8	0.98
			01:06:00	1	4.696	5.22	488.7	0.07	0.9	171.5	32.9	1
			01:08:00	1.5	4.696	5.19	483.6	0.05	0.7	179.8	32.8	0.86
			01:10:00	2	4.696	5.20	484.0	0.04	0.5	181.2	32.8	0.73
			01:12:00	2.5	4.696	5.22	481.1	0.03	0.5	183.2	32.8	0.79
Darwin Turf Club	MW03	28/04/2021 12:15 PM	11:58:07	0.5	2.791	5.52	781	1.39	19.8	177.2	33.0	0.08
			12:02:07	1.0	2.792	5.30	512	0.28	4.0	184.2	32.8	1.21
			12:04:07	1.5	2.792	5.22	499.3	0.19	2.6	193.5	32.8	1.49
			12:06:07	2.0	2.793	5.20	497.1	0.11	1.5	198.9	32.8	1.64
			12:08:07	2.5	2.793	5.21	493.9	0.07	0.9	201.3	32.8	1.72
			12:10:07	3.0	2.793	5.21	492.3	0.06	0.8	203.2	32.8	1.76
			12:12:07	3.5	2.793	5.21	491.5	0.06	0.8	204.2	32.8	1.8
Darwin Turf Club	MW04	17/01/2020 01:20 PM	13:03:00	1.0	2.174	5.41	9691	4.08	56.8	126.9	31.7	-
			13:05:00	2.0	-	5.34	10356	4.17	59.5	137.8	31.8	-
			13:07:00	3.0	2.566	5.06	15173	3.12	45.4	156.6	32.0	-
			13:09:00	4.0	-	4.99	17340	2.05	31.9	187.3	32.3	-
			13:12:00	6.0	2.830	4.99	13930	2.03	31.0	189.3	32.3	-
			13:15:00	8.0	-	5.06	13225	2.07	32.4	189.3	32.3	-
			13:18:00	10	-	5.09	13025	2.09	32.4	191.7	32.3	-
			13:20:00	11	-	5.11	12521	2.06	32.1	193.3	32.3	-

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW04	23/04/2020 12:41 PM	12:26:40	0.5	1.949	4.83	13350	1.59	23.1	214.6	33.7	87.86
			12:28:49	1.0	1.963	4.97	11288	1.51	21.9	217.4	33.6	85.43
			12:30:50	1.5	1.965	5.05	9530	1.51	21.8	217.5	33.6	85.32
			12:32:28	2.0	1.964	5.08	7500	1.48	21.2	217.3	33.6	85.47
			12:36:24	3.0	1.964	5.18	6430	1.44	20.7	215.4	33.6	53.69
			12:39:04	3.5	1.965	5.20	6366	1.46	20.8	214.2	33.6	50.41
			12:41:01	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	11:55:39	0.5	2.037	4.47	23696	0.63	9.4	237.4	33.2	13.14
			11:58:45	1.0	2.037	4.59	23663	0.53	8.0	246.7	33.3	4.81
			12:02:58	1.5	2.037	4.71	19250	0.57	8.4	251.7	33.3	3.00
			12:06:01	2.0	2.037	4.73	15003	0.62	9.0	249.4	33.3	0.92
			12:09:37	2.5	2.037	4.86	11724	0.69	9.9	245.9	33.3	1.68
			12:12:02	3.0	2.037	4.99	9581	0.78	11.2	241.1	33.3	2.52
			12:15:07	3.5	2.037	5.03	8491	0.82	11.8	237.8	33.3	3.31
			12:18:21	4.0	2.037	5.10	7352	0.93	13.3	234.6	33.3	3.55
			12:20:28	4.5	2.037	5.13	6922	0.95	13.6	232.8	33.3	3.97
			12:22:18	5.0	2.037	5.15	6875	0.98	14.0	231.0	33.3	4.95
			12:24:03	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
Darwin Turf Club	MW04	4/08/2020 12:34 PM	12:15:11	0.50	2.753	4.86	16623	2.13	30.2	294.8	32.0	4.01
			12:18:32	1.0	2.796	4.98	13810	2.24	32.1	300.0	31.9	3.62
			12:21:06	1.5	2.834	4.96	13554	1.44	20.5	303.1	31.9	4.35
			12:23:43	2.0	2.875	5.01	12026	1.06	15.1	304.1	31.9	4.06
			12:25:26	2.5	2.888	5.05	11123	0.88	12.3	303.8	31.9	4.13
			12:27:10	3.0	2.897	5.07	10237	0.85	12.0	303.9	31.9	4.18
			12:30:13	3.5	2.899	5.09	10062	0.81	11.6	302.6	31.9	4.25
			12:32:51	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW04	8/09/2020 11:39 AM	11:18:00	0.1	-	4.59	19058	0.84	12.8	235.1	33.3	330.9
			11:21:00	1	-	4.61	18855	0.32	4.90	238.9	32.7	281.9
			11:25:00	2	-	4.63	18863	0.25	3.70	243.5	32.6	38.9
			11:30:00	3	-	4.45	18450	0.15	2.20	146.4	32.6	385.1
			11:34:00	4	-	4.65	18610	0.17	2.80	247.8	32.5	299.3
			11:37:00	5	-	4.65	18810	0.17	2.81	247.2	32.5	301.9
Darwin Turf Club	MW04	16/09/2020 11:07 AM	10:45:00	0.1	3.039	4.49	21623	7.70	0.52	213.0	33.3	30.72
			10:47:00	0.5	3.115	4.49	21250	3.30	0.21	221.7	33.4	52.41
			10:50:00	1	3.186	4.49	21233	-1.10	-0.08	224.9	33.1	80.71
			10:55:00	1.5	3.218	4.51	21436	-1.70	-0.12	226.0	33.9	62.13
			10:58:00	2	3.244	4.51	21031	-2.30	-0.16	225.3	33.2	90.10
			11:01:00	2.5	3.307	4.52	20977	-2.50	-0.18	224.9	33.2	76.10
			11:05:00	3	3.376	4.52	20888	-2.39	-0.16	225.9	33.2	63.10
Darwin Turf Club	MW04	20/04/2021 12:20 PM	12:04:00	0.5	2.259	5.41	14928	3.53	51.9	167.2	33.4	255.0
			12:07:00	1	2.269	5.31	14811	2.71	39.6	162.6	33.4	360.0
			12:11:00	1.5	2.272	5.36	13138	2.37	34.3	158.8	33.5	109.0
			12:13:00	2	2.275	5.47	9833	2.36	34.2	150.7	33.5	0.17
			12:15:00	2.5	2.277	5.52	8487	2.09	30.1	148.9	33.5	0.22
			12:16:00	3	2.287	5.57	7300	1.91	27.3	147.1	33.5	0.33
			12:18:00	3.5	2.283	5.59	7111	1.90	27.1	146.8	33.5	0.54
			12:20:00	4	2.280	5.63	7055	1.89	26.8	145.9	33.5	0.83
Darwin Turf Club	MW04	28/04/2021 11:30 AM	11:07:00	0.5	2.385	4.72	23371	0.47	7.0	254.1	33.1	1.21
			11:12:00	1.0	2.408	4.94	20870	0.61	9.0	252.5	33.1	1.84
			11:14:00	1.5	2.404	4.99	20404	0.59	8.8	252.5	33.2	1.88
			11:16:00	2.0	2.401	5.03	19232	0.55	8.0	251.3	33.2	1.79
			11:18:00	2.5	2.411	5.20	14750	0.99	14.4	244.8	33.2	1.82
			11:20:00	3.0	2.406	5.27	12930	1.17	16.8	241.1	33.2	1.74
			11:24:00	3.5	2.408	5.47	8822	1.57	21.5	233.2	33.2	1.77
			11:26:00	4.0	2.409	5.49	8901	1.41	20.1	232.5	33.2	1.67
			11:28:00	4.5	2.408	5.53	8828	1.42	20.2	229.3	33.2	1.63
Darwin Turf Club	MW05	17/01/2020 01:50 PM	13:35:00	2.0	3.705	6.64	157.8	4.65	56.6	143.0	31.1	-
			13:37:00	3.0	3.870	6.60	116.0	4.49	61.0	145.2	31.1	-
			13:39:00	4.0	4.021	5.97	115.0	4.48	66.7	148.5	31.2	-
			13:40:00	5.0	4.121	5.95	110.2	4.52	69.3	150.2	31.2	-
			13:42:00	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	-
Darwin Turf Club	MW05	23/04/2020 01:28 PM	13:18:41	0.5	3.902	5.67	126.5	6.05	83.6	185.2	32.5	1.06
			13:20:39	1.0	3.961	5.65	102.5	6.05	83.5	190.5	32.5	1.04
			13:22:24	1.5	4.018	5.62	96.2	6.03	83.2	195.7	32.5	-0.80
			13:25:34	2.0	4.077	5.60	95.1	5.95	82.2	201.9	32.5	-0.80
			13:28:09	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW05	28/04/2020 01:14 PM	12:51:41	0.5	3.915	5.80	152.0	6.23	85.9	181.4	32.4	-1.39
			12:54:01	1.0	3.974	5.77	102.3	6.24	86.0	191.0	32.4	-1.71
			12:58:40	1.5	4.064	5.73	92.8	6.22	85.6	198.9	32.4	-1.76
			13:03:09	2.0	4.147	5.71	91.5	6.21	85.7	207.5	32.4	-1.47
			13:08:41	2.5	4.226	5.68	91.5	6.27	86.6	211.6	32.4	-1.35
			13:14:03	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	12:57:58	0.50	3.944	6.36	184.5	7.09	95.4	251.8	31.0	2.08
			13:01:10	1.0	4.063	6.30	79.0	7.13	95.9	258.8	31.0	2.20
			13:03:51	1.25	4.112	6.29	78.3	7.13	95.9	260.3	31.0	2.24
			13:05:27	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
			11:58:00	0.1	3.978	6.05	288.6	7.01	98.4	150.6	33.5	2.17
Darwin Turf Club	MW05	8/09/2020 12:11 PM	12:03:00	1	4.285	5.96	102.1	6.84	94.3	165.1	32.3	4.11
			12:07:00	2	4.310	5.96	109.8	6.83	92.0	167.0	32.3	4.81
			12:11:00	3	4.323	5.96	112.0	6.79	89.1	171.0	32.3	4.86
			11:26:00	0.1	3.934	6.11	161.7	6.69	97.1	107.0	33.6	0.92
Darwin Turf Club	MW05	16/09/2020 11:46 AM	11:30:00	0.5	4.089	6.10	96.8	6.67	96.0	121.1	32.4	0.15
			11:35:00	1.0	4.141	6.09	97.7	6.95	96.7	119.8	33.1	2.90
			11:40:00	1.5	4.198	6.04	103.0	6.81	95.9	114.3	33.1	1.80
			11:44:00	2.0	4.219	6.04	110.4	6.95	96.8	116.9	33.1	1.27
			11:28:00	0.5	4.010	5.04	229.9	3.83	52.7	202.6	32.3	2.01
Darwin Turf Club	MW05	20/04/2021 11:40 AM	11:30:00	1	4.140	4.90	228.6	4.08	56.3	223.8	32.1	2.12
			11:32:00	1.5	4.261	4.86	227.0	3.94	54.1	234.1	32.1	2.11
			11:34:00	2	4.364	4.87	230.9	3.72	51.1	238.0	32.2	2.08
			11:36:00	2.5	4.404	4.89	230.5	3.76	51.8	241.4	32.3	1.96
			10:37:00	0.5	3.835	5.82	101.6	6.25	85.1	204.8	31.7	5.3
Darwin Turf Club	MW05	28/04/2021 10:50 AM	10:41:00	1.0	3.879	5.72	98.8	6.19	84.5	207.2	31.7	4.4
			10:43:00	1.5	3.972	5.66	97.9	5.96	81.4	210.2	31.8	0.6
			10:45:00	2.0	4.023	5.66	98.9	5.93	80.8	211.5	31.8	0.66
			10:47:00	2.5	4.076	5.66	99.4	5.91	80.7	212.6	31.8	0.67
			14:12:14	1.0	3.492	5.44	197.5	4.47	62.4	165.1	32.5	-
Darwin Turf Club	MW06	17/01/2020 02:30 PM	14:13:04	2.0	3.495	5.15	203.0	4.30	62.0	189.9	32.4	-
			14:14:14	3.0	3.498	5.10	210.6	4.48	62.8	203.3	32.5	-
			14:15:24	4.0	3.502	5.08	220.7	4.41	61.9	211.6	32.5	-
			14:16:36	5.0	3.505	5.07	227.3	4.29	57.8	218.6	32.5	-
			14:17:53	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	-
Darwin Turf Club	MW06	23/04/2020 09:33 AM	09:19:23	0.5	4.380	4.68	356.1	1.76	23.2	169.1	33.2	-1.20
			09:22:45	1.0	4.381	4.64	355.0	0.74	10.2	186.8	33.0	-1.05
			09:24:58	1.5	4.381	4.64	354.4	0.51	7.1	192.0	33.0	-0.90
			09:27:38	2.0	4.381	4.63	353.2	0.43	6.2	198.5	33.0	-0.87
			09:29:24	2.5	4.381	4.63	353.4	0.37	5.2	202.0	33.0	-0.71
			09:31:28	3.0	4.382	4.64	353.3	0.36	5.0	205.4	33.0	-0.61
			09:33:22	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
			08:58:36	0.5	4.422	4.71	291.5	0.63	8.7	156.7	32.1	0.46
Darwin Turf Club	MW06	28/04/2020 09:11 AM	09:02:30	1.0	4.422	4.70	289.0	0.48	6.4	176.8	32.3	0.49
			09:05:56	1.5	4.423	4.69	289.8	0.36	5.0	192.1	32.4	0.69
			09:08:24	2.0	4.423	4.69	290.5	0.35	4.9	195.9	32.4	1.10
			09:11:27	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
			09:11:00	0.5	5.436	4.63	102.4	0.52	7.1	255.7	31.7	5.20
Darwin Turf Club	MW06	4/08/2020 09:35 AM	09:17:00	1.0	5.565	4.65	102.3	0.43	5.9	268.2	31.7	10.54
			09:23:00	1.25	5.643	4.64	106.7	0.45	6.1	275.3	31.7	10.85
			09:27:00	1.50	5.683	4.62	107.9	0.44	6.0	280.1	31.7	10.95
			09:31:00	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
			12:41:00	0.1	5.625	4.32	107.4	1.91	27.7	220.0	35.3	12.21
Darwin Turf Club	MW06	8/09/2020 12:58 PM	12:47:00	1	5.759	4.36	104.5	0.61	8.60	246.5	33.9	8.16
			12:49:00	1.5	5.75	4.35	106.1	0.60	7.91	251.3	33.7	8.01
			12:52:00	2	5.749	4.35	108.5	0.57	7.8	249.0	33.5	7.92
			12:55:00	2.5	5.745	4.35	107.9	0.57	7.79	245.1	33.5	7.94

