ENVIRONMENTAL AUDIT

Fannie Bay Racecourse
20 Dick Ward Drive, Fannie Bay, Northern Territory

Prepared for:

Darwin Turf Club Incorporated
20 Dick Ward Drive
Fannie Bay NT 0820

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Darwin Turf Club Incorporated (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Reviewed & endorsed by Environmental Auditor	Authorised for SLR issue
680.30070.00000-R01-v3.0	21 June 2021	Julie McDowell	Anthony Lane	Paul Turyn
680.30070.00000-R01-v2.0	31 May 2021	Julie McDowell	Anthony Lane	Paul Turyn
680.30070.00000-R01-v1.0	28 May 2021	Julie McDowell	-	Paul Turyn

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1 Introduction

1.1 Background & Auditor Endorsement

SLR Consulting Pty Ltd (SLR) was engaged by Darwin Turf Club Incorporated (DTC) to conduct an environmental audit in response to the Notice to Carry Out Environmental Audit Program (the Notice) that was issued to the DTC by the Northern Territory (NT) Environment Project Authority (EPA) on 23 February 2021. In accordance with the Notice, a qualified person pursuant to Section 67 of the Environment Protection Act has reviewed and endorsed this report, namely Mr Anthony Lane, a person accredited by EPA Victoria as an Environmental Auditor.

The Environmental Audit report was issued to the NT EPA on 31 May 2021 (reference: 680.30070.00000-v2.0). This version of the Environmental Audit report addresses comments provided by the NT EPA in their email dated 3 June 2021. Where amendments to the Environmental Audit Report have been made, the text has been highlighted.

The DTC currently operates and manages the Fannie Bay Racecourse located at 20 Dick Ward Drive, Fannie Bay, NT (the site), which has been hosting horse racing events since May 1955. The site is located approximately 4 km north of Darwin's Central Business District (CBD) and covers an area of approximately 43 hectares.

The location of the site is shown in Figure 1 and further detail is provided in Table 1.

Figure 1 Site Location

Table 1 Site Description

Fannie Bay Racecourse	
Address	20 Dick Ward Drive, Fannie Bay, NT
Parcel	Lot 5298, Town of Darwin
Title	CUFT Volume 844 Folio 164
Plan	Survey Plan S79/109
Council	Darwin City Council
Zoning	Organised Recreation (OR)
Owner	Darwin Turf Club Incorporated (Crown Lease Perpetual)
Area	430,000 m^2

As part of the operation and maintenance program of the Fannie Bay Racecourse, the DTC applies a waste mixture/emulsion of oil and water or hydrocarbon and water (waste oil mixture) to the racetrack's sandy surface twice a year (April and September). This application conditions the racetrack's surface to ensure an even, uniform and stable track surface, which is integral for the safety of both horses and riders. In addition to this six-monthly application, the racetrack is maintained by rotovating the track twice a week and tilling daily after each morning's training session.

Waste oil application to the surface of the racetrack has historically occurred for many years at the Fannie Bay Racecourse, and prior to the issuance of an Environment Protection Licence (EPL) by the NT EPA. Until approximately 10 years ago, waste sump oil was used to condition the racetrack. Now a refined waste oil product is applied to the racetrack's surface and consists of:

- six parts engine oil;
- four parts cooking oil; and
- a small fraction of pine oil concentrate.

The waste oil mixture is considered "refined" as the oil has been polished whereby hydrocarbons are separated from potential sediment and water in the mix, and then settled in a pond followed by air-sparging to minimise the odour produced when the refined waste oil mixture is used.

The refined waste oil mixture is supplied and applied directly to the racetrack's surface by a licenced listed waste handler (Cleanaway Operations Pty Ltd, Cleanaway). By engaging the supplier to apply the refined waste oil mixture directly to the racetrack's surface negates the need for DTC to store and/or handle the mixture at the site thereby reducing associated risks.

The volume of waste oil mixture used during each application (each April and September) ranges from 25 to 35 m^3, depending on track conditions. The racetrack to which the waste oil mixture is applied, is 18 m wide by approximately 2,000 m long, with a total area of 36,000 m^2. The resulting application rate ranges from approximately 0.7 to 0.97 L/m^2.

The DTC commissioned samples of the waste oil mixture to be collected and tested in May 2012 with key results summarised in Table 2.

Table 2 Waste Oil Mixture Characterisation

Analyte	Concentration (mg/kg)
Total recoverable hydrocarbon (TRH) C_6-C_9	4,000
TRH C_{10}-C_{14}	53,000
TRH C_{15}-C_{28}	160,000
TRH C_{29}-C_{36}	57,000
TRH C_{10}-C_{36} (Total)	270,000
Benzene	<5
Toluene	190
Ethylbenzene	67
Ortho-Xylenes	120
Meta-, and para-Xylenes	260
Xylenes (ortho-, meta- and para-)	380
Laboratory description (TPH fingerprint analysis): Comparison of the sample chromatogram with the chromatograms of various standard products suggests that the sample is a mixture of diesel and motor oil or a similar hydrocarbon product.	

Source: Mgt-Labmark report no. 335793a included in Appendix A of the Fannie Bay Racecourse, Environmental Management Plan for the Application of Used Oil, GHD Pty Ltd, May 2012 (ref.: 43/21851/32370).

A soil sample of the racetrack was collected in October 2011 after waste oil was applied to the surface in September 2011. The results of this soil sample are summarised in Table 3.

Table 3 Racetrack Surface Soil Sample Results

Analyte	Concentration (mg/kg)
Arsenic	9.2
Chromium (total)	20
Copper	7.4
Lead	69
Zinc	45
Cadmium, mercury, nickel	Non-detect
BTEX compounds (benzene, toluene, ethylbenzene, xylenes)	Non-detect
TPH C_6-C_9	<20
TPH C_{10}-C_{14}	100
TPH C_{15}-C_{28}	6,500
TPH C_{29}-C_{36}	7,500
Total TPH C_{10}-C_{36}	14,000

Source: Report for Environmental Monitoring Darwin Turf Club, GHD Pty Ltd, November 2011 (ref: 43/21851/32045).

1.2 Relevant Statutory Instruments

The application of the refined waste oil mixture to the surface of the Fannie Bay Racecourse's racetrack is to be undertaken in accordance with the following.

- The EPL 218, issued by the NT EPA (a copy has been included in Appendix A).
- The Fannie Bay Racecourse Environmental Management Plan (EMP) for the Application of Used Oil, prepared in May 2012 by GHD Pty Ltd (GHD) (document reference: 43/21851/32370) (the EMP).
- Other relevant regulatory requirements and legislation applicable to this activity

1.2.1 Environment Protection Licence 218

The waste oil mixture used to condition the racetrack is classified as a listed waste as per Table 1 of the Waste Management and Pollution Control Act 1998 (the WMPC Act). Collecting, transporting, storing, re-cycling, treating, or disposing of a listed waste on a commercial or fee for service basis, other than in or for the purpose of a sewage treatment plant, is a Schedule 2 Activity under the WMPC Act and as such persons/companies undertaking these activities are required to obtain an EPL.

In this respect, through the issuance of EPL 218 the NT EPA has authorised DTC to undertake the following scheduled activities as defined under the WMPC Act.

- Collecting, transporting, storing, re-cycling, treating, or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of a sewage treatment plant.
- Operating premises, other than a sewage treatment plant, associated with collecting, transporting, storing, re-cycling, treating, or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis.

Specifically, EPL 218 permits the "application of waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water by disposal to Darwin Turf Club Fannie Bay Racecourse for the purpose of conditioning the track twice yearly."

There are 45 conditions and an additional 50 sub-conditions (total 95) in EPL 218, which have been assessed for compliance in this audit.

1.2.2 Fannie Bay Racecourse Environmental Management Plan

As per condition 8 of the EPL 218, the DTC is required to implement the Fannie Bay Racecourse EMP.

The objectives of the EMP are as follows.

- Provide management procedures for the application of the waste oil mixture to the racetrack to minimise environmental impacts.
- Outline monitoring requirements to demonstrate whether the application of the waste oil mixture to the racetrack was causing adverse impacts to the receiving environment.
- Provide a framework to allow regular reviews and continual improvements of the activity's environmental performance.

The current EMP was finalised in May 2012. The EMP has not been reviewed since its initial implementation.

1.2.3 Other Applicable Regulatory Requirements

In addition to the above, the following regulatory requirements and guidelines are also relevant to the racetrack's operations.

- Australia and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Government and Australian state and territory governments, 2018. (ANZG 2018).
- Environment Protection Act 2019 and Environment Protection Regulations 2020.
- Environment Protection (National Pollution inventory) Objective 2004.
- Environmental Offences and Penalties Act 1996 and Environmental Offences and Penalties Regulations 2011.
- National Environment Protection Council (NEPC) National Environment Protection (Air Toxics) Measure 2004 (AT NEPM 2004).
- NEPC National Environment Protection (Ambient Air Quality) Measure 1998, revised 2015 (AA NEPM 2015).
- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999, revised 2013 (ASC NEPM 2013).
- National Environmental Protection Council (Northern Territory) Act 1994.
- Planning Act 1999 and Planning Regulations 2000.
- Public and Environmental Health Act 2011 and Public and Environmental Health Regulations 2014.
- Waste Management and Pollution Control Act 1998 (the WMPC Act) and Waste Management and Pollution Control (Administration Regulations) 1998.
- Water Act 1992 and Water Regulations 1992.
- Work Health and Safety (National Uniform Legislation) Act 2011 and Work Health and Safety (National Uniform Legislation) Regulations 2011.

1.3 Audit Purpose, Objectives and Scope

The purpose of the environmental audit program is to formally address the Notice issued to the DTC by the NT EPA on 23 February 2021, and to assess the environmental risk and potential environmental harm that may have occurred as a result of conditioning the surface of the racetrack twice a year through the application of a refined waste oil mixture.

The objectives of the environmental audit program are as follows.

- Assess current operations to ensure they are being conducted in compliance with relevant statutory instruments applicable to the site.
- Review the adequacy of the monitoring program that has been developed for the site to detect environmental harm and offsite environmental impact to surface water, groundwater and residents from air/odour emissions.
- Assess the environmental risk of the licenced activities undertaken at the site to cause offsite migration of contamination (in particular waste oil).
- Identify areas for improvement within the current operations as they relate to the identification, management, mitigation and monitoring of potential environmental impacts.

- Determine the extent to which improvements comply with respect to the WMPC Act, the conditions of EPL 218 and NT EPA approved Fannie Bay Racecourse EMP.
- Undertake an options assessment of alternative techniques that could be used to condition the racetrack's surface, in addition to the current practice of applying the refined waste oil mixture to the track twice a year.
- Assess the environmental risk that potential alternatives identified in the options assessment would have to understand whether existing risks would be reduced if implemented.

1.4 Audit Methodology

1.4.1 Audit Procedure

The methodology for the audit consisted of the following steps.

- Pre-Audit preparation, background scoping and document review.
- Site inspection by a member of the audit team and follow-up communications with key DTC staff on 27 April 2021.
- Review of relevant documentation provided by DTC staff.
- DTC's review and comment on the draft audit report.

1.4.2 Pre-Audit Preparation, Background Scoping and Document Review

A draft audit framework template was prepared based on the relevant conditions of EPL 218 and requirements of the EMP and used as part of the audit process.

The Darwin Turf Club – EPL Monitoring, GME and Air Monitoring Report, prepared by GHD, dated October 2020 (GHD 2020) was provided to SLR and was reviewed in preparation for the audit.

1.4.3 Site Inspection

A site inspection was undertaken by a suitably qualified and experienced member of the SLR environmental audit team (Julie McDowell – Principal Environmental Engineer) when Cleanaway, engaged by the DTC, applied 30 kL of waste oil/emulsion to the racetrack surface on the morning of 27 April 2021. The site inspection with photography included:

- a visual verification of the environmental controls that were implemented during the application;
- an inspection of the racetrack surface prior to and after the application;
- an inspection of the stormwater drainage lines; and
- a subjective odour assessment at the boundaries of the site during the application.

Photographs taken during the site inspection are included in Appendix C.

2 References and Documents Reviewed

Table 4 summarises the documents reviewed or referred to during the preparation of this audit report.

Table 4 References and Documents Reviewed

Document Description	Date
Report for Environmental Monitoring Darwin Turf Club (GHD)	November 2011
Darwin Turf Club Fannie Bay Racecourse Environmental Management Plan for the Application of Used Oil (GHD)	May 2012
Environment Protection Licence 218 (NT EPA)	2017
EPL 218 Annual Return (DTC)	2019-2020
Darwin Turf Club Fannie Bay Racecourse Wet Season Groundwater Monitoring, Quarterly Monitoring Report No. 1 – February 2020, Non-compliance Notification	February 2020
Darwin Turf Club Fannie Bay Racecourse EPL 218 Monitoring GME and Air Monitoring Report - May 2020, Non-compliance Notification	May 2020
Darwin Turf Club – EPL Monitoring, GME and Air Monitoring report (GHD)	October 2020

3 Review of Monitoring Data

A review of monitoring data was undertaken as part of this audit, for the purposes of determining whether the application of the refined waste oil mixture is causing potential groundwater and/or air quality impacts.

3.1 Groundwater Quality Data Review

There are seven groundwater monitoring wells located around the racetrack and are shown in Figure 2. Attachment A of EPL 218 states that groundwater "monitoring is to be conducted quarterly to include a representative sample of the dry season and the wet season, and a sample within two weeks prior to and within 48 hours following application of the waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water to the racetrack considering the application of waste is undertaken in April and September of each year of this licence."