Site	Well ID	Sampled Date/Time	Time	Purge Vol. (L)	Purge SWL (mbTOC)	pH Field (pH Units)	EC Field (µS/cm)	DO Field (mg/L)	DO Field (%S)	OPR Field (mV)	Temp Field (°C)	Turbidity Field (NTU)
Darwin Turf Club	MW06	16/09/2020 12:27 PM	11:57:08	0.1	5.657	4.39	100.1	23.1	1.54	213.1	35.1	5.10
			11:57:40	0.5	5.758	4.38	91.7	26.6	1.80	223.8	35.2	59.11
			11:57:43	1	5.844	4.38	99.3	22.6	1.52	242.1	34.4	69.10
			11:57:46	1.5	5.939	4.35	96.1	18.7	1.39	241.0	34.0	49.80
			11:57:49	2.0	5.981	4.32	97.8	19.0	1.40	236.7	34.0	30.19
			11:57:52	2.5	6.028	4.32	103.9	20.2	1.43	249.8	34.1	12.10
Darwin Turf Club	MW06	20/04/2021 11:08 AM	10:56:00	1	4.408	5.07	349.4	1.28	17.5	173.8	31.7	233.67
			10:58:00	1.5	4.408	4.99	353.8	1.13	15.5	183.3	31.6	0.57
			11:00:00	2	4.408	4.96	355.0	0.84	11.8	192.9	31.6	1.6
			11:02:00	2.5	4.408	4.93	356.4	0.78	10.7	200.0	31.6	1.85
			11:04:00	3	4.409	4.91	356.6	0.60	8.5	207.3	31.6	1.95
			11:06:00	3.5	4.409	4.91	355.8	0.53	7.5	211.0	31.6	1.96
Darwin Turf Club	MW06	28/04/2021 09:22 AM	11:08:00	4	4.410	4.90	355.0	0.52	7.4	215.5	31.6	1.87
			09:10:36	0.5	4.545	4.89	345.5	0.42	5.7	198.6	31.0	2.02
			09:12:52	1.0	4.547	4.89	338.5	0.28	3.7	206.0	31.2	2.16
			09:14:48	1.5	4.547	4.96	338.6	0.21	2.8	209.1	31.2	2.17
			09:16:23	2.0	4.547	4.97	338.5	0.14	1.8	214.4	31.2	2.17
			09:18:05	2.5	4.547	4.97	337.8	0.13	1.8	217.2	31.2	2.16
Darwin Turf Club	MW07	23/04/2020 10:17 AM	09:20:42	3.0	4.547	4.97	338.3	0.13	1.8	219.9	31.2	2.10
			10:08:37	0.5	2.921	4.31	195.3	2.53	34.1	208.8	31.3	0.30
			10:10:15	1.0	2.930	4.27	176.6	2.45	32.9	218.9	31.1	0.31
			10:12:33	1.5	2.931	4.26	176.1	2.27	30.6	226.9	31.1	-0.85
			10:15:08	2.0	2.932	4.25	177.7	2.35	31.6	232.0	31.1	-0.9
			10:17:05	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	09:43:53	0.5	3.021	4.21	317.5	1.41	19.2	238.3	31.1	-1.78
			09:46:04	1.0	3.022	4.22	212.0	1.93	26.1	244.1	31.1	-2.62
			09:48:49	1.5	3.022	4.19	188.6	2.10	28.3	250.9	31.1	-2.67
			09:50:54	2.0	3.023	4.18	186.9	2.10	28.3	254.2	31.1	-2.84
			09:53:01	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	09:53:01	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
			10:21:28	0.5	3.760	4.65	1500	1.27	17.1	208.0	30.7	8.33
			10:27:42	1.0	3.846	4.74	1451	1.24	17.1	226.1	30.8	8.75
			10:33:24	1.50	3.931	4.75	1877	1.25	17.7	194.4	30.8	9.28
			10:39:55	2.00	4.095	4.79	1722	0.45	6.1	170.7	30.8	6.29
			10:43:33	2.5	4.193	4.82	1693	0.48	6.4	178.5	30.8	6.12
Darwin Turf Club	MW07	8/09/2020 01:43 PM	10:47:12	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66
			13:33:00	0.1	3.891	4.57	2855	1.89	25	100.1	36.0	36.5
			13:35:00	0.5	4.15	4.53	2541	0.09	1.40	186.9	32.7	35.1
			13:37:00	1	4.071	4.53	2561	0.08	1.32	187.1	32.5	35.91
			13:40:00	1.5	4.103	4.52	2614	0.09	1.34	186.1	32.5	36.09
			13:42:00	2	4.121	4.53	2599	0.08	1.30	179.0	32.5	35.96
Darwin Turf Club	MW07	16/09/2020 01:26 PM	13:42:00	2	4.121	4.53	2599	0.08	1.30	179.0	32.5	35.96
			11:59:42	0.1	3.914	4.24	2114	14.6	1.02	227.9	34.0	14.10
			12:00:16	0.5	4.050	4.07	1727	16.6	1.20	264.4	32.9	18.57
			12:00:20	1.0	4.138	4.07	1617	22.5	1.62	275.0	32.7	21.19
			12:00:23	1.5	4.198	4.07	1691	24.1	1.67	218.1	32.7	16.18
			13:24:00	2.0	4.263	4.07	1710	25.6	1.72	247.1	32.7	20.11
Darwin Turf Club	MW07	20/04/2021 10:32 AM	10:12:39	0.5	3.007	5.12	2272	0.35	4.9	90.1	30.5	2.06
			10:14:09	1.0	3.019	4.97	1844	0.16	2.2	109.2	30.4	2.07
			10:16:42	1.5	3.024	4.83	1533	0.13	1.7	127.9	30.4	2.1
			10:18:18	2.0	3.027	4.64	1085	0.25	3.3	146.5	30.4	2.14
			10:20:23	2.5	3.030	4.59	692	0.66	8.4	158.2	30.4	2.16
			10:22:18	3.0	3.032	4.54	307.8	1.45	19.2	176.6	30.3	2.17
			10:24:14	3.5	3.034	4.49	283.9	1.53	20.3	191.4	30.3	2.18
			10:26:29	4.0	3.036	4.47	273.8	1.54	20.5	196.3	30.3	2.18
			10:28:06	4.5	3.037	4.46	281.8	1.54	20.5	199.9	30.3	2.18
			09:50:34	0.5	3.111	4.91	1729	1.56	21.3	184.9	30.2	1.96
Darwin Turf Club	MW07	28/04/2021 10:10 AM	09:52:25	1.0	3.137	4.78	1633	0.25	3.4	183.9	30.4	2.10
			09:55:02	1.5	3.195	4.49	985	0.28	3.7	210.4	30.4	2.15
			09:58:41	2.0	3.228	4.48	620	0.74	9.5	219.1	30.4	2.14
			10:00:39	2.5	3.295	4.47	319.5	1.71	22.7	227.1	30.4	2.15
			10:02:24	3.0	3.329	4.45	324.7	2.22	29.0	229.2	30.4	2.14
			10:04:21	3.5	3.371	4.44	330.1	2.30	30.0	231.5	30.4	2.15
			10:06:36	4.0	3.399	4.45	331.4	2.32	31.6	233.5	30.4	2.14

Site	Well ID	Date/Time	Water Depth (mbTOC)	Well Depth (mbTOC)	Method	Dry	Comments	PID (ppm)
Darwin Turf Club	MW01	17/01/2020 12:30 PM	-	0.777	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	23/04/2020 11:21 AM	-	0.777	Dip	Y	Well Dry	0.1
Darwin Turf Club	MW01	28/04/2020 10:58 AM	-	0.777	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	4/08/2020 11:58 AM	-	0.779	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	8/09/2020 10:00 AM	-	0.770	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	16/09/2020 09:33 AM	-	0.774	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	20/04/2021 1:30 PM	-	0.777	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW01	28/04/2021 11:44 AM	-	0.778	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	17/01/2020 12:31 PM	0.941	1.775	Dip	N	Clear with organic matter, no odour, no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW02	23/04/2020 11:27 AM	1.346	1.750	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW02	28/04/2020 10:59 AM	1.443	1.750	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW02	4/08/2020 12:00 PM	-	1.746	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	8/09/2020 10:05 AM	-	1.748	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	16/09/2020 09:35 AM	-	1.750	Dip	Y	Well Dry	0.0
Darwin Turf Club	MW02	20/04/2021 1:20 PM	1.428	1.746	Dip	N	Insufficient water in the column to purge and take samples - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW02	28/04/2021 11:40 AM	1.523	1.752	Dip	N	Insufficient water in the column to purge and take samples - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW03	17/01/2020 12:29 PM	1.467	4.636	Dip	N	Unable to get bailer down well	0.0
Darwin Turf Club	MW03	23/04/2020 10:56 AM	2.157	4.630	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW03	28/04/2020 10:15 AM	2.264	4.630	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	1.2
Darwin Turf Club	MW03	4/08/2020 11:21 AM	2.876	4.648	Dip	N	Slightly cloudy, no odour, no sheen, Clear at 2 L - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW03	8/09/2020 11:37 AM	3.040	4.642	Dip	N	Slightly cloudy, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW03	16/09/2020 09:30 AM	3.085	4.634	Dip	N	Initially very light brown cloudy, cleared around 0.5 L, no odour, no sheen - Peristaltic, YSI Pro DSS	0.1
Darwin Turf Club	MW03	20/04/2021 12:56 PM	2.69	4.639	Dip	N	Clear, no odour, no sheen, low turbidity	0.0
Darwin Turf Club	MW03	28/04/2021 11:50 AM	2.789	4.68	Dip	N	Clear, no odour, no sheen, no turbidity	0.1
Darwin Turf Club	MW04	17/01/2020 01:00 PM	1.804	6.030	Dip	N	Orange/brown, moderate sediment load, no odour, no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW04	23/04/2020 12:07 PM	2.081	6.072	Dip	N	Slightly cloudy/milky, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.3
Darwin Turf Club	MW04	28/04/2020 11:44 AM	1.965	6.072	Dip	N	Slightly cloudy/milky, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW04	4/08/2020 12:05 PM	2.605	6.030	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW04	8/09/2020 11:37 AM	-	-	Dip	N	Unable to get IP probe through bend in PVC piping. Water was white-red slightly cloudy, light sheen.	0.0
Darwin Turf Club	MW04	16/09/2020 11:07 AM	2.968	5.035	Dip	N	Water slightly yellow-hazy, no odour, no sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW04	20/04/2021 11:56 AM	2.148	6.030	Dip	N	Bailer stuck in well. turbid initially (mostly due to disturbance of attempting to retrieve bailer). Yellow in colour. clearing	3.7
Darwin Turf Club	MW04	28/04/2021 11:02 AM	2.297	6.030	Dip	N	Clear, no odour, no sheen, no turbidity.	1.3
Darwin Turf Club	MW05	17/01/2020 01:30 PM	3.325	5.484	Dip	N	Brown, slightly turbid, no odour. no sheen - Bail, YSI Pro Plus	0.0
Darwin Turf Club	MW05	23/04/2020 01:08 PM	3.759	5.470	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	28/04/2020 12:40 PM	3.781	5.470	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW05	4/08/2020 12:48 PM	3.809	5.484	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	8/09/2020 12:11 PM	3.932	5.472	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW05	16/09/2020 09:20 AM	3.854	4.472	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW05	20/04/2021 11:26 AM	3.921	5.471	Dip	N	Clear, no odour, no sheen, no turbidity - Peristaltic, YSI Pro DSS	0.2
Darwin Turf Club	MW05	28/04/2021 10:30 AM	3.656	5.464	Dip	N	Clear, no odour, no sheen, no turbidity - Peristaltic, YSI Pro DSS	0.2
Darwin Turf Club	MW06	17/01/2020 02:10 PM	3.468	6.595	Dip	N	Cloudy brown, moderate sediment load, no odour, no sheen - Bail - Peristaltic, YSI Pro DSS	0.2
Darwin Turf Club	MW06	23/04/2020 09:03 AM	4.376	6.610	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	28/04/2020 08:47 AM	4.418	6.610	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW06	4/08/2020 08:52 AM	5.244	6.595	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	8/09/2020 12:55 PM	5.481	6.583	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW06	16/09/2020 09:15 AM	3.824	6.601	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS	0.0
Darwin Turf Club	MW06	20/04/2021 10:47 AM	4.405	6.593	Dip	N	High turbidity initially, cleared after 200mL (tubing at base of well, then raised up higher). Clear, no odour, no sheen, no	0.2
Darwin Turf Club	MW06	28/04/2021 09:00 AM	4.54	6.53	Dip	N	Cloudy (yellowish brown), no odour, no sheen, low turbidity. Clear by 0.5 L - Peristaltic, YSI Pro DSS	0.2
Darwin Turf Club	MW07	17/01/2020 10:40 AM	2.529	6.043	Dip	N	Bore bent, unable to get bailer down well	0.5
Darwin Turf Club	MW07	23/04/2020 10:01 AM	2.869	6.050	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.8
Darwin Turf Club	MW07	28/04/2020 09:36 AM	2.984	6.050	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.1
Darwin Turf Club	MW07	4/08/2020 10:02 AM	3.605	6.025	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0
Darwin Turf Club	MW07	16/09/2020 09:02 AM	3.824	6.048	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS	0.1
Darwin Turf Club	MW07	20/04/2021 09:55 AM	2.948	6.039	Dip	N	Clear, no odour, no sheen, no turbidity - Peristaltic, YSI Pro DSS	0.6
Darwin Turf Club	MW07	28/04/2021 09:44 AM	3.053	6.040	Dip	N	Clear, no odour, no sheen, no turbidity - Peristaltic, YSI Pro DSS	0.3
Darwin Turf Club	MW07	8/09/2020 13:42 PM	3.774	6.013	Dip	N	Clear, no odour, no sheen - Peristaltic, YSI Pro DSS w/ Flow Cell	0.0

Appendix B

Results Tables



Appendix B Table 1
Groundwater Results

Darwin Turf Club Inc.
EPL Monitoring GME and Air Monitoring Report
April 2021

			Well ID	MW02			MW03						
			Field ID	MW02_200117	MW02_200423	MW02_200428	MW03_200423	MW03_200428	MW03_200804	MW03_200908	MW03_200916	MW03_210420	MW03_210428
			Date	17/01/2020	23/04/2020	28/04/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	20/04/2021	28/04/2021
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL218)										
Field Parameters													
pH (Field)	pH units		6.0 - 8.0	5.86	5.46	5.45	4.76	4.67	5.02	4.81	5.60	5.22	5.21
Electrical conductivity (field)	µS/cm		20 - 250	505	528	490.1	582	586	406.4	422.8	529	481.1	491.5
DO (%S) (Field)	%S		80 - 110	27.4	5.6	8.3	13.2	5	4.0	-3.7	-0.3	0.5	0.8
Redox (Field)	mV			11.3	68.0	84.1	209.4	236.7	229.0	202.1	-0.2	183.2	204.2
Temperature (Field)	°C			34.8	34.8	34.2	34.0	33.8	32.8	33.6	33.9	32.8	32.8
Turbidity (Field)	NTU		2 - 15	89.1	0.76	0.41	22.1	0	9.56	1.00	2.197	0.79	1.8
Metals													
Arsenic (filtered)	mg/L	0.001	0.094	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (filtered)	mg/L	0.0001	0.0004	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	0.001	0.0018	<0.001	0.011	0.002	0.008	0.002	0.009	0.007	0.012	0.011	<0.001
Lead (filtered)	mg/L	0.001	0.0056	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury (filtered)	mg/L	0.0001	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.001	0.013	<0.001	0.010	<0.001	0.009	0.002	0.005	0.007	0.005	0.001	<0.001
Zinc (filtered)	mg/L	0.005	0.015	<0.005	0.113	0.007	0.048	0.010	0.040	0.039	0.038	0.010	<0.005
BTEXN													
Benzene	µg/L	1	300	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	2	300	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/L	2	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (m & p)	µg/L	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	µg/L	2	75	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	µg/L	5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
BTEX (Sum of Total) - Lab Calc	µg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH - NEPM 2013													
F1 (C6-C10 minus BTEX)	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction	µg/L	20		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F3 (>C16-C34 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F4 (>C34-C40 Fraction)	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	100	600	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100



Appendix B Table 1
Groundwater Results

		MW04								MW05							
		MW04_200117	MW04_200423	MW04_200428	MW04_200804	MW04_200908	MW04_200916	MW04_210420	MW04_210428	MW05_200117	MW05_200423	MW05_200428	MW05_200804	MW05_200908	MW05_200916	MW05_210420	MW05_210428
		17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	20/04/2021	28/04/2021	17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	20/04/2021	28/04/2021
	Unit																
Field Parameters																	
pH (Field)	pH units	5.11	5.23	5.18	5.11	4.65	4.52	5.63	5.53	5.93	5.59	5.67	6.28	5.96	6.04	4.89	5.66
Electrical conductivity (field)	µS/cm	12521	6,273	6,729	9,850	18,810	20,888	7,055	8,828	107.3	95.1	93.6	77.4	112.0	110.4	230.5	99.4
DO (%S) (Field)	%S	32.1	20.1	14.8	11.3	2.81	-2.39	26.8	20.2	69.3	81.7	85.3	95.7	89.1	96.8	51.8	80.7
Redox (Field)	mV	193.3	213.1	229.2	302.6	247.2	225.9	145.9	229.3	153.5	205.4	217.1	262.4	171.0	116.9	241.4	212.6
Temperature (Field)	°C	32.3	33.6	33.3	31.9	32.5	33.2	33.5	33.2	31.2	32.5	32.4	31.0	32.3	33.1	32.3	31.8
Turbidity (Field)	NTU	1,160	47.99	8.16	4.56	301.9	63.10	0.83	1.63	608	0.33	1.79	2.26	4.86	1.27	1.96	0.67
Metals																	
Arsenic (filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (filtered)	mg/L	0.0001	0.0001	0.0002	0.0005	0.0009	0.0015	0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	<0.001	0.005	0.007	0.011	0.009	0.018	0.010	0.013	<0.001	0.009	0.003	0.007	0.007	0.007	0.011	0.009
Lead (filtered)	mg/L	0.004	<0.001	<0.001	0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Mercury (filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.014	0.021	0.030	0.066	0.099	0.142	0.025	0.020	<0.001	0.006	0.006	0.009	0.005	0.004	<0.001	<0.001
Zinc (filtered)	mg/L	0.067	0.093	0.140	0.291	0.430	0.571	0.095	0.074	<0.005	0.039	0.062	0.061	0.021	0.026	<0.005	<0.005
BTEXN																	
Benzene	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (m & p)	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
BTEX (Sum of Total) - Lab Calc	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRH - NEPM 2013																	
F1 (C6-C10 minus BTEX)	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C16 Fraction	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F3 (>C16-C34 Fraction)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
F4 (>C34-C40 Fraction)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 (Sum of Total)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100



Appendix B Table 1
Groundwater Results

		MW06								MW07							
		MW06_200117	MW06_200423	MW06_200428	MW06_200804	MW06_200908	MW06_200916	MW06_210420	MW06_210428	MW07_200423	MW07_200428	MW07_200804	MW07_200908	MW07_200916	MW07_210420	MW07_210428	
		17/01/2020	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	20/04/2021	28/04/2021	23/04/2020	28/04/2020	4/08/2020	8/09/2020	16/09/2020	20/04/2021	28/04/2021	
	Unit																
Field Parameters																	
pH (Field)	pH units	5.05	4.63	4.69	4.61	4.35	4.32	4.90	4.97	4.24	4.17	4.81	4.53	4.07	4.46	4.45	
Electrical conductivity (field)	µS/cm	232.2	353.4	290.9	109.8	107.9	103.9	355.0	338.3	176.4	186.4	1,651	2,599	1,710	281.8	331.4	
DO (%S) (Field)	%S	60.0	4.7	4.6	5.9	7.79	20.2	7.4	1.8	31.3	28.3	6.5	1.30	25.6	20.5	31.6	
Redox (Field)	mV	221.5	208.1	201.9	283.1	245.1	249.8	215.5	219.9	236.0	256.7	179.9	179.0	247.1	199.9	233.5	
Temperature (Field)	°C	32.5	33.0	32.4	31.7	33.5	34.1	31.6	31.2	31.1	31.1	30.8	32.5	32.7	30.3	30.4	
Turbidity (Field)	NTU	359	1.56	4.66	11.02	7.94	12.10	1.87	2.10	0	13	6.66	35.96	20.11	2.18	2.14	
Metals																	
Arsenic (filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.004	0.001	<0.001	<0.001	
Cadmium (filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0004	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper (filtered)	mg/L	<0.001	0.011	0.005	0.002	0.016	0.007	0.005	0.164	0.007	0.003	0.009	0.006	0.007	0.010	0.010	
Lead (filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.006	0.002	<0.001	0.004	0.004	0.011	<0.001	0.003	
Mercury (filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	<0.001	0.010	0.001	0.002	0.010	0.004	<0.001	0.022	0.008	0.002	0.008	0.007	0.010	<0.001	0.001	
Zinc (filtered)	mg/L	<0.005	0.065	0.021	0.011	0.060	0.028	0.014	0.206	0.056	0.012	0.062	0.020	0.031	<0.005	<0.005	
BTEXN																	
Benzene	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Toluene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Ethylbenzene	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (o)	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (m & p)	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene Total	µg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Naphthalene	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
BTEX (Sum of Total) - Lab Calc	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
TRH - NEPM 2013																	
F1 (C6-C10 minus BTEX)	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
C6-C10 Fraction	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
F2 (>C10-C16 minus Naphthalene)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C16 Fraction	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
F3 (>C16-C34 Fraction)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
F4 (>C34-C40 Fraction)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C40 (Sum of Total)	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	