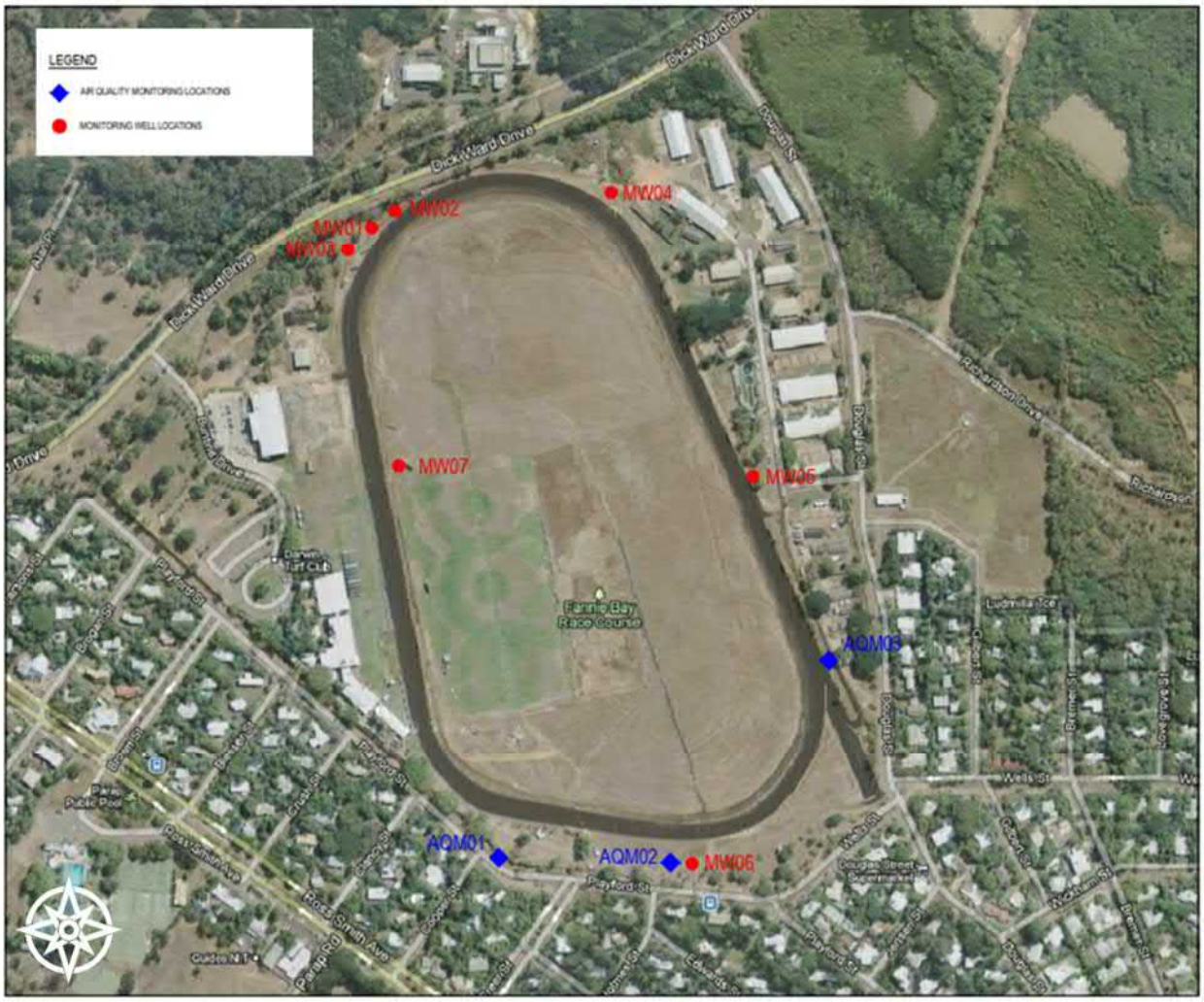

Figure 2 Groundwater and Air Quality Monitoring Locations

The range of groundwater quality parameters recorded during all monitoring events conducted at the site (i.e. October 2011, and January, April (x2), August and September (x2) 2020) are summarised against the EPL trigger values in Table 5.

Table 5 Summary of Groundwater Monitoring Results

Parameter	Trigger Values	MW1	MW2	MW3	MW4	MW5	MW6	MW7
Physical Characteristics								
pH	6.0-8.0	6.25	5.45-5.86	4.67-6.80	4.52-6.53	5.59-6.28	4.32-5.61	4.07-5.71
Temperature (°C)	NA	32.5	34.2-34.8	30.2-33.9-	31.9-33.6	31.0-33.1	31.7-35.0	30.8-33.2
Dissolved Oxygen (% saturation)	80-110	59.6	5.6-27.4	0-56.6	0-58.8	69.3-96.8	1.43-69.4	1.3-75.8
Electrical Conductivity (uS/cm)	20 – 250	503	490.1-528.0	406.4-1,534	558-20,888	93.6-112.0	103.9-353.4	176.4-2,599
Turbidity (NTU)	2 – 15	Not sampled	*	1.00-2,197	4.56-301.9	0.00*-4.86	0.60-12.10	0.00*-35.96
Heavy Metals								
Arsenic (mg/L)	0.094	0.002	<0.001-0.002	<0.001 – 0.001	<0.001-0.003	<0.001-0.003	<0.001	<0.001-0.011
Cadmium (mg/L)	0.0004	<0.0002	<0.0001-0.0003	<0.0001	0.0001-0.0015	<0.0001	<0.0001	<0.0001-0.0004
Chromium (mg/L)	0.006	<0.001	<0.001	<0.001	<0.001-0.001	<0.001	<0.001	<0.001
Copper (mg/L)	0.0018	<0.001	<0.001-0.011	<0.001-0.012	<0.001-0.018	<0.001-0.009	<0.001-0.016	<0.001-0.009
Lead (mg/L)	0.0056	<0.001	<0.001-0.001	<0.001-0.001	<0.001-0.026	<0.001-0.005	<0.001-0.001	<0.001-0.011
Mercury (mg/L)	0.0019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (mg/L)	0.013	<0.001	<0.001-0.010	<0.001-0.009	0.014-0.142	<0.001-0.009	<0.001-0.010	<0.001-0.010
Zinc (mg/L)	0.015	0.038	<0.005-0.113	0.005-0.048	0.052-0.571	<0.005-0.062	<0.005-0.065	0.012-0.062
BTEX Compounds								
Benzene (mg/L)	0.3	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene (mg/L)	0.3	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ethylbenzene (mg/L)	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Xylenes (mg/L)	0.075	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Hydrocarbons								
Total TPH C_{10}-C_{36} (mg/L)	0.6	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

*turbidity values reported were below zero, indicating a potential issue with the water quality meter.

Shaded cells with bolded text highlight instances where groundwater quality results exceed the trigger values specified in EPL 218.

Only one round of monitoring samples has been collected from MW1 due to an apparent blockage in the well.

The following observations were noted when reviewing the groundwater data collected at the site to date.

- The earliest groundwater quality data available for review is from October 2011, when GHD was commissioned to conduct soil, groundwater and air quality monitoring at the Fannie Bay Racecourse. Baseline data does not appear to exist for groundwater conditions beneath the Fannie Bay Racecourse, prior to the waste oil mixture being applied to the surface of the racetrack (date unknown as to when this activity commenced).
- The investigation works involved the following.
    - Installation of five additional groundwater monitoring wells positioned around the racetrack (MW03 – MW07).
    - Collection and analysis of soil samples from the bores when installing the monitoring wells and from the racetrack surface itself.
    - Collection of groundwater samples from the two existing wells (MW1 and MW2) and the five newly installed wells (MW3-MW7).
- Based on a review of the monitoring well bore logs (GHD 2011), groundwater appears to be within the claystone lithology located beneath the site and is encountered at depths ranging from approximately 3.2 to 4.3 m below ground level (bgl).
- The elevation of the monitoring wells' top of casing do not appear to be surveyed. As a result, groundwater flow direction cannot be determined, which limits an assessment on the potential fate and transport of groundwater impact beneath the Fannie Bay Racecourse.
- Conditions 37.1 and 37.2 of EPL 218 states that a licence non-compliance occurs when a trigger value has been exceeded at the authorised monitoring points on three consecutive occasions and/or when the parameter measures greater than or equal to three times the trigger value. Non-compliances have been reported to the NT EPA with respect to groundwater quality and are as follows.
    - pH – MW3, MW4, MW6 and MW7.
    - Dissolved oxygen – MW3, MW4, MW6 and M7
    - Electrical conductivity – MW3, MW4 and MW7
    - Cadmium – MW04
    - Copper – all wells sampled.
    - Nickel – MW04
    - Zinc – MW03, MW04, MW05 and MW07.
- It should be noted that the trigger values specified in the EPL 218 for pH, dissolved oxygen, electrical conductivity and turbidity typically represent surface water environments. When assessing these parameters for potential degradation of groundwater quality, comparisons to background measurements or reference sites' measurements (where background data is not available), are typically undertaken.
- A review of the physiochemical conditions of the groundwater system beneath the Fannie Bay Racecourse is provided below.

  - Overall, decreases in pH levels have been consistent across the site with fluctuations noted between monitoring events in the majority of wells. However, evidence of consistent decreases in pH levels are noted in monitoring wells MW4, MW6 and MW7. Monitoring well MW4 is located next to the north eastern bend of the racetrack, MW7 is located next to the western section of the racetrack and MW6 is located to the south. Based on site topography and location of nearby surface water bodies, it has been assumed that MW6 is the up-gradient well for monitoring purposes (i.e. more likely to be indicative of natural groundwater conditions).
  - As expected, dissolved oxygen levels within the groundwater system are below the levels accepted for a healthy surface water system. This would be expected in many natural groundwater systems, even in the absence of groundwater impact. Variations in dissolved oxygen levels beneath the site are important when assessing whether the groundwater system is conducive to or shows evidence of, microbial degradation of groundwater contamination, and whether it is occurring under anaerobic or aerobic conditions.
  - Electrical conductivity readings reported beneath the site are indicative of a freshwater to brackish groundwater system. The trigger values specified in the EPL 218 are for freshwater systems only. The higher electrical conductivity readings are reported in the monitoring wells located in the northern and western portions of the site (MW3, MW4 and MW7), and are likely to be influenced by Ludmilla Creek (north, mangrove/brackish waters) and Darwin Harbour (west, marine environment).
  - Turbidity readings appear to fluctuate between the monitoring events with no clear trend. However, higher turbidity readings are expected in claystone groundwater systems due to its fine particulate nature.
- During the October 2011 monitoring event, only one total recoverable hydrocarbon (TRH) concentration (MW1 – 0.8 mg/L) was reported above the EPL 218 trigger value (0.6 mg/L). Monitoring well MW1 is located to the northwest of the racetrack. Monitoring well MW1 has not been sampled since the October 2011 sampling event due to what appears to be a blockage in the well. Monitoring wells MW2 and MW3 are also located to the northwest of the racetrack near MW1. Groundwater samples were not collected from monitoring well MW2 during the October 2011 sampling event as this well was dry. However, samples were able to be collected from this well in January and April 2020, after the wet season. Groundwater samples collected from monitoring wells MW2 and MW3 did not detect any TRH.
- TRH and BTEX compounds (benzene, toluene, ethylbenzene and xylenes) were not detected in any of the groundwater samples collected during the 2020 monitoring events. This suggests that the application of waste oil emulsion to the surface of the racetrack has not resulted in the migration of hydrocarbon impact down into the groundwater table beneath the site.
- Heavy metal impact was recorded in two monitoring wells during the October 2011 monitoring event. Lead concentrations were detected above the EPL 218 trigger value in groundwater samples collected from monitoring wells MW4 and MW7, and zinc was also detected above the trigger value in MW4. Monitoring well MW4 is located to the north east of the racetrack and monitoring well MW7 is located next to the western section of the racetrack, both are considered to be downgradient of the waste oil emulsion application activity.
- Heavy metal impact was also recorded above the trigger values in groundwater samples collected from monitoring wells MW2 (copper, zinc), MW3 (copper, zinc), MW4 (cadmium, copper, nickel, zinc), MW5 (copper, zinc), MW6 (copper, zinc) and MW7 (copper, zinc, lead) during at least one of the monitoring events conducted in 2020. Monitoring well MW6 is located to the south of the racetrack and considered to be a reference site (i.e. upgradient) for groundwater conditions beneath the Fannie Bay Racecourse. The remaining wells are downgradient/across gradient of the waste oil emulsion application activity.

- Although copper (7.4 mg/kg), lead (69 mg/kg) and zinc (45 mg/kg) were detected in the soil sample collected from the racetrack surface in October 2011, the concentrations detected were below the maximum concentrations typically accepted when assessing whether soil could be considered natural excavated material (NSW EPA ENM 2014). Cadmium and nickel were not detected in the soil sample collected from the racetrack surface. Therefore, based on available information, the racetrack soil quality does not appear to be an obvious source of metal impact detected in groundwater beneath the Fannie Bay Racecourse.
- Trends in metal concentrations detected above the nominated trigger values are shown in the charts included in Appendix D. Heavy metal impact (cadmium, copper, nickel and zinc) appears to be increasing in groundwater samples collected from monitoring well MW4. The consistent upward trend in metal impact noted in MW4 does not appear to correspond to when waste oil emulsion is applied to the racetrack, providing further evidence that another source may be the cause of impact detected in this well.

3.2 Air Quality Data Review

There are three registered air quality monitoring points, the locations of which are shown in Figure 2. Attachment C of EPL 218 states that air quality "monitoring [is] to be carried [out] during the application of waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water to the racetrack."

The range of air quality parameters recorded during all monitoring events conducted at the site (i.e. September 2011 (x2, prior to and during application), April and September 2020 are summarised in Table 6.

Table 6 Summary of Air Quality Monitoring Results

Analyte	EPL 218 Trigger Values	Date	AQM01	AQM02	AQM03
Benzene	3 ppb	16-Sep-2011 (prior)	<0.5 ppb	<0.5 ppb	4.6 ppb
	3 ppb	29-Sep-2011 (during)	<0.5 ppb	1.9 ppb	0.6 ppb
	0.010 (mg/m^3)*	27-Apr-2020 (during)	<0.003	<0.003	<0.003
	0.010 (mg/m^3)*	15-Sep-2020 (during)	<0.003	<0.003	<0.004
Toluene	1,000 ppb	16-Sep-2011 (prior)	2	1.3	23
	1,000 ppb	29-Sep-2011 (during)	3.6	16	7
	3.766 (mg/m^3)*	27-Apr-2020 (during)	0.0096	<0.0075	<0.0075
	3.766 (mg/m^3)*	15-Sep-2020 (during)	<0.0075	<0.0075	0.029
o-Xylene	250 ppb	16-Sep-2011 (prior)	<0.5	<0.5	1.8
	250 ppb	29-Sep-2011 (during)	0.7	4.5	2.5
	1.085 (mg/m^3)*	27-Apr-2020 (during)	<0.004	<0.004	<0.004
	1.085 (mg/m^3)*	15-Sep-2020 (during)	<0.005	<0.003	<0.005
m-&p-Xylenes	250 ppb	16-Sep-2011 (prior)	1.1	<1	8.9
	250 ppb	29-Sep-2011 (during)	2.1	13	5.9
	2.170 (mg/m^3)*	27-Apr-2020 (during)	<0.008	<0.009	<0.009
	2.170 (mg/m^3)*	15-Sep-2020 (during)	<0.009	<0.007	<0.01

*Trigger values converted from parts per billion (ppb) to mg/m^3 (GHD, October 2020).

The following observations were noted when reviewing the air quality data collected at the site to date.

- Only benzene has been detected at concentrations above the EPL 218 trigger values. Benzene was detected in an air quality sample collected at monitoring point AQM01 during the 2011 monitoring event conducted prior to the application of the waste oil mixture. It should also be noted that benzene was not detected in the waste oil sample or the soil sample collected from the racetrack and is therefore not considered to be associated with the application of waste oil to the surface of the track.
- Toluene was detected in samples collected from one of the three monitoring points during the 2020 monitoring events, however the concentrations reported were below the EPL 218 nominated trigger values.
- No analytes have been detected above the EPL 218 trigger values during the application of the waste oil mixture.
- Monitoring locations are positioned between the racetrack and adjacent residents and therefore are considered suitable for the purpose of the monitoring program.

4 Audit Compliance

4.1 Assessing Compliance

As outlined in Section 1.4, the audit included a site inspection of the waste oil mixture activity, document review, and discussions with staff members on 27 April 2021. Compliance with EPL 218 and the EMP has been assessed based upon the evidence gathered during the audit.

The terms used in the audit to describe the level of compliance with the relevant statutory instruments have been determined in accordance with the definitions provided in Table 7 and Table 8. These tables outline appropriate audit terminology (assessment criteria and risk levels) expected for internal and external environmental audits.

Table 7 Compliance Assessment Criteria

Assessment	Criteria
COMPLIANT	Where the auditor has collected sufficient verifiable evidence to demonstrate that the intent and all elements of the requirement of the regulatory approval have been complied with within the scope of the audit.
NOT VERIFIED	Where the auditor has not been able to collect sufficient verifiable evidence to demonstrate that the intent and all elements of the requirement of the regulatory approval have been complied with within the scope of the audit. In the absence of sufficient verification the auditor may in some instances be able to verify by other means (visual inspection, personal communication, etc.) that a requirement has been met. In such a situation, the requirement should still be assessed as not verified. However, the auditor could note in the report that they have no reasons to believe that the operation is non-compliant with that requirement.
NON-COMPLIANT	Where the auditor has collected sufficient variable evidence to demonstrate that the intent of one or more specific elements of the regulatory approval have not been complied with within the scope of the audit.
ADMINISTRATIVE	A technical non-compliance with a regulatory approval that would not impact on performance and that is considered minor in nature (e.g. exceedance of an air quality limit) or where a requirement had not been met at all (e.g. maintenance of a complaints log has not been undertaken but details of complaints received are readily available when requested).
NOT TRIGGERED	A regulatory approval requirement has an activation or timing trigger that had not been met at the time of the audit inspection, therefore a determination of compliance could not be made.
OBSERVATION	Observations are recorded where the audit identified issues of concern which do not strictly relate to the scope of the audit or assessment of compliance. Further observations are considered to be indicators of potential non-compliances or areas where performance may be improved.
NOTE	A statement or fact, where no assessment of compliance is required.

Table 8 Risk Level of Non-compliance

Risk Level	Colour Code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium		Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur.
Low		Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur.
Administrative Non-Compliance		Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).

4.2 Environment Protection Licence 218

The 45 conditions of EPL 218 have been reviewed for compliance during this audit. The evidence reviewed, compliance level and associated risk, as well as comments and recommendations have been included in Table 9.

4.3 Environmental Management Plan

The requirements of the EMP have been assessed for compliance as part of this audit. The evidence reviewed, compliance level and associated risk, as well as comments and recommendations have been included in Table 10.

Table 9 Compliance with EPL 218

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
GENERAL					
1	The licensee must ensure the contact details recorded on NT EPA Online for this licence are correct at all times.	NT EPA website:	Compliant	DTC confirmed that the contact details currently seen on the NT EPA website are correct. Mr Brad Morgan Chief Executive Officer P: 08 8923 4222 M: 0418 809 049 E: bmorgan@darwinturfclub.org.au A: GPO Box 589, Darwin NT 0820	N/A
2	The licensee must at all times have a 24-hour emergency contact.	NT EPA website	Compliant	DTC confirmed that the emergency contact details that can currently viewed on the NT EPA website are correct.	N/A
3	The licensee must notify the NT EPA prior to making any operational change that will cause, or is likely to cause an increase in the potential for environmental harm.	N/A	Compliant	Operations as described in the EMP have not changed.	N/A
4	The licensee must pay the annual fee calculated in accordance with the method prescribed in the Regulations within 50 business days of the anniversary of the commencement date of this licence, for each year or part of a year that this licence is in force.	Tax invoice receipts for EPL yearly fees sighted for 2020 (2019 – 2020 Annual report).	Compliant	Viewed tax invoice received for 2020.	N/A
5	The licensee must cause a copy of this licence to be available for inspection by any person, in hard copy form, at the premises.	Correspondence	Compliant	DTC confirmed that a hard copy of the licence is included in the office.	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
6	The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.	DTC staff request	Administrative	Site personnel communicated that monitoring data was unable to be provided to the NT EPA when requested in early 2020 as monitoring had not been completed. Monitoring has since commenced, and the May 2020 and October 2020 GME and Air Quality Monitoring reports have been provided to the NT EPA (submitted 14 May 2021).	Update monitoring plan to include monitoring events beyond 2020.
7	All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).	Documents uploaded to the NT EPA Online portal included: 1. 2019 – 2020 Annual report. 2. Annual report includes copies of non-compliance notices (emails) provided to the NT EPA during the 2019 – 2020 year. 3. Darwin Turf Club – Fannie Bay Racecourse EMP for the Application of Used Oil, GHD, May 2012.	Administrative	1. Annual reports for 2017 – 2018 & 2018 – 2019 time periods have not been uploaded to the website. 2. Annual report for 2019-2020 has been uploaded to the website. 3. Annual environmental monitoring reports are to be uploaded once prepared.~~3. Annual environmental monitoring reports are to be uploaded once prepared.~~	Upload Annual reports for missing periods. Upload annual environmental monitoring reports once prepared.~~Upload annual environmental monitoring reports once prepared.~~
8	The licensee must implement, maintain and follow the document "Fannie Bay Racecourse Environmental Management plan for the Application of Used Oil (Document Ref. 43/21851/32370).	Current EMP sighted and reviewed.	Administrative	DTC is compliant with the EMP other than that noted in this audit report.	Close out gaps identified in this audit.
9	Within 10 business days of any amendment being made to the document mentioned in 8 above, the licensee must provide the amended document to the NT EPA along with following evidence (9.1,9.2,9.3):	N/A	Not triggered.	DTC confirmed that the EMP has not been amended since it was originally provided to the NT EPA as part of the original EPL application.	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
9.1	a tabulated summary of the amendment(s) with document references;	N/A			
9.2	reasons for the amendment(s); and	N/A			
9.3	an assessment of environmental risk associated with the amendment(s).	N/A			
10	The NT EPA may require the licensee to revise or amend and resubmit any document relating to this licence. Where the NT EPA requires a document to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.	N/A	Not triggered	NT EPA has not requested a document to be revised.	N/A
11	The licensee must, for the duration of this licence, implement, maintain and follow a Consultation and Communication Plan which includes a strategy for communicating with persons who are likely to have a real interest in, or be affected by the activity.	Darwin Turf Club – Fannie Bay Racecourse EMP for the Application of Used Oil, GHD, May 2012. Letter templates used when notifying affected persons of activity (racetrack users and adjacent residents).	Compliant	Appendix E of the EMP contains the DTC's Consultation and Communications Plan. Site personnel confirmed that a "letter drop" was undertaken for neighbouring properties before the recent waste oil mixture application was undertaken on 27 April 2021.	N/A
12	The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.	Complaint Log not maintained. However, sighted email of the most recent complaint received.	Administrative	A complaint log has not been maintained by DTC however, all correspondence relating to complaints are kept on file (DTC correspondence). The most recent complaint relating to the licenced activity was originally directed to the NT EPA Pollution Response Line on 27 April 2021, the details of which were forwarded to DTC via an email dated 28 April 2021 from the NT EPA Acting Senior Environmental Authorisations Officer.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
13	The licensee must ensure that the Complaint Log includes, for each complaint received by the licence, the following information:	Complaint Log not maintained.	Administrative	Complaint log (template included in Appendix B of the EMP) has not been maintained, however details regarding the complaints can be recalled from emails kept on file.	Ensure Complaint Log template included in Appendix B (or similar) is maintained.
13.1	the person to whom the complaint was made;				
13.2	the person responsible for managing the complaint;				
13.3	the date and the time complaint was reported;				
13.4	the date and time of the event(s) that led to the complaint;				
13.5	the contact details of the complainant if known, or where no details are provided a note to that effect;				
13.6	the nature of the complaint;				
13.7	the nature of event(s) giving rise to the complaint;				
13.8	prevailing weather conditions at the time (where relevant to the complaint);				
13.9	the action taken in relation to the complaint, including any follow-up contact with the complainant; and				
13.10	if no action was taken, why no action was taken.				

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
14	The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.	Emergency Response Plan, Fannie Bay Racecourse, SLR, June 2021 (reference: 680.30070.00000-R02.	Compliant (changed from "Not Verified")	Since the environmental audit, DTC has prepared an emergency response plan specifically to manage potential issues that may arise during the application of waste oil to the surface of the racetrack. Cleanaway~~,~~ has also provided copies of their spill response procedures that would be followed in the event an incident occurred during the activity.	Ensure that key site personnel have reviewed and understood its requirements of the Emergency Response Plan and that it is fully implemented at the site.
EARLY SURRENDER OF LICENCE					
15	Any reports, records or other information required or able to be provided by the licensee under this licence must be submitted to the NT EPA prior to the licensee surrendering the licence. If the date on which a report, record or other information is required falls after the date the licensee requests to surrender this licensee, the licensee must provide the report, record or information as far as possible using data available to the licensee up to and including the date the request to surrender the licence is made.	N/A	Not triggered.	Licence remains current.	N/A
OPERATIONAL					

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
16	The licensee must, without limiting any other condition of this licence, in conducting the activity, do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives as declared from time to time, including those applying to Darwin Harbour Region.	Reviewed available groundwater monitoring data.	Compliant	Monitoring results indicates that the Declared Beneficial Uses and Objectives of the Darwin Harbour Region have not been affected by the application of waste oil mixture to the surface of the racetrack.	Continue with current groundwater monitoring program. Consider including an inspection of stormwater drains during/after the first rainfall event that occurs at the site after the waste oil mixture has been applied and the collection of stormwater samples from the drains.
17	The licensee must not collect, transport, store, recycle, treat or dispose of listed waste other than the listed waste (waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water) specified in Table 1 of the EPL.	Site inspection/site communications.	Compliant	Site inspection did not reveal the storage of any additional listed wastes for the purpose of recycling, treatment or disposal at the site. Waste oil mixture used for the licenced activity is not stored at site. Volumes required for each application is transported to site via a licenced listed waste service provider (Cleanaway) and applied directly to the surface of the racetrack thereby negating the need to store or handle the material by DTC staff.	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
18	The licensee must ensure any plant and equipment used by the licensee in conducting the activity meet following requirements (18.1, 18.2, 18.3):	Site inspection, site communications.	Compliant	To reduce environmental risks associated with the storage, handling and application of waste oil mixtures to the racetrack's surface, DTC has engaged a licensed listed waste service provider (Cleanaway) to transport the required volume to site and then apply it directly to the surface of the racetrack in accordance with the controls stipulated in the Fannie Bay Racecourse EMP. Waste oil mixture is not stored at the site nor is it handled by DTC staff. The activity of disposing the waste oil mixture to the surface of the racetrack is supervised by DTC staff.	N/A
18.1	is reasonably fit for the purpose and use to which it is put;			Purpose built trucks supplied by Cleanaway were used to transport and apply the waste oil mixture to the surface of the racetrack.	
18.2	is maintained; and			No obvious maintenance issues were noted with the trucks used to transport and apply the waste oil mixture to the racetrack (i.e. no signs of leaks, black smoke, excessive noise).	
18.3	is operated by a person trained to use the plant and equipment.			Licenced drivers supplied by Cleanaway, EPL254, Listed Waste Handler, were used to transport and apply the waste oil mixture to the racetrack.	

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
19	The licensee must notify the NT EPA, two weeks in advance, of the proposed dates for the application of waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water to the track at the Fannie Bay Racecourse.	Notification letters.	Compliant	DTC provided examples of the notification letter templates used to notify NT EPA, residents and trainers using the facility of upcoming activities.	N/A
20	The licensee must ensure that all listed waste being transported to the premises is transported by a person licenced under section 30 of the WMPC Act to transport the listed waste.	NT EPA website.	Compliant	Cleanaway Operations Pty Ltd: EPL254, Listed Waste Handler.	N/A
DISCHARGES AND EMISSIONS					
21	The licensee must not allow a contaminate or waste, which causes or may cause environmental harm, to enter water.	Site inspection.	Compliant	Waste oil mixture was applied directly to the racetrack sandy surface. Average application rate was calculated to be less than 1L per m^2. Application rate did not result in the flow of waste oil mixture beyond the racetrack surface.	N/A
22	The licensee must ensure there is no migration or overflow of a contaminant or waste, which causes or may cause environmental harm, beyond the boundary of the land on which the premises are located. (For the avoidance of doubt, this condition is not intended to authorise the discharge of a contaminant or waste to any land or water which discharge has not been specifically authorised by another condition of this licence).	Site inspection and staff communications,	Compliant	As above. Air quality and groundwater monitoring results undertaken during 2020 did not identify any impact that would result in environmental harm being caused by the application of waste oil mixture to the surface of the racetrack.	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
23	The licensee must ensure that stormwater does not come into contact with a contaminant or waste, which causes or may cause environmental harm.	Site inspection (review surface water structures and drains).	Compliant	Racetrack is located proud of (above) the surrounding ground surface, thus minimising stormwater runoff from other areas of the site entering the track. Prior to the application of waste oil mixture on 27 April, the last significant (>3mm) rainfall event occurred on 10 April (18.8mm, Darwin Airport, Bureau of Meteorology (BOM) website). Rain was experienced on 29 April (35.2mm, Darwin Airport, BOM website), and none has been experienced at the site since then (at the time this audit report was written 14 May 2021).	N/A
24	The licensee must ensure that discharges from the premises do not cause following problems (24.1, 24.2, 24.3, 24.4, 24.5, 24.6):	Site inspection.	Compliant	Refer to individual notes below.	N/A
24.1	Contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter.			Site inspection conducted on 27 April 2021, did not observe any obvious hydrocarbon sheen or hydrocarbon odour within the stormwater drains. Only two pieces of litter were noted in the drain in the north eastern portion of the site (near the horse stables), otherwise the drains were relatively free from debris (leaves were noted).	
24.2	Cause or generate odours which would adversely affect the use of surrounding waters.			No odours noted in the stormwater drains.	
24.3	Cause visible change in the behaviour of fish or other aquatic organisms in the receiving water.			As expected, fish were not present in the stormwater drains. No observable signs of impact that could cause potential impact to fish within receiving the environment were noted in the drains.	

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
24.4	Cause algal blooms in the receiving water.			No observable signs of impact that could cause potential algae blooms were noted in the stormwater drains.	
24.5	Cause mortality of fish or other aquatic organisms.			No observable signs of impact that could cause potential impact to fish within the receiving environment were noted in the stormwater drains.	
24.6	Cause adverse impacts on plants.			No distressed plants were noted next to the stormwater drains.	
25	The activity must not cause or release, beyond the boundary of the premise offensive odour.	Site inspection.	Compliant*	Site inspection undertaken at the site on the morning of 27 April 2021 did not note any obvious, strong offensive hydrocarbon odours beyond the boundary of the premises. A slight hydrocarbon odour was detected at the south western corner of the site (near Playford Street) albeit at very low levels. A light hydrocarbon odour (similar to canola oil) was noted whilst standing next to the race track when waste oil mixture was being applied. Odour was not noted at the eastern, southern, western and northern boundaries. *Notwithstanding the above, a compliant was received on 27 April 2021 by a resident located near Crush Street (via the NT EPA Pollution Hotline). Details of the complaint were forwarded by NT EPA to DTC on 28 April 2021.	*Continue air quality monitoring and implementation of the Odour Management Plan included in the EMP.