Appendix B Table 2
Air Toxics Results

Darwin Turf Club Inc.
EPL Monitoring GME and Air Monitoring Report
April 2021

			Location ID	AQM01			AQM02			AQM03		
			Date	27/04/2020	15/09/2020	27/04/2021	27/04/2020	15/09/2020	27/04/2021	27/04/2020	15/09/2020	27/04/2021
	Unit	EQL	Environment Protection Licence Trigger Levels (EPL218)*									
BTEXN												
Benzene	mg/m3	0.0016	0.010	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.004	<0.003
Toluene	mg/m3	0.0075	3.766	0.0096	<0.0075	0.043	<0.0075	<0.0075	0.016	<0.0075	0.029	<0.0075
Ethylbenzene	mg/m3	0.0022		<0.004	<0.005	0.011	<0.004	<0.003	0.0047	<0.004	<0.005	<0.004
Xylene (o)	mg/m3	0.0022	1.085	<0.004	<0.005	<0.004	<0.004	<0.003	<0.004	<0.004	<0.005	<0.004
Xylene (m & p)	mg/m3	0.0044	2.170	<0.008	<0.009	0.033	<0.009	<0.007	0.012	<0.009	<0.01	<0.008
PAHs - standard 16												
Naphthalene	mg/m3	0.0105		<0.021	<0.023	<0.018	<0.022	<0.017	<0.019	<0.022	<0.025	<0.019



Appendix B Table 3

RPD Table

Darwin Turf Club Inc.
EPL Monitoring GME and Air Monitoring Report
April 2021

Field ID Lab Report No.			Date	20/04/2021		RPD	20/04/2021		RPD	28/04/2021		RPD	28/04/2021		RPD
			MW04_210420	QC107_210420	MW04_210420		QC207_210420	MW03_210428		QC108_210428	MW03_210428		QC208_210428		
			ES2114601	ES2114601	ES2114601		789456	ES2115803		ES2115803	ES2115803		791716		
	Unit	EQL													
Metals															
Arsenic (filtered)	mg/L	0.001	0.001	0.002	67	0.001	0.002	67	<0.001	<0.001	0	<0.001	<0.001	0	
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0001	67	0.0002	0.0003	40	<0.0001	<0.0001	0	<0.0001	<0.0002	0	
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	
Copper (filtered)	mg/L	0.001	0.010	0.002	133	0.010	<0.001	164	<0.001	<0.001	0	<0.001	0.001	0	
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	
Nickel (filtered)	mg/L	0.001	0.025	0.024	4	0.025	0.039	44	<0.001	<0.001	0	<0.001	<0.001	0	
Zinc (filtered)	mg/L	0.005	0.095	0.094	1	0.095	0.14	38	<0.005	<0.005	0	<0.005	<0.005	0	
BTEXN															
Benzene	µg/L	1	<1	<1	0	<1	<1	0	<1	<1	0	<1	<1	0	
Toluene	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0	
Ethylbenzene	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0	
Xylene (o)	µg/L	1	<2	<2	0	<2	<1	0	<2	<2	0	<2	<1	0	
Xylene (m & p)	µg/L	2	<2	<2	0	<2	<2	0	<2	<2	0	<2	<2	0	
Xylene Total	µg/L	2	<2	<2	0	<2	<3	0	<2	<2	0	<2	<3	0	
BTEX (Sum of Total) - Lab Calc	µg/L	1	<1	<1	0	<1	-	-	<1	<1	0	<1	-	-	
TRH - NEPM 2013															
F1 (C6-C10 minus BTEX)	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0	
C6-C10 Fraction	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0	
F2 (>C10-C16 minus Naphthalene)	µg/L	50	<100	<100	0	<100	<50	0	<100	<100	0	<100	<50	0	
>C10-C16 Fraction	µg/L	50	<100	<100	0	<100	<50	0	<100	<100	0	<100	<50	0	
F3 (>C16-C34 Fraction)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0	
F4 (>C34-C40 Fraction)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0	
>C10-C40 (Sum of Total)	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0	
TRH - NEPM 1999															
C6-C9 Fraction	µg/L	20	<20	<20	0	<20	<20	0	<20	<20	0	<20	<20	0	
C10-C14 Fraction	µg/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	
C15-C28 Fraction	µg/L	100	<100	<100	0	<100	<100	0	<100	<100	0	<100	<100	0	
C29-C36 Fraction	µg/L	50	<50	<50	0	<50	<100	0	<50	<50	0	<50	<100	0	
C10-C36 (Sum of Total)	µg/L	50	<50	<50	0	<50	<100	0	<50	<50	0	<50	<100	0	
PAHs - standard 16															
Naphthalene	µg/L	5	<5	<5	0	<5	<10	0	<5	<5	0	<5	<10	0	

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 200 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix C

Laboratory Reports


CHAIN OF CUSTODY
 COC#: 21168 ALS Laboratory: ES Sydney

RELINQUISHED BY:

 DATE TIME:

RECEIVED BY: *Kim*

 DATE TIME: *20/4/21 7.30am*

RELINQUISHED BY:

 DATE TIME:

RECEIVED BY:

 DATE TIME:

CLIENT: GHD SER - GHD PTY LTD
 PROJECT: Darwin Turf Club EPL Monitoring
 SITE: Darwin Turf Club
 ORDER NO:
 PROJECT MANAGER: Tim Murphy
 PRIMARY SAMPLER: Tim Murphy
 EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com
 EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com

TURNAROUND REQUIREMENTS: 5 Days
 Biohazard info:

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 comments:

CONTACT PH:
 QUOTE NO: SY/010/20

SAMPLER MOBILE:
 / ES2020GHD SER0002

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW01	well dry	20/04/2021 01:31 PM	Water	ALS: 0 Non ALS: 0	Yes		-		well dry
002	MW02	insufficient water to sample	20/04/2021 01:32 PM	Water	ALS: 0 Non ALS: 0	Yes		-		no sample
003	MW03		20/04/2021 01:41 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	MW04		20/04/2021 12:49 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	MW05		20/04/2021 12:09 PM	Water	ALS: 4 Non ALS: 0	No		X		
006	MW06		20/04/2021 11:41 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	MW07		20/04/2021 10:58 AM	Water	ALS: 4 Non ALS: 0	No		X		
008	QC107	field duplicate	20/04/2021 12:55 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	QC207	forward to eurofins	20/04/2021 12:56 PM	Water	ALS: 4 Non ALS: 0	No		X		

Subcon: Forward Lab Split WO
 Lab / Analysis:
 Organised By: Date: *Eurofins*
 Relinquished By / Date: *QC 207*
 Connote: Courier:
 WO No: *ES2114601*
 Attach By PO: Internal Sheet

Environmental Division
 Sydney
 Work Order Reference
ES2114601



Telephone: +61-2-9712 1111

 CHAIN OF CUSTODY COC#: 21168 ALS Laboratory: ES Sydney		RELINQUISHED BY: DATE TIME:	RECEIVED BY: <i>kim</i> DATE TIME: <i>21-04-21 7:30am</i>	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: GHDSER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Darwin Turf Club ORDER NO: PROJECT MANAGER: Tim Murphy PRIMARY SAMPLER: Tim Murphy EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		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 comments:	

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	QC307	rinsate	20/04/2021 01:51 PM	Water	ALS: 4 Non ALS: 0	No		X	W05 - TRH/BTEXN/8 Metals (Total)	
011	QC507	trip blank	20/04/2021 01:03 PM	Water	ALS: 1 Non ALS: 0	No	-		W18 - TRH(C6-C9)/BTEXN	



ALS Laboratory: ES Sydney

RECEIVED BY:

Cum

RECEIVED BY:

DATE TIME:

21-04-71

7. 30am

DATE TIME:

ORDER NO:

CONTACT PH:

QUOTE NO: SY/010/20

SAMPLER MOBILE:

/ ES2020GHDSE0002

EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com

EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com

Biohazard info:

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 comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
003	MW03	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002049735	Red/Green	Yes	
003	MW03	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067162	Purple	No	
003	MW03	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068251	Purple	No	
003	MW03	Amber Glass Bottle - Unpreserved	100 mL	00400219046517	Orange	No	
004	MW04	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002049782	Red/Green	Yes	
004	MW04	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068287	Purple	No	
004	MW04	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067983	Purple	No	
004	MW04	Amber Glass Bottle - Unpreserved	100 mL	00400219046489	Orange	No	
005	MW05	Amber Glass Bottle - Unpreserved	100 mL	00400219046498	Orange	No	
005	MW05	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068100	Purple	No	
005	MW05	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067912	Purple	No	
005	MW05	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002049839	Red/Green	Yes	
006	MW06	Amber Glass Bottle - Unpreserved	100 mL	00400219046469	Orange	No	
006	MW06	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002049818	Red/Green	Yes	
006	MW06	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067858	Purple	No	
006	MW06	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067734	Purple	No	
007	MW07	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068302	Purple	No	
007	MW07	Amber Glass Bottle - Unpreserved	100 mL	00400219046482	Orange	No	
007	MW07	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068277	Purple	No	
007	MW07	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002051527	Red/Green	Yes	
008	QC107	Amber Glass Bottle - Unpreserved	100 mL	00400219046488	Orange	No	
008	QC107	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002049809	Red/Green	Yes	
008	QC107	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068278	Purple	No	
008	QC107	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068241	Purple	No	
009	QC207	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002051650	Red/Green	Yes	
009	QC207	Amber VOC Vial - Sulfuric Acid	40 mL	00160121068315	Purple	No	

 CHAIN OF CUSTODY COC#: 21168 ALS Laboratory: ES Sydney			RELINQUISHED BY:		RECEIVED BY: <i>tim</i>		RELINQUISHED BY:		RECEIVED BY:		
			DATE TIME:		DATE TIME: <i>21 04 21 7:30am</i>		DATE TIME:		DATE TIME:		
CLIENT: GHDSER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Darwin Turf Club ORDER NO: PROJECT MANAGER: Tim Murphy CONTACT PH: PRIMARY SAMPLER: Tim Murphy QUOTE NO: SY/010/20 SAMPLER MOBILE: / ES2020GHDSER0002 EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com			TURNAROUND REQUIREMENTS : 5 Days Biohazard info:			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 comments:					
009	QC207	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067830	Purple	No					
009	QC207	Amber Glass Bottle - Unpreserved	100 mL	00400219046486	Orange	No					
010	QC307	Amber Glass Bottle - Unpreserved	100 mL	00400219046480	Orange	No					
010	QC307	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067882	Purple	No					
010	QC307	Amber VOC Vial - Sulfuric Acid	40 mL	00160121067845	Purple	No					
010	QC307	Clear Plastic Bottle - Filtered; Lab-acidified	60 mL	00282002051537	Red/Green	No	rinsate sample.				
011	QC507	Amber VOC Vial - Sulfuric Acid	40 mL	00160121069626	Purple	No					
Total Bottle Count: ALS: 33, Non ALS: 0											



Esky (F)

ALS Use Only

Custody Document for Submissions via ALS Compass App

Project: 12526136 Darwin Client: AHD Project Manager: Tim Murphy
Turn club Phone: (0499056068)
ALS Compass COC Reference: 21168 # Samples: 9 Sampler: _____
Phone: ()