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
MONITORING					
26	The licensee must conduct air and groundwater monitoring at the authorised monitoring points in accordance with Chapter 5 Risk Management and Appendix C GHD Environmental Monitoring Report November 2011 ("the Monitoring Plan") of the EMP and as per Attachment A - 2017-2018 Groundwater Monitoring Schedule, Attachment B – 2018-2020 Groundwater Monitoring Schedule and Attachment C – Air Monitoring Schedule of this licence.	Records of air quality and groundwater monitoring	Non-compliant	Air quality and groundwater monitoring is undertaken at the authorised monitoring points, although samples can not be collected from one of the monitoring wells (MW1) due to a blockage. Air quality and groundwater monitoring were not performed as per the schedule outlined in Attachment A during the 2017/2018 period (no monitoring was conducted this year). Air quality and groundwater monitoring was not conducted during the period 1 September 2018 to August 2019 (as required in Attachment B of the EPL). However, air quality and groundwater monitoring was undertaken in 2020 at the site as per the schedule outlined in Attachment B. To make up for this lack of monitoring DTC is conducting additional monitoring in 2021 to enable sufficient data to be collected to assess whether the application of waste oil mixture is causing an adverse impact to air quality and groundwater conditions.	Conduct additional monitoring in 2021 and 2022 to ensure sufficient trend data is available to assess groundwater conditions beneath the site. Ensure wells are surveyed to enable a basic hydrogeological assessment to be included in the reports to assess potential groundwater migration, potential fate and transport of chemicals detected, potential connections between groundwater, surface waters and stormwater. Consider the replacement of MW01 if the well can not be unblocked. Consider including additional contaminants of potential concern in the groundwater analytical suite such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons and per-and polyfluoroalkyl substances (PFAS) (given potential primary sources of oil received by Cleanaway).

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
					Consider including stormwater monitoring in the plan to demonstrate that the activity is not causing an impact to stormwater runoff leaving the site. Consider analysing waste oil sample annually for TPH, BTEX, PCBs, chlorinated hydrocarbons and PFAS to ensure potential contaminants of concern are reflected in the air quality and groundwater monitoring program.
27	The NT EPA may require the licensee to revise or amend and resubmit the Monitoring Plan. Where the NT EPA requires the Monitoring Plan to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.	Record of any revisions or amendments to the monitoring plan.	Not triggered.	NT EPA has not requested a document to be revised to date.	N/A
28	The licensee must ensure that any proposed revisions to the Monitoring Plan (other than typographical changes or revisions to formatting or referencing) undergo following stages (28.1, 28.2, 28.3):	Record of any proposed revisions to the monitoring plan.	Not triggered.	Monitoring plan outlined in the EMP has not been updated at the time of this audit.	N/A
28.1	Reviewed by a suitably Qualified person, who must produce a written report about their review.				
28.2	Submitted to the NT EPA with justification for revisions.				

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
28.3	Submitted to the NT EPA, in both hard copy and electronic form (with a complete copy of the Qualified person's written review), 20 business days prior to the proposed implementation date.				
29	The licensee must ensure that all monitoring samples are analysed at a laboratory with current NATA accreditation or equivalent, for the parameters to be measured.	Records of sample collection and testing. Laboratory quality control assurance and quality control documentation.	Compliant	Groundwater samples are submitted to ALS (primary lab) and Eurofins (secondary lab) who are both NATA accredited for the analyses requested. Air quality samples are submitted to Eurofins who is NATA accredited for the parameters analysed.	N/A
30	The licensee must ensure any samples collected in accordance with the Monitoring Plan or in connection with the activity or this licence, are obtained by, or under the supervision of a Qualified sampler.	Monitoring reports.	Compliant	DTC commissioned GHD to undertake air quality and groundwater monitoring at the site. GHD is a recognised and reputable environmental consultancy.	N/A
31	The licensee must ensure that, for each sample collected in accordance with the Monitoring Plan or the activity the following information (31.1, 31.2, 31.3, 31.4, 31.5, 31.6, 31.7) must be recorded and retained:	Monitoring reports.	Compliant	Required information contained within the monitoring reports prepared by GHD.	N/A
31.1	The date on which the sample was collected.				
31.2	The time at which the sample was collected.				
31.3	The location at which the sample was collected.				
31.4	The name of the person who collected the sample.				
31.5	The chain of custody forms relating to the sample.				

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
31.6	The field measurements (if any) and analytical results (if any) relating to the sample.				
31.7	Laboratory quality assurance and quality control documentation.				
RECORDING AND REPORTING					
32	The licensee must keep and maintain records relating to the activity undertaken and the listed waste handled by the licensee in each successive 12-month period following the commencement of this licence, which include followings (32.1, 32.2, 32.3, 32.4, 32.5):	Staff communications.	Compliant	DTC was able to retrieve information on the volume of waste oil received from Cleanaway and the date that the material was applied to the track.	N/A
32.1	the source of the listed waste;				
32.2	the name of the transport company, if not the licensee;				
32.3	a description of the listed waste;				
32.4	the quantity of the listed waste;				
32.5	whether the listed waste was stored, recycled, treated or disposed of.				
33	The licensee must retain records relating to waste, including listed waste, as required by the conditions of this licence, for a period of 2 years after the end of the 12-month period to which the record relates.	Staff communications.	Compliant	DTC was able to retrieve information on the volume of waste oil received for the two events in 2018 from Cleanaway and the date that the material was applied to the track.	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
34	The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.	Records of non – compliances.	Compliant	Non-compliances have occurred with respect to groundwater monitoring. Details of these non-compliances were outlined in the environmental monitoring report prepared by GHD (GHD October 2020). Details of the non-compliances are also provided in the Annual Report uploaded to the NT EPA website.	N/A
35	The licensee must notify the NT EPA of any non-compliance with this licence by completing the Non-Compliance Notification via NT EPA Online (or by emailing waste@nt.gov.au), as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance	Evidence of non – compliance notification.	Compliant	Viewed notifications of non-compliances to NT EPA. Copies included in the Annual Report uploaded to the NT EPA website.	N/A
36	The licensee must include in the notification of non-compliance the following information (36.1, 36.2, 36.3, 36.4, 36.5, 36.6, 36.7):	Records of any/all non-compliances.	Compliant	Viewed notifications of non-compliances issued to the NT EPA. Copies included in the Annual Report uploaded to the NT EPA website.	N/A
36.1	When the non-compliance was detected and by whom.				
36.2	The date and time of the non-compliance.				
36.3	The actual and potential causes and contributing factors to the non-compliance.				
36.4	The risk of environmental harm arising from the non-compliance.				
36.5	The action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance.				

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
36.6	Corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur.				
36.7	If no action was taken, why no action was taken.				
37	A non-compliance with this licence includes following: (37.1, 37.2):	Records of any/all non-compliances.	Information Only	No action required. Purpose of this condition is to clearly outline what the NT EPA considers to be a non-compliance.	N/A
37.1	An exceedance of a trigger value specified in Attachment A, B or C at an authorised monitoring point specified in Attachment A, B and C on three consecutive sampling occasions.				
37.2	An exceedance of a trigger value specified in Attachment A, B or C at an authorised monitoring point specified in Attachment A, B and C on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.				
38	The licensee must keep records of all exceedances of trigger values specified in Attachment A, B or C. These records must be adequate to enable the licensee to comply with the exceedance notification conditions of this licence.	Monitoring report.	Compliant	Details of the non-compliance are included in the Monitoring report prepared by GHD (GHD, 2020).	N/A
39	The licensee must submit a completed Annual Return via NT EPA Online within 10 business days after each anniversary date of this licence, which report relates to the preceding 12-month period.	Annual return for 2019/20 viewed online.	Compliant	Annual report submitted on 9 September 2020, which is within 10 business days of the anniversary date of the EPL 218 (1 September).	N/A

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
40	The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.	Monitoring reports	Administrative (changed from "Compliant"	A monitoring report prepared for the 2020 sampling period was submitted to the NT EPA on 14 May 2021. It should be noted that the monitoring reports submitted by DTC to the NT EPA to date do not meet the requirements of an annual environmental monitoring report. An annual environmental monitoring report is to include the following. • The report will need to include details of all the EPL related monitoring undertaken at the Site within the 12month period. Currently the reports provided to date, primarily details and assesses the results of monitoring undertaken for one waste oil application event, and not an assessment of the results obtained for the year. The reports should also include an analysis of trends (both spatial and temporal) for the year and a comparison to previous monitoring data.	Prepare and submit an annual environmental monitoring report for results from the August/September 2020 monitoring events, and the results from the March/April 2021 monitoring event. Ensure that the annual environmental monitoring report include an analysis of trends (both spatial and temporal) for the year and a comparison to previous monitoring data.

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
				• Given the timing of the operational works undertaken at the Fannie Bay Racecourse, and the monitoring activities specified in the EMP, the annual environmental monitoring report will include (at a minimum for each year) the results from the August/September monitoring event from the previous year, and the results from the March/April monitoring event of the current year. This report is due to the EPA 10 business days after each anniversary data of the licence (i.e. the report is due around 14 September of each year). • The annual environmental monitoring report is to be prepared in accordance with the NT EPA guidelines (https://ntepa.nt.gov.au/__data/assets/pdf_file/0006/284856/guideline_reporting_env_monitoring.pdf).	
41	The licensee must ensure that each Monitoring Report obeys followings (41.1, 41.2, 41.3, 41.4):	Monitoring reports.	Administrative	Monitoring reports prepared by GHD and includes all the aspects listed below except for trend analysis. Given that only one year of analytical results have been obtained to date, any trend analysis would be limited.	Extend the monitoring program into 2021 and 2022. Include trend analyses in the Monitoring report.
41.1	is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';			Report is prepared in general accordance with the requirements of the NT EPA.	

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
41.2	includes a tabulation of all monitoring data required as a condition of this licence;			Monitoring records conducted in 2020 have been tabulated and included in Appendix B of the Monitoring report prepared by GHD (GHD 2020). Does not include data from the 2011 environmental monitoring event.	Ensure wells are surveyed to enable a basic hydrogeological assessment to be included in the reports to assess potential groundwater migration, potential fate and transport of chemicals detected, potential connections between groundwater, surface waters and stormwater. Consider the replacement of MW01 if the well can not be unblocked. Consider including additional contaminants of potential concern in the groundwater analytical suite such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons and per-and polyfluoroalkyl substances (given potential primary sources of oil received by Cleanaway). Consider including stormwater monitoring in the plan to demonstrate that the activity is not causing an impact to stormwater runoff leaving the site.
41.3	includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available); and			Trend analysis not included in the Monitoring report prepared by GHD.	
41.4	includes an assessment of environmental impact from the activity.			Included in the Monitoring Plan.	

Condition Number	Condition	Evidence Reviewed	Compliance Rating	Comments	Recommended Action
42	The NT EPA may require the licensee to revise or amend and resubmit any Monitoring Report. Where the NT EPA requires the Monitoring Report to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.	NT EPA communications – email 3 June 2021	Compliant (changed from "Not triggered")	According to correspondence proved by NT EPA (email 3 June 2021): "DTC were requested to revise and resubmit a track conditioning monitoring report to detail further information on groundwater and air quality sampling methodology and discussion on environmental risk. Correspondence was sent to Keith Stacy and copied to Brad Morgan. Amended reports were requested to be provided by 26 October 2020. They were received by the date specified."	N/A
PERFORMANCE IMPROVEMENT					
43	As per the Conclusions and Recommendations of the Monitoring Plan, the licensee must conduct an investigation into the possible alternative substances to waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water for use in conditioning the track at the Fannie Bay Racecourse.	Investigation reports of possible alternatives for treating the track surface.	Compliant	DTC commissioned SLR to undertake this review as part of conducting the Environmental Audit.	Consider trialling alternative substances identified in the investigation when developing second training track.
44	The investigation of alternative substances, as per condition 43, should be based on the reduced risk they will pose to the environment and human health compared to the use of waste oil.	Investigation reports of possible alternatives for treating the track surface.	Compliant	As above	As above.
45	The licensee must include an investigation report to address requirements of conditions 43 and 44, to be submitted to the NT EPA with the first Monitoring Report in accordance with condition 40.	Investigation reports of possible alternatives for wastes	Administrative	Investigation report was not provided with the first monitoring event.	Submit investigation report prepared to satisfy Conditions 43 and 44.

Table 10 Compliance with EMP

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Emergency Procedure, page 1				
The DTC Project and Operations Manager will provide written details of the notification to the DTC Chief Operating Officer who must forward the written report to NT EPA (formerly referred to NRETAS) within 24 hours of the date(s) on which the incident occurred.	Staff communications.	Not triggered	None	N/A
DTC employees and contractors are required to report all environmental incidents as soon as they become aware of them.	Staff communications.	Not triggered	None	N/A
Any significant environmental incidents/accidents or major breaches of undertakings during the application of used oil or tilling of the track must be reported to NRETAS as soon as possible.	Staff communications.	Not triggered	None	N/A
Section 2.3 Staff Involvement				
All personnel engaged in the application of oil to the site must read and understand the EMP and acknowledge their understanding by signing the acknowledgement form.	Staff communications.	Administrative	Key site personnel are aware of the EMP's existence, however signing of the acknowledgment form was not sighted.	Ensure personnel involved in the application of waste oil mixture acknowledge their understanding of the EMP via signing the Acknowledgement Form in Appendix G.
Section 2.4 Incident Reporting Procedures and Timeframes				
All incidents (including near miss incidents) occurring at the site must be immediately reported to the Project and Operations Manager.	N/A	Not triggered	None.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
If there is an incident, which creates an immediate risk to the surrounding environment requiring an emergency response, the Project and Operations Manager will contact a suitably qualified hazardous materials contractor to contain the issue and mitigate the risk, as far as possible.	N/A	Not triggered	None.	N/A
Following the emergency response actions, the Project and Operations Manager should engage a suitably qualified environmental professional to assess the extent of impact to the environment and propose appropriate remedial actions to mitigate the risk to an acceptable level.	N/A	Not triggered	None.	N/A
Contact details of the Project and Operations Manager will be distributed to adjoining neighbours.	NT EPA website.	Compliant	As per EPL 218 conditions, emergency contact details are available on the NT EPA website.	
Section 5.3 Odour Sub-management Plan				
Application of oil and tilling operations to take place in the early morning / night-time hours when temperatures are lowest and the wind is calm in order to minimise potential odour generation.	Site inspection, staff communications.	Administrative	On 27 April 2021, application of waste oil mixture commenced at approximately 6:30am and was completed within 2 hours. Based on site communications, tilling activities occurred for two days afterwards.	Review odour assessment results. If tilling during day light hours is not causing an offensive odour at neighbouring properties, assess whether the EMP needs to be revised to reflect actual site activities.

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Application of oil should only take place when winds are blowing away from residential properties or during times when wind speeds are less than 7.2 km/h (half annual average wind speed). The BOM website should be checked to confirm wind direction.	Site inspection, staff communications.	Non-compliant	On 27 April 2021, site personnel were asked if the weather forecast was considered before arranging for oil to be applied. They confirmed that they didn't for this event. At the time the oil was applied in the early hours of the morning, little to no wind was observed at the racetrack. BOM data reviewed from the nearest weather station (Darwin Airport) reported easterly south easterly winds at 9am and easterly winds at 3pm with a maximum velocity of 13 km/h.	Ensure personnel are aware of this requirement and document that weather conditions were considered when undertaking the activity. Consider installing a weather station at the site to document actual weather conditions experienced at the site during and after the application of waste oil mixture.
During application and two hours subsequently, mobile odour elimination units will be operated at the site. These units are to be placed at locations on the site boundary taking wind direction and sensitive receptors into account. The units will emit water vapour from a solution of an odour suppressant (eg nil-odour) mixed with potable water at a ratio of no less than 7.5 to 500 mL.	Site inspection.	Administrative	One mobile odour unit was observed to be following the truck applying the waste oil mixture.	Consider installing fixed odour units along the western boundary which will be between the racetrack and adjacent residents. Consider revising the EMP to reflect actual mitigation measures implemented.
Installation of wind vane to provide wind direction and speed.	Site inspection, staff communications.	Non-compliance	Weather vane has not been installed at the Site.	Weather vane that will provide wind direction and speed should be installed at the site. This will aid in addressing any odour complaints received from adjacent neighbours.