Turnaround Requirements: Standard ☒ Urgent ☐

Special Instructions:	ALS Use Only
	Custody seal intact? YES NO <u>N/A</u>
	Free ice / frozen ice bricks upon receipt? <u>YES</u> NO N/A
	Random sample temperature on receipt? <u>27.2°C</u>

Custody:

Relinquished by: <u>T. Murphy</u>	Received by: <u>Vishal Patel</u>	Relinquished by:	Received by:
Date / Time: <u>20/4/21</u> <u>2pm</u>	Date / Time: <u>20/04/2021</u> <u>1400</u>	Date / Time:	Date / Time:

ES2114601

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2114601

Client : GHD PTY LTD Contact : MR TIM MURPHY Address : Level 7 24 Mitchell Street DARWIN NT, AUSTRALIA 0800 E-mail : tim.murphy@ghd.com Telephone : +61 08 89820151 Facsimile : +61 08 89821075 Project : Darwin Turf Club EPL Monitoring Order number : - C-O-C number : 21168 Site : Darwin Turf Club Sampler : TIM MURPHY, Zoe Abbott	Laboratory : Environmental Division Sydney Contact : Angus Harding Address : 277-289 Woodpark Road Smithfield NSW Australia 2164 E-mail : Angus.Harding@ALSGlobal.com Telephone : +61 2 8784 8555 Facsimile : +61-2-8784 8500 Page : 1 of 2 Quote number : ES2020GHDSE0002 (SY/010/20) QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 21-Apr-2021 07:30	Issue Date : 22-Apr-2021
Client Requested Due : 28-Apr-2021	Scheduled Reporting Date : 28-Apr-2021
Date	

Delivery Details

Mode of Delivery : Client Drop Off	Security Seal : Not Available
No. of coolers/boxes : 1	Temperature : 27.2' C - Ice present
Receipt Detail :	No. of samples received / analysed : 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample QC207 has been forwarded to Eurofins as per COC requested.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

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

- Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

Summary of Sample(s) and Requested Analysis

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER TRH/BT	WATER TRH/CG
ES2114601-003	20-Apr-2021 13:31	MW03	✓	
ES2114601-004	20-Apr-2021 13:32	MW04	✓	
ES2114601-005	20-Apr-2021 13:41	MW05	✓	
ES2114601-006	20-Apr-2021 12:49	MW06	✓	
ES2114601-007	20-Apr-2021 12:09	MW07	✓	
ES2114601-008	20-Apr-2021 11:41	QC107 field duplica...	✓	
ES2114601-010	20-Apr-2021 10:58	QC307 rinsate	✓	
ES2114601-011	20-Apr-2021 12:55	QC507 trip blank		✓

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

Email accountspayableAU@qhd.com

Email accountsreceivableAU@ghd.com

Email GHDLabreports@ghd.com

- [illegible]

Email tim.murphy@ghd.com

- [illegible]

CERTIFICATE OF ANALYSIS

Work Order	: ES2114601	Page	: 1 of 10
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Contact	: Angus Harding
Address	: Level 7 24 Mitchell Street DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89820151	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 21-Apr-2021 07:30
Order number	: -	Date Analysis Commenced	: 23-Apr-2021
C-O-C number	: 21168	Issue Date	: 28-Apr-2021 16:02
Sampler	: TIM MURPHY, Zoe Abbott		
Site	: Darwin Turf Club		
Quote number	: SY/010/20		
No. of samples received	: 8		
No. of samples analysed	: 8		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				MW03	MW04	MW05	MW06	MW07
Sampling date / time				20-Apr-2021 13:31	20-Apr-2021 13:32	20-Apr-2021 13:41	20-Apr-2021 12:49	20-Apr-2021 12:09
Compound	CAS Number	LOR	Unit	ES2114601-003	ES2114601-004	ES2114601-005	ES2114601-006	ES2114601-007
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.011	0.010	0.011	0.005	0.010
Nickel	7440-02-0	0.001	mg/L	0.001	0.025	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.010	0.095	<0.005	0.014	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: **GROUNDWATER**
 (Matrix: **WATER**)

				Sample ID	MW03	MW04	MW05	MW06	MW07
Sampling date / time					20-Apr-2021 13:31	20-Apr-2021 13:32	20-Apr-2021 13:41	20-Apr-2021 12:49	20-Apr-2021 12:09
Compound	CAS Number	LOR	Unit		ES2114601-003	ES2114601-004	ES2114601-005	ES2114601-006	ES2114601-007
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		128	126	121	120	122
Toluene-D8	2037-26-5	2	%		121	116	109	110	114
4-Bromofluorobenzene	460-00-4	2	%		117	113	105	110	113



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				QC107 field duplicate	----	----	----	----
Sampling date / time				20-Apr-2021 11:41	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2114601-008	-----	-----	-----	-----
Result				----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.002	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.002	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.024	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.094	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

Sub-Matrix: **GROUNDWATER**
 (Matrix: **WATER**)

Sample ID

				QC107	----	----	----	----
				field duplicate				
Sampling date / time				20-Apr-2021 11:41	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2114601-008	-----	-----	-----	-----
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	125	----	----	----	----
Toluene-D8	2037-26-5	2	%	115	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	115	----	----	----	----



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

				QC307 rinsate	----	----	----	----
Sampling date / time				20-Apr-2021 10:58	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2114601-010	-----	-----	-----	-----
Result				----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

Sub-Matrix: **RINSATE**
 (Matrix: **WATER**)

Sample ID

				QC307 rinsate	----	----	----	----
Sampling date / time				20-Apr-2021 10:58	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2114601-010	-----	-----	-----	-----
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	127	----	----	----	----
Toluene-D8	2037-26-5	2	%	118	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	115	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	QC507 trip blank	----	----	----	----
Sampling date / time				20-Apr-2021 12:55	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2114601-011	-----	-----	-----	-----
Result				----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	100	----	----	----	----
Toluene-D8	2037-26-5	2	%	108	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	115	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Sub-Matrix: RINSATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order : **ES2114601**

Page : 1 of 6

Client : **GHD PTY LTD**

Laboratory : Environmental Division Sydney

Contact : MR TIM MURPHY

Contact : Angus Harding

Address : Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 08 89820151

Telephone : +61 2 8784 8555

Project : Darwin Turf Club EPL Monitoring

Date Samples Received : 21-Apr-2021

Order number : -

Date Analysis Commenced : 23-Apr-2021

C-O-C number : 21168

Issue Date : 28-Apr-2021

Sampler : TIM MURPHY, Zoe Abbott

Site : Darwin Turf Club

Quote number : SY/010/20

No. of samples received : 8

No. of samples analysed : 8



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3640877)									
ES2114512-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.003	63.9	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
ES2114745-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3640879)									
ES2114512-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2114573-019	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3636420)									
ES2114591-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2114601-003	MW03	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3640477)									
WN2104454-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2115109-005	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3636420)									



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3636420) - continued									
ES2114591-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2114601-003	MW03	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3640477)									
WN2104454-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2115109-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3636420)									
ES2114591-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES2114601-003	MW03	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP080: BTEXN (QC Lot: 3640477)									
WN2104454-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	10	10	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES2115109-005	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



Method Blank (MB) and Laboratory Control Sample (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: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit			Result	LCS	Low
EG020F: Dissolved Metals by ICP-MS (QCLot: 3640877)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	88.9	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	89.0	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.8	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.1	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	85.3	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	84.7	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	89.6	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3640879)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.0	83.0	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3634560)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	67.2	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	91.0	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	80.3	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3636420)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	97.6	75.0	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3640477)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	86.0	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3634560)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	69.9	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	91.6	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	100	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3636420)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	101	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3640477)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	87.4	75.0	127
EP080: BTEXN (QCLot: 3636420)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	108	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	107	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	109	70.0	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	110	69.0	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	115	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	109	70.0	120



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
CAS Number				Result	LCS	Low	High	
LOR								
Unit								
EP080: BTEXN (QCLot: 3640477)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	93.0	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	101	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	97.5	70.0	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	97.4	69.0	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	106	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	91.3	70.0	120

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: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3640877)							
ES2114512-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	89.4	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	89.2	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.8	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	90.5	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	85.5	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	88.7	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	88.7	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3640879)							
ES2114538-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	92.3	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3636420)							
ES2114591-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	107	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3640477)							
ES2115109-005	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	113	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3636420)							
ES2114591-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	106	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3640477)							
ES2115109-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	110	70.0	130
EP080: BTEXN (QCLot: 3636420)							
ES2114591-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	120	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	114	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	114	70.0	130

Page : 6 of 6
 Work Order : ES2114601
 Client : GHD PTY LTD
 Project : Darwin Turf Club EPL Monitoring



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 3636420) - continued							
ES2114591-001	Anonymous	EP080: meta- & para-Xylene	108-38-3	25 µg/L	114	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	114	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	105	70.0	130
EP080: BTEXN (QCLot: 3640477)							
ES2115109-005	Anonymous	EP080: Benzene	71-43-2	25 µg/L	104	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	106	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	105	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	112	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	111	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	108	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2114601	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 21-Apr-2021
Site	: Darwin Turf Club	Issue Date	: 28-Apr-2021
Sampler	: TIM MURPHY, Zoe Abbott	No. of samples received	: 8
Order number	: -	No. of samples analysed	: 8

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)		20-Apr-2021	----	----	----	24-Apr-2021	17-Oct-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC107 - field duplicate,							
QC307 - rinsate								
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)		20-Apr-2021	----	----	----	26-Apr-2021	18-May-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC107 - field duplicate,							
QC307 - rinsate								
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)		20-Apr-2021	23-Apr-2021	27-Apr-2021	✔	26-Apr-2021	02-Jun-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC107 - field duplicate,							
QC307 - rinsate								
Amber VOC Vial - Sulfuric Acid (EP080)		20-Apr-2021	24-Apr-2021	04-May-2021	✔	24-Apr-2021	04-May-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC107 - field duplicate,							
QC307 - rinsate,	QC507 - trip blank							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
MW03, MW05, MW07, QC307 - rinsate	MW04, MW06, QC107 - field duplicate,	20-Apr-2021	23-Apr-2021	27-Apr-2021	✔	26-Apr-2021	02-Jun-2021	✔
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03, MW05, MW07, QC307 - rinsate,	MW04, MW06, QC107 - field duplicate, QC507 - trip blank	20-Apr-2021	24-Apr-2021	04-May-2021	✔	24-Apr-2021	04-May-2021	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03, MW05, MW07, QC307 - rinsate,	MW04, MW06, QC107 - field duplicate, QC507 - trip blank	20-Apr-2021	24-Apr-2021	04-May-2021	✔	24-Apr-2021	04-May-2021	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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)							
Dissolved Mercury by FIMS	EG035F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.



CHAIN OF CUSTODY

COC#: 21168

ALS Laboratory: ES Sydney

RELINQUISHED BY:

RECEIVED BY: Kim

RELINQUISHED BY:

RECEIVED BY: MBIRKETI (EUROFINS)

DATE TIME:

DATE TIME: 21/04/21 7:30am

DATE TIME:

DATE TIME: 21/04/21 4:25pm

CLIENT: GHDSER - GHD PTY LTD

PROJECT: Darwin Turf Club EPL Monitoring

SITE: Darwin Turf Club

ORDER NO:

PROJECT MANAGER: Tim Murphy

PRIMARY SAMPLER: Tim Murphy

CONTACT PH:

QUOTE NO: SY/010/20

SAMPLER MOBILE:

/ ES2020GHDSER0002

EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com

EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

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 comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW01	well dry	20/04/2021 01:31 PM	Water	ALS: 0 Non ALS: 0	Yes				well dry
002	MW02	insufficient water to sample	20/04/2021 01:32 PM	Water	ALS: 0 Non ALS: 0	Yes				no sample
003	MW03		20/04/2021 01:41 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	MW04		20/04/2021 12:49 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	MW05		20/04/2021 12:09 PM	Water	ALS: 4 Non ALS: 0	No		X		
006	MW06		20/04/2021 11:41 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	MW07		20/04/2021 10:58 AM	Water	ALS: 4 Non ALS: 0	No		X		
008	QC107	field duplicate	20/04/2021 12:55 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	QC207	forward to eurofins	20/04/2021 12:56 PM	Water	ALS: 4 Non ALS: 0	No		X		

Environmental Division
Sydney

Work Order Reference

ES2114601



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789456

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Site # 1254 & 14271

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NATA # 1261 Site # 25079

New Zealand
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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

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

Sample Receipt Advice

Company name: GHD Pty Ltd NT
Contact name: Tim Murphy
Project name: DARWIN TURF CLUB EPL MONITORING
Project ID: Not provided
Turnaround time: 5 Day
Date/Time received: Apr 21, 2021 4:25 PM
Eurofins reference: 789456

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Sample logged for TRH, BTEXN and 8 filtered metals as per previous reports. Please confirm if this analysis is correct.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Tim Murphy - Tim.Murphy@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection and proficiency testing scheme providers
reports.