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
The Project and Operations Manager is to maintain a log of odour complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Staff communications.	Administrative	A complaint log has not been maintained by DTC however, all correspondence relating to complaints are kept on file (DTC correspondence). The most recent complaint relating to the licenced activity was originally directed to the NT EPA Pollution Response Line on 27 April 2021, the details of which were forwarded to DTC via an email dated 28 April 2021 from the NT EPA Acting Senior Environmental Authorisations Officer.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.
All non-conformances, incidents, corrective actions and complaints regarding odour are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints.	Staff communications.	Administrative	As above, a log of incidents, complaints, non-conformances regarding odour are not contained within a log. However, DTC were able to provide information relation to non-conformances (included in Annual Report uploaded to the NT EPA website) and complaints (correspondence files).	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.
An investigation into any incident or non-conformance is to be immediately undertaken by the Project and Operations Manager. The identified cause/s is/are to be rectified to prevent additional incidents or non-conformance. Results of the investigation are to be reported to the Chief Operating Officer.	Staff communications, monitoring reports.	Compliant	Non-compliances have occurred (albeit with respect to groundwater monitoring). Details of these non-compliances were outlined in the ~~environmental~~ monitoring reports prepared by GHD (GHD October 2020). Details of the non-compliances are also provided in the Annual Report uploaded to the NT EPA website.	N/A
In case of any further odour generation despite the above management controls being implemented, contingency measures defined by EMP should be considered.	Staff communications monitoring reports.	Compliant	Odour complaint was received during the 27 April 2021 application event despite the low odour levels noted at the boundary of the site.	Refer to the recommendations provided above.

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Section 5.4 Air Quality Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Should complaints regarding air quality be consistently made from residents, supplementary air quality monitoring will be undertaken to establish if concentrations pose a risk to human health.	Staff communications.	Not triggered	Complaints received to date have not been related to air quality.	N/A
Air sampling should be undertaken at the locations of, one Silco Canister to the north, two to the east, one to the south and two to the west, thereby enabling samples to be taken upwind and downwind of the track with any given wind direction; The samples should be taken between 1.2 and 1.5 metres above ground level, and in accordance with the methodology in the National Environmental Protection (Air Toxics) Measure over a 24 hour period.	Monitoring report and site inspection.	Compliant	Verified on 27 April 2021 that air quality monitoring was being conducted as per the monitoring plan. Canisters collected air quality samples had been set up to industry standards.	N/A
Monitoring results should be assessed against the National Environmental Protection (Air Toxics) Measure, 2004.	Monitoring reports.	Compliant	Monitoring reports refer to the appropriate investigation criteria specified in EPL 218.	N/A
Section 5.5 Light Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Activities which require lights are to be undertaken with minimum lighting required to carry out operations safely.	N/A	-	Activity being audited did not involve special lighting requirements.	N/A
Stray, non-directional lighting should be avoided during operations.	N/A	-	Activity being audited did not involve special lighting requirements.	N/A
Neighbouring residents to be informed of planned activities and lighting times.	N/A	-	Activity being audited did not involve special lighting requirements.	N/A
The Project and Operations Manager is to maintain a log of lighting outside of daylight hours.	N/A	-	Activity being audited did not involve special lighting requirements.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Should night-time operations cause unacceptable light pollution despite the above management controls, consideration should be given to changing plant/operating protocols. Strategic placement of light screens should also be considered.	N/A	-	Activity being audited did not involve special lighting requirements.	N/A
Section 5.6 Noise Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Noise mitigation measures should have been applied at the source, in the transmission path and at the noise receiver.	N/A	Information only	None.	N/A
Regular maintenance of equipment.	Site inspection	Compliant	Cleanaway vehicles used to apply waste oil to the racetrack did not commence until 6:30 am, travelled slowly around the racetrack, did not cause excessive noise. Engine appeared to be in good working order and no excessive noise was observed as a result of poor maintenance. Vehicle used to apply odour suppressant is a four-wheel drive utility. Mechanical noise from the odour suppressant unit (combustion engine, blower) was not considered excessive and due to the mobile nature of the unit, was not in one location long enough to cause a nuisance. Appeared to be good working order and no excessive noise was observed as a result of poor maintenance. Equipment used to till the waste oil mixture into the soil was not observed. It is understood that this is tractor with a grader. This action occurs during daytime hours and not considered likely to cause a noise related nuisance.	N/A
Consider alternative application methods	N/A	Not triggered	None.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Keeping neighbours informed of the activities.	Site communications, Notification letter templates.	Compliant	DTC provided examples of the notification letter templates used to notify NT EPA, residents and trainers using the facility of the upcoming activities.	N/A
Staff and contractors should be informed about noise and quiet work practises.	Site inspection.	Compliant	During the site inspection, staff appeared to be working in a manner to keep noise levels to a minimum. Minimal staff were involved in the activity itself. Whether specific instruction was provided to site personnel, was not verified.	N/A
The Project and Operations Manager is to maintain a log of noise complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Staff communications.	Administrative	A complaint log has not been maintained by DTC however, all correspondence relating to complaints are kept on file (DTC correspondence).	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.
In presence of inadequate noise mitigation and target achievements, contingency measures such as the erection of noise barriers and implementation of a noise monitoring program at the site boundary to assess exceedance levels should be considered.	N/A	Not triggered	None.	N/A
DTC should have the targets of having no reports of noise nuisance from neighbouring properties and adhering to noise limits as set by local regulatory authorities (on site machinery should have a maximum operating noise level of 85 A-weighted decibels (dBA) where possible and The LA10 (15 minutes) emitted by the works to specific residences should not exceed the LA90 background level by more than 20 dBA).	N/A	Not triggered	Excessive noise levels were not experienced at the site during the application of waste oil mixture to soil, as a result noise monitoring has not been required. Any general noise monitoring that may have been undertaken to address general operations are beyond the audit scope.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Section 5.7 Groundwater Quality Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Application of oil to be avoided immediately before or during heavy rain.	BOM data, site inspection.	Compliant	Prior to the application of waste oil mixture on 27 April, the last significant (>3mm) rainfall event occurred on 10 April (18.8mm, Darwin Airport). Rain was experienced on 29 April (35.2mm, Darwin Airport), and then none has been experienced at the site since then (at the time this audit report has been written 14 May 2021).	N/A
Machinery/plant used to maintain the track to be stored 20 m away from exposed drains and within bunded areas.	N/A	Compliant	Only equipment used in the application of waste oil mixture was included in the audit. Other equipment used to generally maintain the racetrack were not inspected. Waste oil mixture is applied by a third-party licenced waste transport and disposal company (Cleanaway) and equipment is not stored onsite.	N/A
No storage of used oil on site is preferred. However, if storage is required on site the storage should be surrounded by an impervious bund with a containment volume of 120% of the maximum possible spillage volume.	N/A	Not triggered	Waste oil mixture/emulsion used to treat the surface of the racetrack is not stored onsite nor handled by DTC staff.	N/A
A groundwater monitoring event should be carried out in all accessible monitoring wells at the site at a minimum frequency of once every five years. The monitoring should be carried out in accordance with the procedures and analysis described in the EMP.	Monitoring report.	Compliant	Groundwater monitoring frequency specified in the EPL 218 is greater than once every five years. Monitoring frequency specified in EPL 218 requires a groundwater monitoring event two weeks before the application of the waste oil mixture and another within 48 hours post application, for each application event.	N/A
If used oil is stored on site, the Project and Operations Manager is to conduct inspections of hydrocarbon storage areas monthly.	N/A	Not triggered	Waste oil mixture used to treat the surface of the racetrack is not stored onsite nor handled by DTC staff.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
If a spillage of used oil occurs or site conditions change (i.e. excessive surface erosions) a groundwater monitoring plan should be prepared and consideration given to carrying out additional groundwater monitoring events.	N/A	Not triggered	Groundwater monitoring frequency specified in the EPL 218 will determine if impact has occurred as a result of a spill that occurred during the treatment of the racetrack's surface.	N/A
All groundwater sampling results should be reported to NT EPA (previously known as the Department of NRETAS).	Monitoring report, staff communications.	Compliant	All available groundwater data has been provided to the NT EPA. The May 2020 and October 2020 GME and Air Quality Monitoring reports have been provided to the NT EPA (submitted 14 May 2021).	N/A
Monitoring results should be assessed against the National Environmental Protection (Assessment of Site Contamination) Measure and water quality investigation levels for freshwater ecosystems and drinking water levels for reference.	Monitoring report, EPL 218.	Compliant	Monitoring report assesses groundwater quality data against the trigger values specified in EPL 218.	Review EMP to reflect that groundwater data is to be assessed against the trigger values specified in EPL 218. Consider requesting an amendment to the trigger values to ensure that only those parameters representative of assessing groundwater impact are included (i.e. trigger values nominated for dissolved oxygen, turbidity levels, electrical conductivity are generally adopted for freshwater surface water systems, not groundwater systems where saltwater intrusion occurs for part of the site).

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Should the used oil application be identified to be impacting groundwater and causing exceedances of the nominated criteria, the following contingencies should be considered. • Using an environmentally safe alternative to the used oil; and • If an alternative cannot be sourced, consideration should be given to lining the track with an impermeable barrier to prevent downward migration of oil to groundwater. The track drainage would need to be modified so as to divert any impacted rainwater into an appropriate oil/water separator.	N/A	Not triggered	Groundwater data obtained to date does not provide any clear evidence that the application of waste oil mixture to condition the racetrack surface is occurring to the groundwater system beneath the site. Heavy metal impact (cadmium, copper, nickel and zinc) appears to be increasing in groundwater samples collected from monitoring well MW4 (located to the norther eastern bend of the racetrack). The consistent upward trend in metal impact noted in MW4 does not appear to correspond to when waste oil emulsion is applied to the racetrack, providing further evidence that another source may be the cause of impact detected in this well.	Undertake further groundwater investigations that assesses potential causes of metal impact detected in groundwater samples collected from monitoring well MW4. Include trends analyses in the groundwater assessment once adequate number of data points have been obtained.
Section 5.8 Surface Water and Erosion Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Installation of erosion and sediment control measures at drainage lines (potential installation of Stiff Grass Barriers surrounding concrete stormwater channels).	Site inspection	Administrative	Sediment controls have not been installed adjacent to the concrete drainage lines. Established grass verges are located on either side of swales/stormwater drainage lines leaving the site. No evidence of significant sediment build up was noted in the drains on 27 April 2021.	Consider reviewing the EMP to reflect current site practices. Consider including regular site inspections of stormwater drains and including stormwater samples in the site's monitoring program. This will assist in determining if application of waste oil mixture to the racetrack surface is impacting stormwater quality leaving the site.

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Monitoring results should be assessed against the National Environmental Protection (Assessment of Site Contamination) Measure Water Investigation Level for Freshwater Ecosystems and Drinking water levels for reference.	Monitoring reports Site inspection	Not triggered	Stormwater monitoring has not been conducted to date at the site. Site inspection of the drainage lines did not observe and hydrocarbon sheens or evidence of other potential pollutants.	Consider including regular site inspections of stormwater drains and including stormwater samples in the site's monitoring program. This will assist in determining if application of waste oil mixture to the racetrack surface is impacting stormwater quality leaving the site.
Should the identified control measures be ineffective, oil application should be postponed until the issue can be rectified.	N/A	Not triggered	None.	N/A
Section 5.9 Waste Management Sub-management Plan (note: only those requirements that haven't been addressed elsewhere have been included below)				
Spill kits to be maintained on site and relevant persons trained for the use of spill kit (outside tracked area).	N/A	Not verified	Staff communications suggests that DTC rely on Cleanaway's emergency response procedures and believe that spill kits are contained within their trucks.	Recommend requesting a copy of Cleanaway's Emergency Response procedures to understand whether they are sufficient to respond to a spill during the application of waste oil mixture to the racetrack's surface.
Waste generated to be disposed of offsite at an appropriately licensed facility.	N/A	Not triggered	Activity being audited did not involve the generation of waste.	N/A
The Site staff and Property and Operations Manager to monitor for spillage during application, delivery and transport.	Site inspection.	Compliant	Application of waste oil mixture to the surface of the racetrack was supervised by Cleanaway Operators and DTC staff.	N/A
All waste taken offsite is to be documented, details should include volume, type, characteristics and disposal location.	N/A	Not triggered	Activity being audited did not involve the generation of waste.	N/A

EMP Requirement	Documentation/Evidence Review	Compliance	Comments	Recommended Action
Section 6 Consultation and Communication Plan				
A Consultation and Communication Plan should have been prepared.	EMP	Compliant	A Consultation and Communication Plan is included in Appendix E of the EMP	N/A
Section 7 EMP Review				
EMP requires review and amendments during the life of the project.	N/A	Information only	None.	N/A
The EMP should be reviewed by the Project and Operations Manager as follows: • When there is a change in the application of oil or tilling of the track. • Following a significant environmental incident. • When there is a need to improve performance of an environmental parameter.	N/A	Not triggered	None.	Consider reviewing EMP to ensure it reflects current practices.
The review process should include an assessment of the environmental controls in place, consultation with site staff and neighbouring properties to make sure the plan remains effective. All reviews and changes made should be documented and versions kept for record purposes.	N/A	Information Only	None.	As above, consider reviewing EMP to ensure it reflects current practices.

5 Summary of Non-compliance

DTC has demonstrated a high level of compliance with the relevant statutory instruments, these being EPL 218 and the EMP. The non-compliances that were identified were generally found to be administrative or low risk level non-compliances. A summary of non-compliances with the relevant instruments have been provided in the following sections.

5.1 Environment Protection Licence 218

Table 11 summarises the identified non-compliances with EPL 218. A summary of the recommended actions to improve compliance with EPL 218 have been provided in Section 6.

Out of a total of 45 conditions, nine were identified as either non-compliant, not verified or an administrative non-compliance. The represents a compliance rate of 80%.

Table 11 Non-compliances with EPL 218

Condition No.	Condition	Risk Level of Non-compliance
6	The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.	Administrative
7	All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).	Administrative
8	The licensee must implement, maintain and follow the document "Fannie Bay Racecourse Environmental Management plan for the Application of Used Oil (Document Ref. 43/21851/32370).	Administrative
12	The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.	Administrative
13	The licensee must ensure that the Complaint Log includes, for each complaint received by the licence, the following information:	Administrative
13.1	the person to whom the complaint was made;	
13.2	the person responsible for managing the complaint;	
13.3	the date and the time complaint was reported;	
13.4	the date and time of the event(s) that led to the complaint;	
13.5	the contact details of the complainant if known, or where no details are provided a note to that effect;	
13.6	the nature of the complaint;	
13.7	the nature of event(s) giving rise to the complaint;	
13.8	prevailing weather conditions at the time (where relevant to the complaint);	
13.9	the action taken in relation to the complaint, including any follow-up contact with the complainant; and	
13.10	if no action was taken, why no action was taken.	

Condition No.	Condition	Risk Level of Non-compliance
14	The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.	Compliant (changed from "Not Verified")
26	The licensee must conduct air and groundwater monitoring at the authorised monitoring points in accordance with Chapter 5 Risk Management and Appendix C GHD Environmental Monitoring Report November 2011 ("the Monitoring Plan") of the EMP and as per Attachment A - 2017-2018 Groundwater Monitoring Schedule, Attachment B – 2018-2020 Groundwater Monitoring Schedule and Attachment C – Air Monitoring Schedule of this licence.	Non-compliant
40	The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.	Administrative (changed from "Compliant")
41	The licensee must ensure that each Monitoring Report obeys following (41.1, 41.2, 41.3, 41.4):	Administrative
41.1	is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';	
41.2	includes a tabulation of all monitoring data required as a condition of this licence;	
41.3	includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available); and	
41.4	includes an assessment of environmental impact from the activity.	
45	The licensee must include an investigation report to address requirements of conditions 43 and 44, to be submitted to the NT EPA with the first Monitoring Report in accordance with condition 40.	Administrative

5.2 Environmental Management Plan

Table 12 summarises the identified non-compliances with the requirements contained within the EMP. A summary of the recommended actions to improve compliance with EMP have been provided in Section 6.

Ten requirements were identified as either non-compliant, not verified or administrative non-compliance.

Table 12 Non-compliances with the EMP

Section of EMP	EMP Requirement	Risk Level of Non-compliance
Section 2.3 Staff Involvement	All personnel engaged in the application of oil to the site must read and understand the EMP and acknowledge their understanding by signing the acknowledgement form.	Administrative
Section 5.3 Odour Sub-management Plan	Application of oil and tilling operations to take place in the early morning / night time hours when temperatures are lowest and the wind is calm in order to minimise potential odour generation.	Administrative
	Application of oil should only take place when winds are blowing away from resident properties or during times when wind speeds are less than 7.2 km/h (half annual average wind speed). The BOM website should be checked to confirm wind direction.	Non-compliant
	During application and two hours subsequently, mobile odour elimination units will be operated at the site. These units are to be placed at locations on the site boundary taking wind direction and sensitive receptors into account. The units will emit water vapour from a solution of an odour suppressant (e.g. nil-odour) mixed with potable water at a ratio of no less than 7.5 to 500 mL.	Administrative
	Installation of wind vane to provide wind direction and speed.	Non-compliant

Section of EMP	EMP Requirement	Risk Level of Non-compliance
	The Project and Operations Manager is to maintain a log of odour complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Administrative
	All non-conformances, incidents, corrective actions and complaints regarding odour are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints.	Administrative
Section 5.6 Noise Sub-management Plan	The Project and Operations Manager is to maintain a log of noise complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Administrative
Section 5.8 Surface Water and Erosion Sub-management Plan	Installation of erosion and sediment control measures at drainage lines (potential installation of Stiff Grass Barriers surrounding concrete stormwater channels).	Administrative
Section 5.9 Waste Management Sub-management Plan	Spill kits to be maintained on site and relevant persons trained for the use of spill kit (outside tracked area).	Not verified

6 Recommended Actions for Improved Performance

SLR determined a high degree of compliance with EPL 218 and the current EMP. Notwithstanding this, SLR has made a number of recommendations for improvement in environmental performance. A summary of the recommended actions to improve compliance with EPL 218 and the EMP have been provided in Table 13 and Table 14, respectively. Additional observations and recommendations for improvement that have been identified in the audit of the EMP and EPL 218 have also been included under the recommendations columns in Table 9 and Table 10, and noted below.

Table 13 Action plan for EPL 218 audit recommendations

Condition #	Condition	Audit Recommendation	Proposed Timing
6	The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.	Update monitoring plan to include monitoring events beyond 2020.	Q3 2021
7	All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).	Annual reports for 2017 – 2018 & 2018 – 2019 time periods have not been uploaded to the website. Upload Annual reports for missing periods. Upload annual environmental monitoring reports once prepared.	Q3 2021
8	The licensee must implement, maintain and follow the document "Fannie Bay Racecourse Environmental Management plan for the Application of Used Oil (Document Ref. 43/21851/32370).	Close out gaps identified in this audit.	Q3 2021
12	The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.	Q3 2021
13	The licensee must ensure that the Complaint Log includes, for each complaint received by the licence, the following information:	Ensure Complaint Log template included in Appendix B of the EMP (or similar) is maintained.	Q3 2021
13.1	the person to whom the complaint was made;		
13.2	the person responsible for managing the complaint;		
13.3	the date and the time the complaint was reported;		
13.4	the date and time of the event(s) that led to the complaint;		
13.5	the contact details of the complainant if known, or where no details are provided a note to that effect;		
13.6	the nature of the complaint;		
13.7	the nature of event(s) giving rise to the complaint;		
13.8	prevailing weather conditions at the time (where relevant to the complaint);		

Condition #	Condition	Audit Recommendation	Proposed Timing
13.9	the action taken in relation to the complaint, including any follow-up contact with the complainant; and		
13.10	if no action was taken, why no action was taken.		
14	The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.	Ensure that key site personnel have reviewed and understood its requirements of the Emergency Response Plan and that it is fully implemented at the site. ~~Request a copy of Cleanaway's spill prevention and response plan and ensure that key site personnel have reviewed and understood its requirements.~~	Q3 2021
16	The licensee must, without limiting any other condition of this licence, in conducting the activity, do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives as declared from time to time, including those applying to Darwin Harbour Region.	Continue with the current groundwater monitoring program. Consider including inspection of stormwater drains during/after the first rainfall event that occurs after the application of water oil mixture/emulsion and the collection of stormwater samples from the drains.	Q3 2021
25	The activity must not cause or release, beyond the boundary of the premises, an offensive odour.	*In light of the recent complaint, continue air quality monitoring and implementation of the Odour Management Plan included in the EMP.	Q3 2021
26	The licensee must conduct air and groundwater monitoring at the authorised monitoring points in accordance with Chapter 5 Risk Management and Appendix C GHD Environmental Monitoring Report November 2011 ("the Monitoring Plan") of the EMP and as per Attachment A – 2017-2018 Groundwater Monitoring Schedule, Attachment B – 2018-2020 Groundwater Monitoring Schedule and Attachment C – Air Monitoring Schedule of this licence.	Conduct additional monitoring in 2021 and 2022 to ensure sufficient trend data is available to assess groundwater conditions beneath the site. Ensure wells are surveyed to enable a basic hydrogeological assessment to be included in the reports to assess potential groundwater migration, potential fate and transport of chemicals detected, potential connections between groundwater, surface waters and stormwater. Consider the replacement of MW01 if the well can not be unblocked.	Q3 2021 – Q2 2023

Condition #	Condition	Audit Recommendation	Proposed Timing
		Consider including additional contaminants of potential concern in the groundwater analytical suite such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons and per-and polyfluoroalkyl substances (PFAS) (given potential primary sources of oil received by Cleanaway). Consider including stormwater monitoring in the plan to demonstrate that the activity is not causing an impact to stormwater runoff leaving the site. Consider analysing waste oil sample annually for TPH, BTEX, PCBs, chlorinated hydrocarbons and PFAS to ensure potential contaminants of concern are reflected in the air quality and groundwater monitoring program.	
40	The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.	Prepare and submit an annual environmental monitoring report for results from the August/September 2020 monitoring events, and the results from the March/April 2021 monitoring event. Ensure that the annual environmental monitoring report include an analysis of trends (both spatial and temporal) for the year and a comparison to previous monitoring data.	Q3 2020
41	The licensee must ensure that each Monitoring Report obeys followings (41.1, 41.2, 41.3, 41.4):	Extend the monitoring program into 2021 and 2022. Include trend analyses in the Monitoring report. Ensure wells are surveyed to enable a basic hydrogeological assessment to be included in the reports to assess potential groundwater migration, potential fate and transport of chemicals detected, potential connections between groundwater, surface waters and stormwater.	Q3 2021 – Q2 2023
41.1	is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';		
41.2	includes a tabulation of all monitoring data required as a condition of this licence;		
41.3	includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available); and		

Condition #	Condition	Audit Recommendation	Proposed Timing
41.4	includes an assessment of environmental impact from the activity.	Consider the replacement of MW01 if the well can not be unblocked. Consider including additional contaminants of potential concern in the groundwater analytical suite such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons and per-and polyfluoroalkyl substances (given potential primary sources of oil received by Cleanaway). Consider including stormwater monitoring in the plan to demonstrate that the activity is not causing an impact to stormwater runoff leaving the site.	
43	As per the Conclusions and Recommendations of the Monitoring Plan, the licensee must conduct an investigation into the possible alternative substances to waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water for use in conditioning the track at the Fannie Bay Racecourse.	Consider trialling alternative substances identified in the investigation when developing second training track.	To be determined.
45	The licensee must include an investigation report to address requirements of conditions 43 and 44, to be submitted to the NT EPA with the first Monitoring Report in accordance with condition 40.	Submit investigation report prepared to satisfy Conditions 43 and 44.	Q2 2021

Table 14 Action plan for EMP audit recommendations

Section	Requirement	Audit Recommendation	Proposed Timing
Section 2.3 Staff Involvement	All personnel engaged in the application of oil to the site must read and understand the EMP and acknowledge their understanding by signing the acknowledgement form.	Ensure personnel involved in the application of waste oil mixture acknowledge their understanding of the EMP via signing the Acknowledgement Form in Appendix G.	Q3 2021
Section 5.3 Odour Sub-management Plan	Application of oil and tilling operations to take place in the early morning / night time hours when temperatures are lowest and the wind is calm in order to minimise potential odour generation.	Review odour assessment results. If tilling during day light hours is not causing an offensive odour at neighbouring properties, assess whether the EMP needs to be revised to reflect actual site activities.	Q4 2021
	Application of oil should only take place when winds are blowing away from resident properties or during times when wind speeds are less than 7.2 km/h (half annual average wind speed). The Bureau of Meteorology website should be checked to confirm wind direction.	Ensure personnel are aware of this requirement and document that weather conditions were considered when undertaking the activity. Consider installing a weather station at the site to document actual weather conditions experienced at the site during and after the application of waste oil mixture.	Q3 2021
	During application and two hours subsequently, mobile odour elimination units will be operated at the site. These units are to be placed at locations on the site boundary taking wind direction and sensitive receptors into account. The units will emit water vapour from a solution of an odour suppressant (e.g. nil-odour) mixed with potable water at a ratio of no less than 7.5 to 500 mL.	Consider installing fixed odour units along the western boundary which will be between the racetrack and adjacent residents. Consider revising the EMP to reflect actual mitigation measures implemented.	Q4 2021
	Installation of wind vane to provide wind direction and speed.	Weather vane that will provide wind direction and speed should be installed at the site. This will aid in addressing any odour complaints received from adjacent neighbours.	Q3 2021
	The Project and Operations Manager is to maintain a log of odour complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.	Q3 2021
	All non-conformances, incidents, corrective actions and complaints regarding odour are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.	Q3 2021

Section	Requirement	Audit Recommendation	Proposed Timing
Section 5.6 Noise Sub-management Plan	The Project and Operations Manager is to maintain a log of noise complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.	Transfer information contained within the correspondence file to a Complaint Log. Template provided in Appendix B of the EMP.	Q3 2021
Section 5.7 Groundwater Quality Sub-management Plan	Monitoring results should be assessed against the National Environmental Protection (Assessment of Site Contamination) Measure and water quality investigation levels for freshwater ecosystems and drinking water levels for reference.	Although activities are compliant, it is recommended that the EMP is reviewed to reflect that groundwater data is to be assessed against the trigger values specified in EPL 218. Consider requesting an amendment to the trigger values to ensure that only those parameters representative of assessing groundwater impact are included (i.e. trigger values nominated for dissolved oxygen, turbidity levels, electrical conductivity are generally adopted for freshwater surface water systems, not groundwater systems where saltwater intrusion occurs for part of the site).	Q4 2021
	Should the used oil application be identified to be impacting groundwater and causing exceedances of the nominated criteria, the following contingencies should be considered. • Using an environmentally safe alternative to the used oil; and • If an alternative cannot be sourced, consideration should be given to lining the track with an impermeable barrier to prevent downward migration of oil to groundwater. The track drainage would need to be modified so as to divert any impacted rainwater into an appropriate oil/water separator.	Not requirement has not been triggered, it is recommended that further groundwater investigations that assesses potential causes of metal impact detected in groundwater samples collected from monitoring well MW4. Include trends analyses in the groundwater assessment once adequate number of data points have been obtained.	Q4 2021
Section 5.8 Surface Water and Erosion Sub-management Plan	Installation of erosion and sediment control measures at drainage lines (potential installation of Stiff Grass Barriers surrounding concrete stormwater channels).	Consider reviewing the EMP to reflect current site practices. Consider including regular site inspections of stormwater drains and including stormwater samples in the site's monitoring program. This will assist in determining if application of waste oil mixture to the racetrack surface is impacting stormwater quality leaving the site.	Q4 2021

7 List of Abbreviations

ANZG	Australia and New Zealand Governments
AA NEPM	National Environment Protection Council (2015), National Environment Protection (Ambient Air Quality) Measure
ASC NEPM	National Environment Protection Council (1999, 2013 revision), National Environment Protection (Assessment of Site Contamination) Measure
AT NEPM	National Environment Protection Council (2004), National Environment Protection (Air Toxics) Measure
bgl	Below ground level
BOM	Bureau of Meteorology
BTEX	Benzene, toluene, ethylbenzene, xylenes
CBD	Central Business District
Cleanaway	Cleanaway Operations Pty Ltd
COPC	Contaminants of Potential Concern
DEPWS	Department of Environment, Parks and Water Security
DG	Dangerous Goods
DTC	Darwin Turf Club Incorporated
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EPA	Environment Protection Authority
EPL	Environment Protection Licence
GHD	GHD Pty Ltd
GME	Groundwater Monitoring Event
IL	Investigation Level
m AHD	metres above Australian Height Datum
m bgs	metres below ground surface
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NR	Natural Resources
NRETAS	Department of Natural Resources, Environment, Tourism and Sports
NT	Northern Territory
NTG	Northern Territory Government
OR	Organised Recreation
PCB	Polychlorinated biphenyl
PFAS	Per- and polyfluoroalkyl substances
SLR	SLR Consulting Australia Pty Ltd
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
WMPC Act	Waste Management and Pollution Control Act 1998

8 References

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

DTC 2020 (1). Darwin Turf Club Fannie Bay Racecourse Wet Season Groundwater Monitoring Quarterly Monitoring Report No.1 – February 2020 Non-Compliance Notification.

DTC 2020 (2). Darwin Turf Club Fannie Bay Racecourse – EPL218 Monitoring GME and Air Monitoring Report - May 2020 Non-Compliance Notification.

DTC 2020 (3). Annual Return EPL 218, Reporting Period: 01/09/19 – 31/08/20.

GHD 2011. Report for Environmental Monitoring Darwin Turf Club, GHD Pty Ltd, November 2011 (ref: 43/21851/32045).