Attention: **Tim Murphy**

Report **789456-W**
Project name **DARWIN TURF CLUB EPL MONITORING**
Received Date **Apr 21, 2021**

Client Sample ID			QC207
Sample Matrix			Water
Eurofins Sample No.			S21-Ap38629
Date Sampled			Apr 20, 2021
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	107
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	0.002
Cadmium (filtered)	0.0002	mg/L	0.0003
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	0.039
Zinc (filtered)	0.005	mg/L	0.14

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 22, 2021	7 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 22, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 22, 2021	7 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 22, 2021	7 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Apr 22, 2021	28 Days

Australia

Melbourne

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

Sydney

Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

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

Perth

46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland

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

Christchurch

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

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800
Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 789456
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Apr 21, 2021 4:25 PM
Due: Apr 28, 2021
Priority: 5 Day
Contact Name: Tim Murphy

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Metals M8 filtered	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
Mayfield Laboratory - NATA Site # 25079							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	QC207	Apr 20, 2021		Water	S21-Ap38629	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	93			70-130	Pass	
TRH C10-C14	%	116			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	103			70-130	Pass	
Toluene	%	102			70-130	Pass	
Ethylbenzene	%	106			70-130	Pass	
m&p-Xylenes	%	104			70-130	Pass	
o-Xylene	%	104			70-130	Pass	
Xylenes - Total*	%	104			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	105			70-130	Pass	
TRH C6-C10	%	95			70-130	Pass	
TRH >C10-C16	%	103			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	90			80-120	Pass	
Cadmium (filtered)	%	93			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)			%	95			80-120	Pass	
Copper (filtered)			%	98			80-120	Pass	
Lead (filtered)			%	97			80-120	Pass	
Mercury (filtered)			%	101			80-120	Pass	
Nickel (filtered)			%	99			80-120	Pass	
Zinc (filtered)			%	95			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S21-Ap39010	NCP	%	86			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S21-Ap39010	NCP	%	87			70-130	Pass	
Toluene	S21-Ap39010	NCP	%	87			70-130	Pass	
Ethylbenzene	S21-Ap39010	NCP	%	89			70-130	Pass	
m&p-Xylenes	S21-Ap39010	NCP	%	86			70-130	Pass	
o-Xylene	S21-Ap39010	NCP	%	90			70-130	Pass	
Xylenes - Total*	S21-Ap39010	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S21-Ap39010	NCP	%	89			70-130	Pass	
TRH C6-C10	S21-Ap39010	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S21-Ap37671	NCP	%	89			75-125	Pass	
Cadmium (filtered)	S21-Ap37671	NCP	%	82			75-125	Pass	
Chromium (filtered)	S21-Ap31664	NCP	%	81			75-125	Pass	
Copper (filtered)	M21-Ap35170	NCP	%	98			75-125	Pass	
Lead (filtered)	M21-Ap35170	NCP	%	106			75-125	Pass	
Mercury (filtered)	S21-Ap37671	NCP	%	81			75-125	Pass	
Nickel (filtered)	M21-Ap35170	NCP	%	101			75-125	Pass	
Zinc (filtered)	M21-Ap35170	NCP	%	103			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S21-Ap33123	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S21-Ap26436	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S21-Ap26436	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S21-Ap26436	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S21-Ap33123	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S21-Ap33123	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S21-Ap33123	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S21-Ap33123	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S21-Ap33123	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S21-Ap33123	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S21-Ap33123	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S21-Ap33123	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	S21-Ap26436	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S21-Ap26436	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S21-Ap26436	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	

Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic (filtered)	S21-Ap38629	CP	mg/L	0.002	0.002	7.0	30%	Pass
Cadmium (filtered)	S21-Ap38629	CP	mg/L	0.0003	0.0003	2.0	30%	Pass
Chromium (filtered)	S21-Ap38629	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Copper (filtered)	S21-Ap38629	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Lead (filtered)	S21-Ap38629	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Mercury (filtered)	S21-Ap38629	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Nickel (filtered)	S21-Ap38629	CP	mg/L	0.039	0.039	<1	30%	Pass
Zinc (filtered)	S21-Ap38629	CP	mg/L	0.14	0.14	1.0	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised by:

Harry Bacalis	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

06.05.21

CHAIN OF CUSTODY (ALS) COC#: 21170 ALS Laboratory: ES Sydney		RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:	RELINQUISHED BY: DATE TIME:	RECEIVED BY: <i>Kim</i> DATE TIME: <i>29.04.21 7.30am</i>
CLIENT: GHD SER - GHD PTY LTD PROJECT: Darwin Turf Club EPL Monitoring SITE: Darwin Turf Club ORDER NO:		TURNAROUND REQUIREMENTS: 5 Days Biohazard info:		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 comments:	
PROJECT MANAGER: Tim Murphy PRIMARY SAMPLER: Tim Murphy EMAIL REPORTS TO: "GHD LabReports@ghd.com, Tim.murphy@ghd.com" EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com		CONTACT PH: QUOTE NO: SY/010/20		SAMPLER MOBILE: / ES2020GHD SER0002	

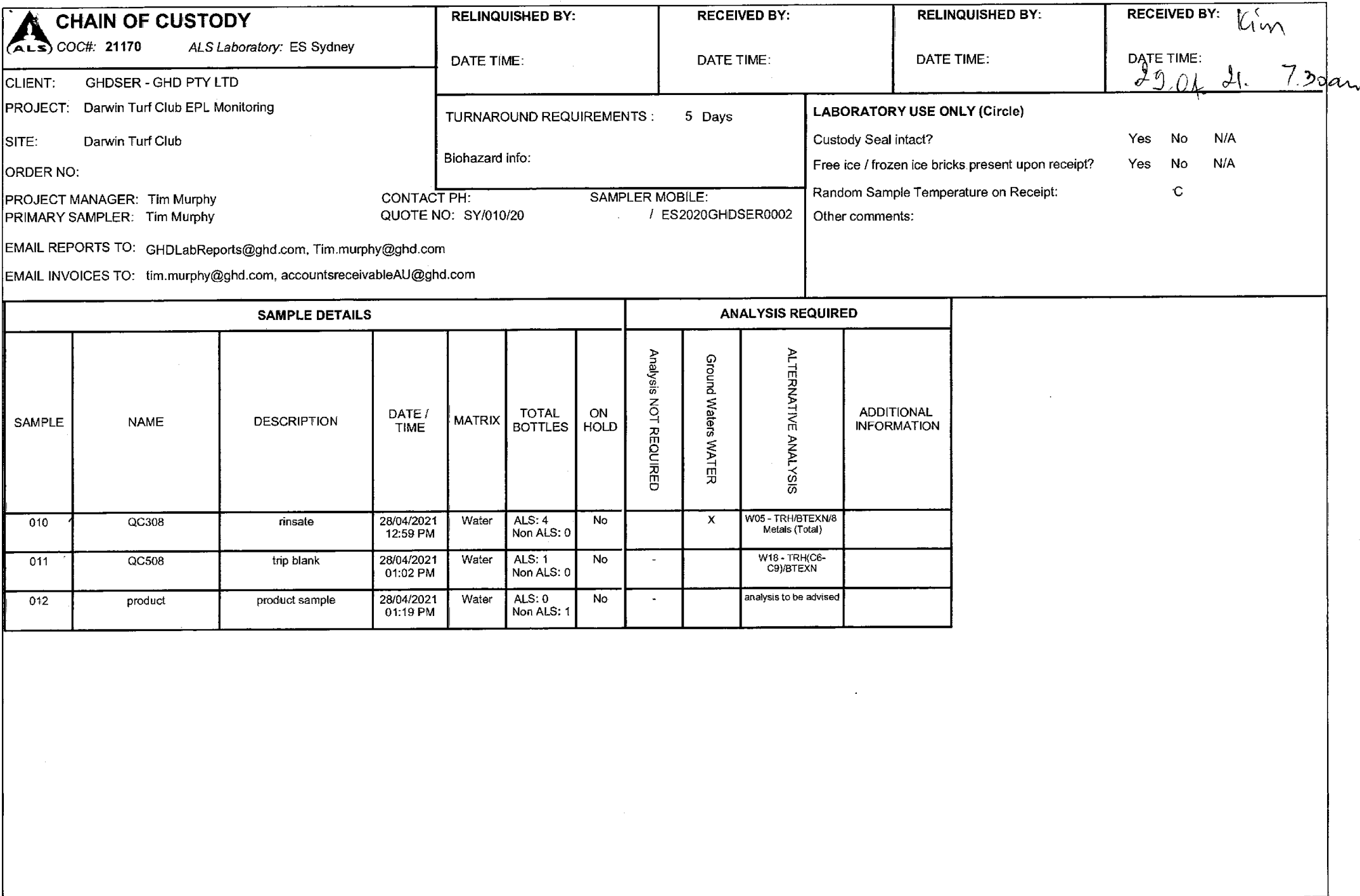
SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW01	well dry	28/04/2021 12:15 PM	Water	ALS: 0 Non ALS: 0	Yes	-			
002	MW02	insufficient water column to sample	28/04/2021 12:11 PM	Water	ALS: 0 Non ALS: 0	Yes	-			
003	MW03		28/04/2021 12:50 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	MW04		28/04/2021 12:03 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	MW05		28/04/2021 11:21 AM	Water	ALS: 4 Non ALS: 0	No		X		
006	MW06		28/04/2021 09:52 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	MW07		28/04/2021 10:40 AM	Water	ALS: 4 Non ALS: 0	No		X		
008	QC108	field duplicate	28/04/2021 12:53 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	QC208	forward to eurofins	28/04/2021 12:56 PM	Water	ALS: 4 Non ALS: 0	No		X		

Subcon / Forward Lab / Split WO
 Lab / Analysis: _____
 Organised By / Date: Eurofins
 Relinquished By / Date: _____
 Connote / Courier: _____
 WO No: ES2115803
 Attach By PO / Internal Sheet: _____

Environmental Division
 Sydney
 Work Order Reference
ES2115803



Telephone: +61-2-874 1111





ALS Laboratory: ES Sydney

RECEIVED BY: *Kim*

DATE TIME: 29.04.21 9:30am

Other comments:

Wednesday, April 28, 2021 3:24:54 AM 3 of 3



ALS Laboratory: ES Sydney

RECEIVED BY: Am

DATE TIME:

SAMPLER MOBILE:
/ ES2020GHD SER0002

Other comments:

Total Bottle Count: ALS: 33, Non ALS: 1



ALS Compass
SAMPLING *Intelligence*



ALS Use Only

Custody Document for Submissions via ALS Compass App

Project: Darwin Turf Club Client: CHD Project Manager: Tim Murphy
Phone: (0499 056 068)
ALS Compass COC Reference: 21170 # Samples: 10 Sampler: Tim Murphy
Phone: (0499 056 068)

Turnaround Requirements: Standard / Urgent /

Special Instructions:

product sample analysis to be advised

ALS Use Only

Custody seal intact? YES NO N/A

Free ice / frozen ice bricks upon receipt? YES NO N/A

Random sample temperature on receipt? 1.0 3.0 °C

Custody:

Relinquished by: <u>Tim Murphy</u>	Received by: <u>RLD</u>	Relinquished by:	Received by:
Date / Time: <u>28/4/21 13:15</u>	Date / Time: <u>1:15 pm</u> <u>28/04/21</u>	Date / Time:	Date / Time:

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2115803

Client : GHD PTY LTD Contact : MR TIM MURPHY Address : Level 7 24 Mitchell Street DARWIN NT, AUSTRALIA 0800 E-mail : tim.murphy@ghd.com Telephone : +61 08 89820151 Facsimile : +61 08 89821075 Project : Darwin Turf Club EPL Monitoring Order number : - C-O-C number : 21170 Site : Darwin Turf Club Sampler : TIM MURPHY, Zoe Abbott	Laboratory : Environmental Division Sydney Contact : Angus Harding Address : 277-289 Woodpark Road Smithfield NSW Australia 2164 E-mail : Angus.Harding@ALSGlobal.com Telephone : +61 2 8784 8555 Facsimile : +61-2-8784 8500 Page : 1 of 2 Quote number : ES2020GHDSE0002 (SY/010/20) QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 29-Apr-2021 07:30	Issue Date : 30-Apr-2021
Client Requested Due Date : 06-May-2021	Scheduled Reporting Date : 06-May-2021

Delivery Details

Mode of Delivery : Client Drop Off	Security Seal : Not Available
No. of coolers/boxes : ----	Temperature : 3.0' C - Ice present
Receipt Detail :	No. of samples received / analysed : 9 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Sample QC208 has been forwarded to Eurofins as per COC requested**
- **30/04/21: This is an updated SRN which indicates the analysis for sample 11 and 12.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

- *AU Certificate of Analysis - NATA (COA)	Email	tim.murphy@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	tim.murphy@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	tim.murphy@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	tim.murphy@ghd.com
- A4 - AU Tax Invoice (INV)	Email	tim.murphy@ghd.com
- Chain of Custody (CoC) (COC)	Email	tim.murphy@ghd.com
- Chromatogram (CHROM)	Email	tim.murphy@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	tim.murphy@ghd.com
- Electronic SRN for ESDat (ESRN_ESDAT)	Email	tim.murphy@ghd.com

CERTIFICATE OF ANALYSIS

Work Order	: ES2115803	Page	: 1 of 10
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Contact	: Angus Harding
Address	: Level 7 24 Mitchell Street DARWIN NT, AUSTRALIA 0800	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89820151	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 29-Apr-2021 07:30
Order number	: -	Date Analysis Commenced	: 01-May-2021
C-O-C number	: 21170	Issue Date	: 06-May-2021 17:10
Sampler	: TIM MURPHY, Zoe Abbott		
Site	: Darwin Turf Club		
Quote number	: SY/010/20		
No. of samples received	: 9		
No. of samples analysed	: 8		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				MW03	MW04	MW05	MW06	MW07
Sampling date / time				28-Apr-2021 12:20	28-Apr-2021 11:33	28-Apr-2021 10:51	28-Apr-2021 09:22	28-Apr-2021 10:10
Compound	CAS Number	LOR	Unit	ES2115803-003	ES2115803-004	ES2115803-005	ES2115803-006	ES2115803-007
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0003	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.013	0.009	0.164	0.010
Nickel	7440-02-0	0.001	mg/L	<0.001	0.020	<0.001	0.022	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.006	0.003
Zinc	7440-66-6	0.005	mg/L	<0.005	0.074	<0.005	0.206	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				MW03	MW04	MW05	MW06	MW07
Sampling date / time				28-Apr-2021 12:20	28-Apr-2021 11:33	28-Apr-2021 10:51	28-Apr-2021 09:22	28-Apr-2021 10:10
Compound	CAS Number	LOR	Unit	ES2115803-003	ES2115803-004	ES2115803-005	ES2115803-006	ES2115803-007
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	109	110	109	113	110
Toluene-D8	2037-26-5	2	%	121	120	120	118	115
4-Bromofluorobenzene	460-00-4	2	%	114	112	114	111	105



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				QC108 field duplicate	----	----	----	----
Sampling date / time				28-Apr-2021 12:23	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2115803-008	-----	-----	-----	-----
Result				----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

Sub-Matrix: **GROUNDWATER**
 (Matrix: **WATER**)

Sample ID

				QC108	----	----	----	----
				field duplicate				
Sampling date / time				28-Apr-2021 12:23	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2115803-008	-----	-----	-----	-----
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	112	----	----	----	----
Toluene-D8	2037-26-5	2	%	122	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	111	----	----	----	----



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

				QC308 rinsate	----	----	----	----
Sampling date / time				28-Apr-2021 12:29	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2115803-010	-----	-----	-----	-----
Result				----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

Sub-Matrix: **RINSATE**
 (Matrix: **WATER**)

Sample ID

				QC308 rinsate	----	----	----	----
Sampling date / time				28-Apr-2021 12:29	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2115803-010	-----	-----	-----	-----
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	109	----	----	----	----
Toluene-D8	2037-26-5	2	%	117	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	108	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	QC508 trip blank	----	----	----	----
Sampling date / time				28-Apr-2021 12:32	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2115803-011	-----	-----	-----	-----
Result				----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	111	----	----	----	----
Toluene-D8	2037-26-5	2	%	120	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	108	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Sub-Matrix: RINSATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order : **ES2115803**

Page : 1 of 5

Client : **GHD PTY LTD**

Contact : **MR TIM MURPHY**

Address : Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800

Telephone : +61 08 89820151

Project : Darwin Turf Club EPL Monitoring

Order number : -

C-O-C number : 21170

Sampler : TIM MURPHY, Zoe Abbott

Site : Darwin Turf Club

Quote number : SY/010/20

No. of samples received : 9

No. of samples analysed : 8

Laboratory : Environmental Division Sydney

Contact : Angus Harding

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 2 8784 8555

Date Samples Received : 29-Apr-2021

Date Analysis Commenced : 01-May-2021

Issue Date : 06-May-2021



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3656216)									
ES2115518-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.008	0.008	0.00	No Limit
ES2115751-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.004	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.013	0.013	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3656215)									
ES2115518-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES2115751-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3652933)									
ES2115755-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2115803-004	MW04	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3652933)									
ES2115755-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2115803-004	MW04	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3652933)									

Page : 3 of 5
 Work Order : ES2115803
 Client : GHD PTY LTD
 Project : Darwin Turf Club EPL Monitoring



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 3652933) - continued									
ES2115755-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES2115803-004	MW04	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



Method Blank (MB) and Laboratory Control Sample (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: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3656216)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.3	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	92.8	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	90.6	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.5	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.4	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3656215)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	100	83.0	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3651675)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	75.7	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	82.5	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	85.4	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3652933)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	90.6	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3651675)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	82.3	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	99.3	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	81.4	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3652933)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	94.4	75.0	127
EP080: BTEXN (QCLot: 3652933)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	95.6	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	103	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	103	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	108	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	90.5	70.0	120

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: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3656216)							
ES2115518-003	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	113	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	122	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	122	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	123	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	115	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	124	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	121	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3656215)							
ES2115518-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	102	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3652933)							
ES2115755-004	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	106	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3652933)							
ES2115755-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	107	70.0	130
EP080: BTEXN (QCLot: 3652933)							
ES2115755-004	Anonymous	EP080: Benzene	71-43-2	25 µg/L	106	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	114	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	116	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	115	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	114	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	101	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2115803	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR TIM MURPHY	Telephone	: +61 2 8784 8555
Project	: Darwin Turf Club EPL Monitoring	Date Samples Received	: 29-Apr-2021
Site	: Darwin Turf Club	Issue Date	: 06-May-2021
Sampler	: TIM MURPHY, Zoe Abbott	No. of samples received	: 9
Order number	: -	No. of samples analysed	: 8

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)		28-Apr-2021	----	----	----	04-May-2021	25-Oct-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC108 - field duplicate,							
QC308 - rinsate								
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)		28-Apr-2021	----	----	----	05-May-2021	26-May-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC108 - field duplicate,							
QC308 - rinsate								
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)		28-Apr-2021	01-May-2021	05-May-2021	✔	03-May-2021	10-Jun-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC108 - field duplicate,							
QC308 - rinsate								
Amber VOC Vial - Sulfuric Acid (EP080)		28-Apr-2021	05-May-2021	12-May-2021	✔	05-May-2021	12-May-2021	✔
MW03,	MW04,							
MW05,	MW06,							
MW07,	QC108 - field duplicate,							
QC308 - rinsate,	QC508 - trip blank							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
MW03, MW05, MW07, QC308 - rinsate	MW04, MW06, QC108 - field duplicate,	28-Apr-2021	01-May-2021	05-May-2021	✔	03-May-2021	10-Jun-2021	✔
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03, MW05, MW07, QC308 - rinsate,	MW04, MW06, QC108 - field duplicate, QC508 - trip blank	28-Apr-2021	05-May-2021	12-May-2021	✔	05-May-2021	12-May-2021	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
MW03, MW05, MW07, QC308 - rinsate,	MW04, MW06, QC108 - field duplicate, QC508 - trip blank	28-Apr-2021	05-May-2021	12-May-2021	✔	05-May-2021	12-May-2021	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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)							
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.



CHAIN OF CUSTODY

COC#: 21170

ALS Laboratory: ES Sydney

RELINQUISHED BY:

DATE TIME:

RECEIVED BY: *MR*

(Eurofins)

DATE TIME: *29/4/21 4 PM*

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: Darwin Turf Club EPL Monitoring

SITE: Darwin Turf Club

ORDER NO:

PROJECT MANAGER: Tim Murphy

PRIMARY SAMPLER: Tim Murphy

EMAIL REPORTS TO: GHDLabReports@ghd.com, Tim.murphy@ghd.com

EMAIL INVOICES TO: tim.murphy@ghd.com, accountsreceivableAU@ghd.com

CONTACT PH:

QUOTE NO: SY/010/20

SAMPLER MOBILE:

/ ES2020GHDSER0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

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:

11.6 °C

Other comments:

#791716

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Ground Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	MW01	well dry	28/04/2021 12:15 PM	Water	ALS: 0 Non ALS: 0	Yes	-			
002	MW02	insufficient water column to sample	28/04/2021 12:11 PM	Water	ALS: 0 Non ALS: 0	Yes	-			
003	MW03		28/04/2021 12:50 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	MW04		28/04/2021 12:03 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	MW05		28/04/2021 11:21 AM	Water	ALS: 4 Non ALS: 0	No		X		
006	MW06		28/04/2021 09:52 AM	Water	ALS: 4 Non ALS: 0	No		X		
007	MW07		28/04/2021 10:40 AM	Water	ALS: 4 Non ALS: 0	No		X		
008	QC108	field duplicate	28/04/2021 12:53 PM	Water	ALS: 4 Non ALS: 0	No		X		
009	<i>QC208</i>	<i>forward to eurofins</i>	28/04/2021 12:56 PM	Water	ALS: 4 Non ALS: 0	No		X		

Subcon / Forward Lab Split WO

Lab / Analysis:

Organised By / Date: *Eurofins*

Relinquished By / Date:

Connote / Courier:

WO No: *ES2115803*

Attach By PO / Internal Sheet:

Environmental Division
Sydney

Work Order Reference

ES2115803



Australia
Melbourne

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

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Perth

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Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle

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PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand
Auckland

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

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

Sample Receipt Advice

Company name: GHD Pty Ltd NT
Contact name: Tim Murphy
Project name: DARWIN TURF CLUB EPL MONITORING
Project ID: Not provided
Turnaround time: 5 Day
Date/Time received: Apr 29, 2021 4:00 PM
Eurofins reference: 791716

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Sample logged for TRH, BTEXN and 8 filtered metals as per previous reports. Please confirm if this analysis is correct.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Tim Murphy - Tim.Murphy@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection and proficiency testing scheme providers
reports.