GHD 2012. Fannie Bay Racecourse, Environmental Management Plan for the Application of Used Oil, GHD Pty Ltd, May 2012 (ref.: 43/21851/32370).

GHD 2020. Darwin Turf Club – EPL Monitoring, GME and Air Monitoring Report, GHD Pty Ltd, dated October 2020.

NT EPA 2017. Northern Territory Contaminated Land Guideline.

NT EPA 2013. Guidelines for Consultants Reporting on Environmental Issues.

APPENDIX A
ENVIRONMENT PROTECTION LICENCE 218

ntepa Northern Territory Environment Protection Authority

ENVIRONMENT PROTECTION LICENCE

(Pursuant to section 34 of the *Waste Management and Pollution Control Act*)

Licensee	Darwin Turf Club Inc.
Licence Number	**EPL218**
Registered Business Address	Darwin Turf Club Inc. 20 Dick Ward Drive Fannie Bay NT 0820
ABN	21 373 066 193
Premises Address	Lot 05298 Town of Darwin Plan(s) S 79/109 (20 Dick Ward Dr, Fannie Bay)
Anniversary Date:	01 September
Commencement Date:	01/09/2017
Expiry Date:	31/08/2022
Scheduled Activity	Collecting, transporting, storing, re-cycling, treating or disposing of a **listed waste** (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of a sewage treatment plant. Operating **premises**, other than a sewage treatment plant, associated with collecting, transporting, storing, re-cycling, treating or disposing of a **listed waste** (as per Table 1) on a commercial or fee for service basis.
Description	Application of *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* by dispoal to Darwin Turf Club Fannie Bay Racecourse for the purpose of conditioning the track twice yearly.

Table 1 - Listed Wastes Authorised to be Handled

Listed Waste	Collection	Transport	Storage	Treatment	Recycling	Disposal
Waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water	✗	✗	✗	✗	✗	✓

✓ Activity authorised by this licence

✗ Activity not authorised by this licence

ENVIRONMENT PROTECTION LICENCE 218

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ATTACHMENTS

ENVIRONMENT PROTECTION LICENCE 218

INFORMATION ABOUT THIS LICENCE

- This licence does not in any way relieve the licence holder from its obligations to comply with the *Waste Management and Pollution Control Act* (WMPC Act), including the general environmental duty in section 12 of the WMPC Act and the duty to notify of incidents causing or threating to cause pollution under section 14 of the WMPC Act.

Duration of a licence (section 40, 43 and 45 of the WMPC Act)

- A licence will remain in force until its expiry date or until it is surrendered by the licensee or is suspended or cancelled in accordance with the WMPC Act.
- The licensee must notify the Northern Territory Environment Protection Authority (NT EPA) within 14 days after ceasing to conduct the activity.
- The licensee may, with the approval of the NT EPA, surrender the licence to the NT EPA.

Amendment or Revocation of a licence (section 37 of the WMPC Act)

- The licensee may apply to amend or revoke a condition of this licence.
- A fee applies and the application must be made using the designated form via NT EPA Online.
- The NT EPA may also amend or revoke a condition of this licence as set out in section 38 of the WMPC Act.

Transfer of a licence (section 46 of the WMPC Act)

- The licensee can apply to transfer their licence to another person.

Renewal of a licence (section 40 of the WMPC Act and section 3 of the Regulations)

- The licensee may apply for the renewal of their licence not earlier than 90 days, and not later than 30 days, before their licence expires.
- A fee applies and the application must be made via NT EPA Online.

Public Register

- A copy of environment protection licences and any plans for environmental management, reports, submissions or documents required as a condition of an environment protection licence, will be placed on a register in accordance with section 9 of the WMPC Act.
- A copy of the Annual Return will be placed on the register.
- The NT EPA makes this register freely available from the NT EPA website.

Environment Protection Objectives (Part 4 of the WMPC Act), and Water Quality Standards (section 73 of the *Water Act*)

- An Environment Protection Objective (EPO) is a statutory instrument to establish principles on which:
  a. environmental quality is to be maintained, enhanced, managed or protected;
  b. pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; and
  c. effective waste management is to be implemented or evaluated.
- In accordance with section 18 of the WMPC Act a beneficial use, quality standard, criteria or objective declared under section 73 of the *Water Act* and in force is an environment protection objective for the purposes of the WMPC Act.

- The following EPOs and Beneficial Use Declarations (BUDs) are relevant to this licence:
    - Darwin Harbour Region: Aquaculture, environment, cultural, rural stock and domestic

Environmental Interests

- This section highlights sensitivity of the surrounding land use and environment associated with the location of the approved activity.
- Sites of Conservation Significance
- Ramsar Wetland

Cultural Interests

- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the licenced activity are obtained and complied with.

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

- Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
- Any reference to any standard (Australian or international) in this licence means the relevant parts of the current version of that standard.
- A reference to any guideline or code of practice (or to the relevant parts of any guideline or code of practice) in this licence means the current version of the guideline or code of practice.
- Under section 39 of the WMPC Act, any contravention of or failure to comply with this licence by the licensee may be an offence.
- In determining whether the licensee has committed an offence, the licensee may be liable for the conduct of its directors, employees or agents.
- The licensee should ensure that each of its directors, employees, contractors or agents are aware of, and comply with, this licence.
- In this licence, unless the contrary intention appears, words that are defined in the WMPC Act are intended to have the meaning given to them in that Act.

LICENCE CONDITIONS

GENERAL

1 The licensee must ensure the contact details recorded in NT EPA Online for this licence are correct at all times.

2 The licensee must at all times have a 24 hour emergency contact.

3 The licensee must notify the NT EPA prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.

4 The licensee must pay the annual fee calculated in accordance with the method prescribed in the Regulations within 50 business days of the anniversary of the commencement date of this licence, for each year or part of a year that this licence is in force.

5 The licensee must cause a copy of this licence to be available for inspection by any person, in hard copy form, at the premises.

6 The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.

7 All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).

8 The licensee must implement, maintain and follow the documents listed in Table 2.

Table 2 - Documents Relevant to the Licenced Activity

Document Ref.	Document Name
43/21851/32370	Fannie Bay Racecourse Environmental Management Plan for the Application of Used Oil

9 Within 10 business days of any amendment being made to a document listed in Table 2 the licensee must provide the amended document to the NT EPA, along with:

9.1 a tabulated summary of the amendment(s) with document references;

9.2 reasons for the amendment(s); and

9.3 an assessment of environmental risk associated with the amendment(s).

10 The NT EPA may require the licensee to revise or amend and resubmit any document relating to this licence. Where the NT EPA requires a document to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.

11 The licensee must, for the duration of this licence, implement, maintain and follow a Consultation and Communication Plan which includes a strategy for communicating with persons who are likely to have a real interest in, or be affected by, the activity.

12 The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.

13 The licensee must ensure that the Complaint Log includes, for each complaint received by the licensee, the following information:

13.1 the person to whom the complaint was made;

13.2 the person responsible for managing the complaint;

13.3 the date and time the complaint was reported;

13.4 the date and time of the event(s) that led to the complaint;

13.5 the contact details of the complainant if known, or where no details are provided a note to that effect;

13.6 the nature of the complaint;

13.7 the nature of event(s) giving rise to the complaint;

13.8 prevailing weather conditions at the time (where relevant to the complaint);

13.9 the action taken in relation to the complaint, including any follow-up contact with the complainant; and

13.10 if no action was taken, why no action was taken.

14 The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.

EARLY SURRENDER OF LICENCE

15 Any reports, records or other information required or able to be provided by the licensee under this licence must be submitted to the NT EPA prior to the licensee surrendering the licence. If the date on which a report, record or other information is required falls after the date the licensee requests to surrender this licensee, the licensee must provide the report, record or information as far as possible using data available to the licensee up to and including the date the request to surrender the licence is made.

OPERATIONAL

16 The licensee must, without limiting any other condition of this licence, in conducting the activity, do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives as declared form time to time, including those applying to:

- *Darwin Harbour Region*

17 The licensee must not collect, transport, store, recycle, treat or dispose of listed waste other than the listed waste specified in Table 1.

18 The licensee must ensure any plant and equipment used by the licensee in conducting the activity:

18.1 is reasonably fit for the purpose and use to which it is put;

18.2 is maintained; and

18.3 is operated by a person trained to use the plant and equipment.

19 The licensee must notify the NT EPA, two weeks in advance, of the proposed dates for the application of *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* to the track at the Fannie Bay Racecourse.

20 The licensee must ensure that all listed waste being transported to the premises is transported by a person licenced under section 30 of the WMPC Act to transport the listed waste.

DISCHARGES AND EMISSIONS

21 The licensee must not allow a contaminant or waste, which causes or may cause environmental harm, to enter water.

22 The licensee must ensure there is no migration or overflow of a contaminant or waste, which causes or may cause environmental harm, beyond the boundary of the land on which the premises are located. (For the avoidance of doubt, this condition is not intended to authorise the discharge of a contaminant or waste to any land or water which discharge has not been specifically authorised by another condition of this licence.)

23 The licensee must ensure that stormwater does not come into contact with a contaminant or waste, which causes or may cause environmental harm.

24 The licensee must ensure that discharges from the premises do not:

24.1 contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;

24.2 cause or generate odours which would adversely affect the use of surrounding waters;

24.3 cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;

24.4 cause algal blooms in the receiving water;

24.5 cause mortality of fish or other aquatic organisms; or

24.6 cause adverse impacts on plants.

25 The activity must not cause or release, beyond the boundary of the premises offensive odour.

MONITORING

26 The licensee must conduct air and groundwater monitoring at the authorised monitoring points in accordance with *Chapter 5 Risk Management* and *Appendix C GHD Environmental Monitoring Report November 2011* ("the Monitoring Plan") of the EMP and as per Attachment A - 2017-2018 Groundwater Monitoring Schedule, Attachment B - 2018-2020 Groundwater Monitoring Schedule and Attachment C - Air Monitoring Schedule of this licence.

27 The NT EPA may require the licensee to revise or amend and resubmit the Monitoring Plan. Where the NT EPA requires the Monitoring Plan to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.

28 The licensee must ensure that any proposed revisions to the Monitoring Plan (other than typographical changes or revisions to formatting or referencing) are:

28.1 reviewed by a suitably Qualified person, who must produce a written report about their review;

28.2 submitted to the NT EPA with justification for revisions; and

28.3 submitted to the NT EPA, in both hard copy and electronic form (with a complete copy of the Qualified person's written review), 20 business days prior to the proposed implementation date.

29 The licensee must ensure that all monitoring samples are analysed at a laboratory with current NATA accreditation or equivalent, for the parameters to be measured.

30 The licensee must ensure any samples collected in accordance with the Monitoring Plan or in connection with the activity or this licence, are obtained by, or under the supervision of a Qualified sampler.

31 The licensee must ensure that, for each sample collected in accordance with the Monitoring Plan or the activity the following information must be recorded and retained:

31.1 the date on which the sample was collected;

31.2 the time at which the sample was collected;

31.3 the location at which the sample was collected;

31.4 the name of the person who collected the sample;

31.5 the chain of custody forms relating to the sample;

31.6 the field measurements (if any) and analytical results (if any) relating to the sample; and

31.7 laboratory quality assurance and quality control documentation.

RECORDING AND REPORTING

32 The licensee must keep and maintain records relating to the activity undertaken and the listed waste handled by the licensee in each successive 12 month period following the commencement of this licence, which include:

32.1 the source of the listed waste;

32.2 the name of the transport company, if not the licensee;

32.3 a description of the listed waste;

32.4 the quantity of the listed waste; and

32.5 whether the listed waste was stored, recycled, treated or disposed of.

33 The licensee must retain records relating to waste, including listed waste, as required by the conditions of this licence, for a period of 2 years after the end of the 12 month period to which the record relates.

34 The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.

35 The licensee must notify the NT EPA of any non-compliance with this licence by completing the Non-Compliance Notification via NT EPA Online (or by emailing waste@nt.gov.au), as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.

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;

36.2 the date and time of the non-compliance;

36.3 the actual and potential causes and contributing factors to the non-compliance;

36.4 the risk of environmental harm arising from the non-compliance;

36.5 the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;

36.6 corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and

36.7 if no action was taken, why no action was taken.

37 A non-compliance with this licence includes:

37.1 an exceedance of a trigger value specified in Attachment A, B or C at an authorised monitoring point specified in Attachment A, B and C on three consecutive sampling occasions; and

37.2 an exceedance of a trigger value specified in Attachment A, B or C at an authorised monitoring point specified in Attachment A, B and C on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.

38 The licensee must keep records of all exceedances of trigger values specified in Attachment A, B or C. These records must be adequate to enable the licensee to comply with the exceedance notification conditions of this licence.

39 The licensee must submit a completed Annual Return via NT EPA Online within 10 business days after each anniversary date of this licence, which report relates to the preceding 12 month period.

40 The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.

41 The licensee must ensure that each Monitoring Report:

41.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';

41.2 includes a tabulation of all monitoring data required as a condition of this licence;

41.3 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available); and

41.4 includes an assessment of environmental impact from the activity.

42 The NT EPA may require the licensee to revise or amend and resubmit any Monitoring Report. Where the NT EPA requires the Monitoring Report to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.

PERFORMANCE IMPROVEMENT

43 As per the Conclusions and Recommendations of the Monitoring Plan, the licensee must conduct an investigation into the possible alternative substances to *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* for use in conditioning the track at the Fannie Bay Racecourse.

44 The investigation of alternative substances, as per condition 43, should be based on the reduced risk they will pose to the environment and human health compared to the use of waste oil.

45 The licensee must include an investigation report to address requirements of conditions 43 and 44, to be submitted to the NT EPA with the first Monitoring Report in accordance with condition 40.

END OF LICENCE CONDITIONS

This licence is not valid unless signed below:

Leonie Cooper
Director Environment Authorisations
Delegate of the Northern Territory
Environment Protection Authority
Dated: 20/09/2017

DEFINITIONS

All terms in the Licence which are defined in the *Waste Management and Pollution Control Act* have the meaning given in that Act unless otherwise or further defined in this section.

DEFINITION	In this licence, unless a contrary intention appears:
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the activity.
Activity	the Scheduled activity as described on the covering page of this licence.
Air	includes any layer of the atmosphere.
Annual fee	yearly fee payable in respect of the activity as specified in the WMPC Act and the Regulations.
Annual Return	an NT EPA prescribed format for demonstrating and reporting compliance with the conditions of this licence and providing information on waste volumes for the preceding 12 month period.
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000: National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting.
Business days	a day not Saturday, Sunday or a public holiday, in the Northern Territory.
Complaint Log	a register of complaints to be maintained by the Licensee that records the details of each complaint received in relation to the activity.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the activity before, during and after the activity which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the activity.
Contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and activity.
Contaminant	a solid, liquid or gas or any combination of such substances and includes: (a) noise, odour, heat and electromagnetic radiation; (b) a prescribed substance or prescribed class of substances; and (c) a substance having a prescribed property or prescribed class of properties.
Discharges	allow a liquid, gas or other substance to flow out from where it has been confined.
Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the activity and that may cause environmental harm.
Environmental harm	(a) any harm to or adverse effect on the environment; or (b) any potential harm (including the risk of harm and future harm) to or potential adverse effect on the environment, of any degree or duration and includes environmental nuisance.