Attention: **Tim Murphy**

Report **791716-W**
Project name **DARWIN TURF CLUB EPL MONITORING**
Received Date **Apr 29, 2021**

Client Sample ID			QC208
Sample Matrix			Water
Eurofins Sample No.			S21-Ap58038
Date Sampled			Apr 28, 2021
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	103
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	0.001
Lead (filtered)	0.001	mg/L	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001
Zinc (filtered)	0.005	mg/L	< 0.005

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 30, 2021	7 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 30, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 30, 2021	7 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 30, 2021	7 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Apr 30, 2021	28 Days

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800
Project Name: DARWIN TURF CLUB EPL MONITORING

Order No.:
Report #: 791716
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Apr 29, 2021 4:00 PM
Due: May 6, 2021
Priority: 5 Day
Contact Name: Tim Murphy

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Metals M8 filtered	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
Mayfield Laboratory - NATA Site # 25079							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	QC208	Apr 28, 2021	12:56PM	Water	S21-Ap58038	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	107			70-130	Pass	
TRH C10-C14	%	74			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	96			70-130	Pass	
Toluene	%	99			70-130	Pass	
Ethylbenzene	%	102			70-130	Pass	
m&p-Xylenes	%	103			70-130	Pass	
o-Xylene	%	100			70-130	Pass	
Xylenes - Total*	%	102			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	110			70-130	Pass	
TRH C6-C10	%	112			70-130	Pass	
TRH >C10-C16	%	73			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	105			80-120	Pass	
Cadmium (filtered)	%	106			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium (filtered)			%	107			80-120	Pass	
Copper (filtered)			%	108			80-120	Pass	
Lead (filtered)			%	106			80-120	Pass	
Mercury (filtered)			%	107			80-120	Pass	
Nickel (filtered)			%	112			80-120	Pass	
Zinc (filtered)			%	107			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S21-Ap57932	NCP	%	121			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S21-Ap57932	NCP	%	106			70-130	Pass	
Toluene	S21-Ap57932	NCP	%	112			70-130	Pass	
Ethylbenzene	S21-Ap57932	NCP	%	116			70-130	Pass	
m&p-Xylenes	S21-Ap57932	NCP	%	113			70-130	Pass	
o-Xylene	S21-Ap57932	NCP	%	115			70-130	Pass	
Xylenes - Total*	S21-Ap57932	NCP	%	113			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S21-Ap57932	NCP	%	106			70-130	Pass	
TRH C6-C10	S21-Ap57932	NCP	%	122			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	P21-Ap28748	NCP	%	84			75-125	Pass	
Cadmium (filtered)	P21-Ap28748	NCP	%	89			75-125	Pass	
Chromium (filtered)	P21-Ap28748	NCP	%	86			75-125	Pass	
Copper (filtered)	P21-Ap28748	NCP	%	85			75-125	Pass	
Lead (filtered)	P21-Ap28748	NCP	%	91			75-125	Pass	
Mercury (filtered)	P21-Ap28748	NCP	%	105			75-125	Pass	
Nickel (filtered)	P21-Ap28748	NCP	%	90			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S21-Ap58102	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S21-Ap58102	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S21-Ap58102	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S21-Ap58102	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S21-Ap58102	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S21-Ap58102	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S21-Ap58102	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S21-Ap58102	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S21-Ap58102	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	P21-Ap28739	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	P21-Ap28739	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	P21-Ap28739	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	P21-Ap28739	NCP	mg/L	0.001	< 0.001	57	30%	Fail	Q15

Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Lead (filtered)	P21-Ap28739	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Mercury (filtered)	P21-Ap28739	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Nickel (filtered)	P21-Ap28739	NCP	mg/L	0.005	0.004	3.0	30%	Pass
Zinc (filtered)	P21-Ap28739	NCP	mg/L	1.6	1.6	<1	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Emily Daos	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Appendix D

Calibration Certificates

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-115206



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓	10.6 ev			
Connectors	Condition	✓				
Sensor	PID	✓				
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading	
PID Lamp		100ppm Isobutylene	NIST	190793	100.3ppm	

Calibrated by:

Andrew Boyd

Calibration date:

12/04/2021

Next calibration due:

9/10/2021

Oil / Water Interface Meter

Instrument Geotech Interface Meter (30M)
Serial No. 3916



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	8.8V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: _____ Josep Tomas

Calibration date: 05-Feb-21

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 20F1622172



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		329027	2.76mS
2. Temp		18			18
3. pH 4		pH 4.00		330734	pH 4.00
4. pH 7		pH 7.00		330737	pH 7.00
6. DO		0.0ppm		10465	0.0ppm
7. ORP		245mV		333082/329762	245 mV
8. Turbidity		0NTU		Dist.H2O	0.0NTU
9. Turbidity		100NTU		332244	100NTU
10. Turbidity		1000NTN		20A20030022	1000NTU

Calibrated by: _____ Anoop Kumar

Calibration date: 12/04/2021

Next calibration due: 12/05/2021



ghd.com

➔ The Power of Commitment

Appendix B

2020-2021 Annual Return Form

ANNUAL RETURN

Information on this form is required in accordance with the conditions of your licence or approval issued under part 5 of the *Waste Management and Pollution Control Act* or part 7 of the *Water Act*.

Failure to provide the information requested on this form and/or the provision of false or misleading information is an offence under the legislation and you may be liable to heavy penalties.

LICENCE/APPROVAL NO.	EPL218
REPORTING PERIOD	01/09/2020 - 31/08/2021

Section 1. Licence/Approval Holder Details

Please check your business details and contact details including 24 hour emergency response in NT EPA online and/or on page one of your licence.

Are these details correct?

☒ Yes Go to Section 2

☐ No Please correct your details by updating in NT EPA Online or complete the table below.

Licence holder	
Legal Entity Name:	
ABN:	
Registered Business Address:	
Postal Address:	
Contact Person:	
Position Title:	
Contact Details:	
b/h:	
mobile:	
email:	
Location of premises	
Address:	
24 hour emergency response	
Position Title:	
phone:	
mobile:	

Section 3. Report of Non-compliance

Please supply the following details for each non-compliance not reported to the NT EPA identified in Section 2. Use a separate page for each non-compliance.

The date and time of the non-compliance.
When the non-compliance was detected and by whom.
The actual and potential causes and contributing factors to the non-compliance.
The risk of environmental harm arising from the non-compliance.
The action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance.
Corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur.
If no action was taken, why no action was taken.

9th October 2020

Chief Executive Officer
Northern Territory Environment Protection Authority
GPO Box 3675
Darwin NT 0801

BY EMAIL: Waste.NTEPA@nt.gov.au

Dear Chief Executive Officer

**RE: Darwin Turf Club Fannie Bay Racecourse – EPL218 Monitoring
GME and Air Monitoring Report – October 2020
Non-Compliance Notification**

In accordance with your Department's instruction under Environmental Licence Number (EPL) 218 as per clause 35, the NT EPA is to be notified as soon as practicable after becoming aware of the non-compliance.

This is being done upon receipt today of Darwin Turf Club Fannie Bay Racecourse GME and Air Monitoring Report – October 2020 in relation to the track conditioning activities undertaken in September 2020 in accordance with the Environmental Protection Licence (EPL) 218 requirements for the site.

Some parameter exceedances for groundwater were detected and have been summarised in sections 5 and 6 of the report and the notifiable non-compliances summarised in the tables below.

Table 1 – Notifiable exceedances

Well ID	Three consecutive exceedance of trigger values	Exceedance by three times trigger value		Date and Time	
		GME 4	GME 5	GME 4	GME 5
MW03	pH, DO, EC, copper, zinc	DO, copper	DO, turbidity, copper	8/9/2020 10:53 AM	16/09/2020 10:06 AM
MW04	pH, DO, EC, cadmium, copper, nickel, zinc	DO, EC, turbidity, copper, nickel, zinc	DO, EC, turbidity, cadmium, copper, nickel, zinc	8/9/2020 11:37 AM	16/09/2020 11:05 AM
MW05	Copper, zinc	Copper	Copper	8/9/2020 12:11 PM	16/09/2020 11:44 AM
MW06	pH, DO, copper	DO, copper, zinc	DO, copper	8/9/2020 12:55 PM	16/09/2020 11:57 AM
MW07	pH, DO, EC, copper, zinc	DO, EC, Copper	DO, EC, copper	8/9/2020 01:42 PM	16/09/2020 01:24 PM

As per clause 35 of the EPL, the EPA is to be notified as soon as practicable after becoming aware of the non-compliance. With clause 36 detailing the information to be including in the notification to the EPA. Below is clause 36 and the information to be included for each item.

Clause 36: The licensee must include in the notification of non-compliance the following information:

36.1 When the non-compliance was detected and by whom;

When: Sampling completed for GME 4 on 8 September 2020, with Laboratory results received 15 September 2020. GME 5 on 16 September 2020, with laboratory results received on 23 September 2020

Whom: GHD undertook the sampling, with ALS the testing Laboratory

36.2 The date and time of the non-compliance;

Date and time: Refer to above

36.3 The actual and potential causes and contributing factors to the non-compliance;

Causes and contributing factors:

pH, DO and turbidity: Naturally occurring levels in the groundwater

EC: Monitoring well MW04 location in a tidally influence area/zone

Metals: Potential leaching from the natural ground.

36.4 The risk of environmental harm arising from the non-compliance;

There is little to no risk of environmental harm from the non-compliances

36.5 The action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;

Non-compliance documented and plans to continue monitoring, as per EPL218, to monitor levels.

36.6 Corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and

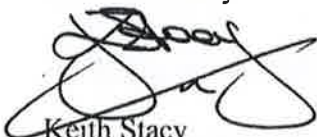
Non-compliance documented and plans to continue monitoring, as per EPL218, to monitor levels.

36.7 If no action was taken, why no action was taken.

N/A

Should you have any questions in relation to this please contact me without hesitation.

Yours sincerely



Keith Stacy

Chief Operating Officer

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Table 2 **Notifiable exceedances values for three consecutive exceedances**

Well ID	Parameter/Analyte	pH	DO	EC	Turbidity	Copper	Nickel	Zinc
	Trigger value	6.0-8.0	80-110	20-250	2-15	0.0018	0.013	0.005
	Unit	pH units	%Sat.	µS/cm	NTU	mg/L	mg/L	mg/L
MW03	Wet season GME	5.60	-0.3	529	2197			
	GME 6	5.22	0.5	481.1	0.79	Nil	Nil	Nil
	GME 7	5.21	0.8	491.5	1.80			
MW04	Wet season GME	4.52	-2.39	20,888	63.10	0.018	0.142	0.571
	GME 6	5.63	26.8	7,055	0.83	0.010	0.025	0.095
	GME 7	5.53	20.2	8,828	1.63	0.013	0.020	0.074
MW05	Wet season GME				1.27	0.007		
	GME 6	Nil	Nil	Nil	1.96	0.011	Nil	Nil
	GME 7				0.67	0.009		
MW06	Wet season GME	4.32	20.2			0.007		
	GME 6	4.90	7.4	Nil	Nil	0.005	Nil	Nil
	GME 7	4.97	1.8			0.164		
MW07	Wet season GME	4.07	25.6	1,710		0.007		
	GME 6	4.46	20.5	281.8	Nil	0.010	Nil	Nil
	GME 7	4.45	31.6	331.4		0.010		

Table 3 **Notifiable exceedances for three times the trigger value**

Parameter/Analyte	EC		Copper		Zinc	
	GME 6	GME 7	GME 6	GME 7	GME 6	GME 7
Trigger value	20-250		0.0018		0.005	
Unit	µS/cm		mg/L		mg/L	
MW03	Nil	Nil	0.011	Nil	Nil	Nil
MW04	7,055	8,828	0.010	0.013	0.095	0.074
MW05	Nil	Nil	0.011	0.009	Nil	Nil
MW06	Nil	Nil	Nil	0.164	Nil	0.206
MW07	Nil	Nil	0.010	0.010	Nil	Nil

Should you have any questions in relation to this please contact the undersigned.

Yours faithfully



Brad Morgan
Chief Executive Officer