Environmental nuisance	means: (a) an adverse effect on the amenity of an area that: (i) is caused by noise, smoke, dust, fumes or odour; and (ii) unreasonably interferes with or is likely to unreasonably interfere with the enjoyment of the area by persons who occupy a place within the area or are otherwise lawfully in the area; or (b) an unsightly or offensive condition caused by contaminants or waste.
Incident	includes: (a) an accident, emergency or malfunction; and (b) a deliberate action, whether or not that action was taken by the person conducting the activity in the course of which the incident occurred.
Land	includes water and air on, above or under land.
Listed waste	a waste included under Schedule 2 of the Regulations.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
NATA	National Association of Testing Authorities, Australia.
Non-compliance	failure or refusal to comply, whether by act or omission, with obligations or requirements and includes any exceedance of a licence limit.
Non-compliance notification	an NT EPA prescribed format for notifying the NT EPA of a non-compliance.
NT EPA Online	online system for Environment Protection Licence (EPL), Environment Protection Approval (EPA) and Waste Discharge Licence (WDL) lodgement and maintenance.
Point source discharge	means any discernible, confined or discrete conveyance from which contaminants or waste are or may be discharged.
Pollution	(a) a contaminant or waste that is emitted, discharged, deposited or disturbed or that escapes; or (b) a contaminant or waste, effect or phenomenon, that is present in the environment as a consequence of an emission, discharge, deposition, escape or disturbance or a contaminant or waste.
Premises	the premises identified in this licence which includes equipment, plant and structures, whether stationary or portable, and the land on which premises are situated.
Qualified person	A person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature.
Qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Regulations	*Waste Management and Pollution Control (Administration) Regulations*.
Stormwater	water flowing over ground surfaces, in natural streams and drains as a direct result of rainfall over a catchment and consists primarily of rainfall runoff.
Trigger values	assigned value for each indicator used to assess the risk to an environmental value, a value that initiates some type of pre-defined management action.

Waste	(a) a solid, a liquid or a gas; or (b) a mixture of such substances, that is or are left over, surplus or an unwanted by-product from any activity (whether or not the substance is of value) and includes a prescribed substance or class of substances.
Wastewater	water that contains a contaminant or waste.
Water	includes: (a) surface water, ground water and tidal waters; (b) coastal waters of the Territory, within the meaning of the Coastal Waters (Northern Territory Powers) Act 1980 of the Commonwealth; and (c) water containing an impurity.
WMPC Act	the Northern Territory *Waste Management and Pollution Control Act*.

Attachment A – 2017/2018 Groundwater Monitoring Schedule

01 September 2017 – 31 August 2018			Authorised Groundwater Monitoring Points						
		Site Code	MW01	MW02	MW03	MW04	MW05	MW06	MW07
		Latitude	-12.422236°	-12.422014°	-12.422411°	-12.421720°	-12.424530°	-12.428082°	-12.424160°
		Longitude	130.844103°	130.844409°	130.843923°	130.845984°	130.847717°	130.847055°	130.844353°
Parameter	**Units**	**Trigger Values**							
Field Parameters									
pH	pH units	6.0 – 8.0 [a]	Q						
Temperature	^{0}C	N/A							
Turbidity	NTU	2 – 15 [a]							
Electrical Conductivity	µS/cm	20 – 250 [a]							
Laboratory Parameters									
Dissolved Oxygen	% Saturation	80 – 110 [a]	Q						
BTEX									
Benzene	mg/L	0.3 [b]	Q						
Toluene	mg/L	0.3 [b]							
Ethylbenzene	mg/L	0.005 [b]							
Xylenes	mg/L	0.075 [b]							
Heavy Metals									
Arsenic	mg/L	0.094 [c]	Q						
Cadmium	mg/L	0.0004 [c]							
Chromium	mg/L	0.006 [c]							
Copper	mg/L	0.0018 [c]							
Lead	mg/L	0.0056 [c]							
Mercury	mg/L	0.0019 [c]							
Nickel	mg/L	0.013 [c]							

Zinc	mg/L	0.015 [c]	Q
Total Recoverable Hydrocarbons (TRH)			
Total TPH C10 – C36	mg/L	0.6 [b]	Q

[a] - default trigger values provided in the ANZECC guideline applicable to the Northern Territory for slightly disturbed ecosystems in tropical Australia to suit receiving environment

[b] - value provided in EMP derived from the *National Environment Protection (Assessment of site contamination) Measure (NEPM) – Water Investigation Levels for Drinking and Freshwater Ecosystems*

[c] - 95% protection level default trigger values provided in the ANZECC guideline for toxicants in slightly-moderately disturbed systems

Q - Monitoring to be conducted quarterly to include a representative sample of the dry season and the wet season, and a sample within two weeks prior to and within 48 hours following application of *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* to the race track considering application of the waste is undertaken in April and September of each year of this licence.

Attachment B – 2018/2020 Groundwater Monitoring Schedule

01 September 2018 – 31 August 2020			Authorised Groundwater Monitoring Points						
		Site Code	MW01	MW02	MW03	MW04	MW05	MW06	MW07
		Latitude	-12.422236°	-12.422014°	-12.422411°	-12.421720°	-12.424530°	-12.428082°	-12.424160°
		Longitude	130.844103°	130.844409°	130.843923°	130.845984°	130.847717°	130.847055°	130.844353°
Parameter	**Units**	**Trigger Values**							
Field Parameters									
pH	pH units	6.0 – 8.0 [a]	A						
Temperature	^{0}C	N/A							
Turbidity	NTU	2 – 15 [a]							
Electrical Conductivity	µS/cm	20 – 250 [a]							
Laboratory Parameters									
Dissolved Oxygen	% Saturation	80 – 110 [a]	A						
BTEX									
Benzene	mg/L	0.3 [b]	A						
Toluene	mg/L	0.3 [b]							
Ethylbenzene	mg/L	0.005 [b]							
Xylenes	mg/L	0.075 [b]							
Heavy Metals									
Arsenic	mg/L	0.094 [c]	A						
Cadmium	mg/L	0.0004 [c]							
Chromium	mg/L	0.006 [c]							
Copper	mg/L	0.0018 [c]							
Lead	mg/L	0.0056 [c]							
Mercury	mg/L	0.0019 [c]							
Nickel	mg/L	0.013 [c]							

Zinc	mg/L	0.015 [c]	A
Total Recoverable Hydrocarbons (TRH)			
Total TPH C10 – C36	mg/L	0.6 [b]	A

[a] - default trigger values provided in the ANZECC guideline applicable to the Northern Territory for slightly disturbed ecosystems in tropical Australia to suit receiving environment

[b] - value provided in EMP derived from the *National Environment Protection (Assessment of site contamination) Measure (NEPM) – Water Investigation Levels for Drinking and Freshwater Ecosystems*

[c] - 95% protection level default trigger values provided in the ANZECC guideline for toxicants in slightly-moderately disturbed systems

A - Monitoring to be carried out within two weeks prior to and within 48 hours following application of *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* to the race track considering application of the waste is undertaken in April and September of each year of this licence.

Attachment C – Air Monitoring Schedule

			Authorised Air Monitoring Points		
		Site Code	**AQM01**	**AQM02**	**AQM03**
		Latitude	-12.428028°	-12.428043°	-12.426214°
		Longitude	130.845404°	130.846868°	130.848408°
Parameter	**Units**	**Trigger Values**			
BTEX					
Benzene	ppb	3[a]	B		
Toluene	ppb	1,000[a]			
o-Xylene	ppb	250[a]			
M & p Xylenes	ppb	250[a]			

[a] - value provided in EMP derived from the *National Environment Protection (Air Toxics) Measure (NEPM)*

B – Monitoring to be carried during application of *waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water* to the race track.

APPENDIX B
DARWIN TURF CLUB EMP

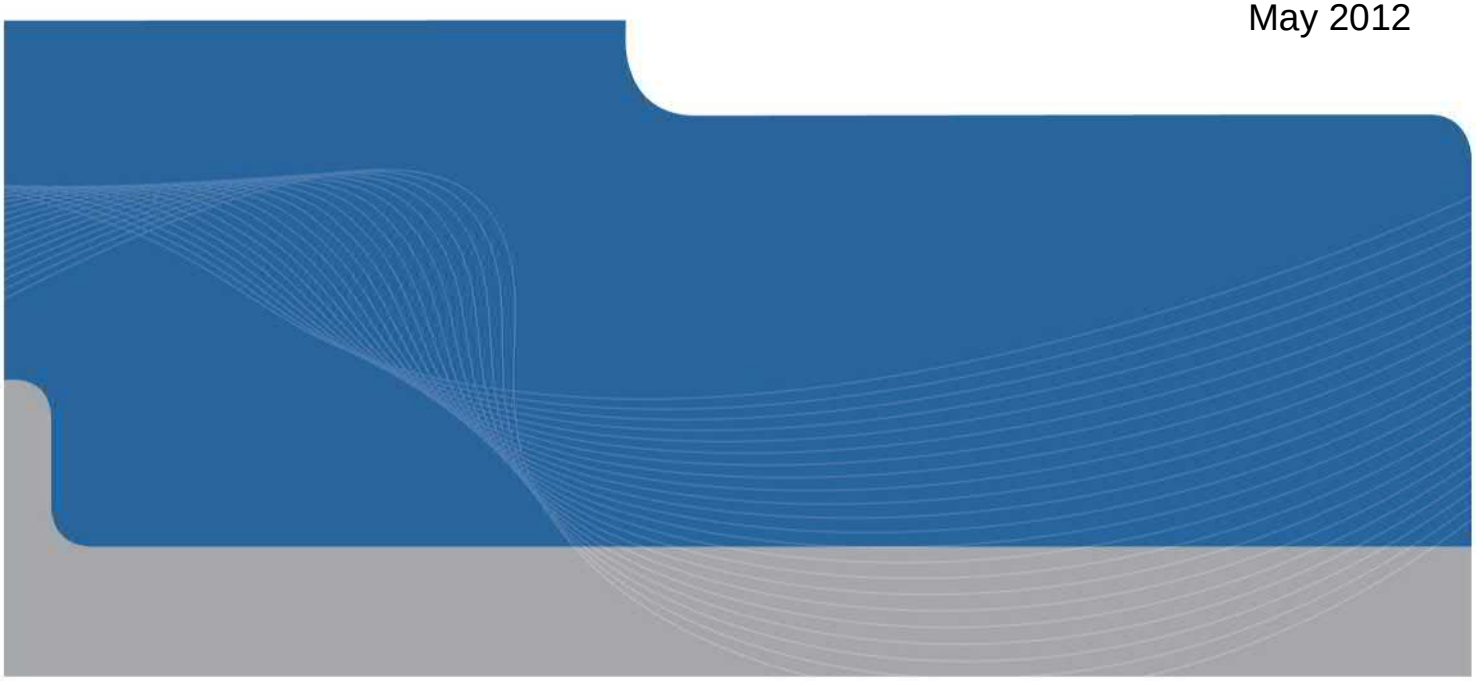
CLIENTS | PEOPLE | PERFORMANCE

Darwin Turf Club

Fannie Bay Racecourse

Environmental Management Plan for the Application of Used Oil

May 2012



INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Emergency Contact Register

Emergency Procedure

Immediately after a person causes, or becomes aware of an environmental incident relating to activities described in this EMP they should:

1 - Ensure the site is safe	First, consider personal safety; and *if safe to do so*, prevent any further environmental impact from occurring.
2 - Notify	Emergency services if required on 000 Darwin Turf Club Project and Operations Manager (Richard McKeating; 0419 819 926).
3 - Follow Procedure	Follow the Darwin Turf Club Environmental Management Plan
4 – Inform Regulator	Inform NRETAS of incident (08 8999 4555).

The DTC Project and Operations Manager will provide written details of the notification to the DTC Chief Operating Officer who must forward the written report to NRETAS within 24 hours of the date(s) on which the incident occurred. Darwin Turf Club employees and contractors are required to report all environmental incidents as soon as they become aware of them. These include, but are not limited to:

- Accidental spills of hydrocarbons, chemicals and any other potentially toxic substances greater than 25 litres; and
- Injury to, or deaths of, threatened native fauna/flora caused by the application of used oil.

Any significant environmental incidents/accidents or major breaches of undertakings during the application of used oil or tilling of the track must be reported to NRETAS as soon as possible.

Contents

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1. Introduction

1.1 Background Information

Darwin Turf Club (DTC) operates Fannie Bay Racecourse, situated approximately 4 km north of Darwin CBD. The site is approximately 47 hectares and the main site entrance is accessed off Dick Ward Drive.

Refined used oil is applied to the racecourse twice a year; at the end of April and September by Waste Solutions and is subsequently tilled into the track. To maintain the track rotovation occurs twice a week and tilling occurs daily after morning training sessions. Analysis results of the used oil are provided in Appendix A.

The oil is of high viscosity and is applied to the sand to maintain cohesion between the sand particles. The relatively high viscosity reduces potential erosion of the sand due to the local climate, which produces monsoonal rain in the wet season.

Neighbouring residential properties to the south and east have historically registered complaints about odours emanating from the track and concerns have been raised over the impact of oil application to the track on the soils and local groundwater.

1.2 Objectives

The objectives of this EMP are to provide management procedures for the application of used oil to the track in order to minimise potential environmental impacts.

The EMP is subject to regular review and continual improvement. The EMP is to be used on an ongoing basis to guide and inform environmental planning and management at Fannie Bay Racecourse in respect of oil application to the track.

2. Environmental Management Framework

2.1 Legislation

This EMP has been prepared in general accordance with Commonwealth, state and local government legislation, policies and guidelines, which include the following:

2.1.1 Commonwealth

- *Aboriginal and Torres Strait Islander Heritage Protection Act* 1984.
- *Coastal Waters (Northern Territory Title) Act* 1980.
- *Environment Protection and Biodiversity Conservation Act* 1999.
- Environment Protection and Biodiversity Conservation Regulations 2000.
- 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 (Assessment of Site Contamination) Measure (NEPM), 1999.
- National Environment Protection (Air Toxics) Measure (NEPM), 2004; 43/21851/32045 Environmental Monitoring Darwin Turf Club 6 Environmental Monitoring Report.
- Australian Standard Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds, AS 4482.1, 2005.
- Australian Standard Guide to the investigation and sampling of sites with potentially contaminated soil. Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances, AS 4482.1, 2005.

2.1.2 Northern Territory

- NRETAS Guideline for Consultants Reporting on Environmental Issues, 2010.
- *Environmental Assessment Act* 1982.
- Environmental Assessment Administrative Procedures.
- *Environmental Offences and Penalties Act* 1996.
- *Litter Act* 1972.
- *Marine Pollution Act* 1999.
- Marine Pollution Regulations 2003.

- *National Environment Protection Council (NT) Act* 1994.
- *Planning Act* 1999.
- Planning Regulations.
- *Public Health Act* 1952.
- *Waste Management and Pollution Control Act* 1998.
- Waste Management and Pollution Control (Administration Regulations) 1998.
- *Water Act* 1992.
- Water Regulations 1992.
- *Workplace Health and Safety Act* 2007.
- Workplace Health and Safety Regulations.

2.2 Roles and Responsibility for EMP Implementation

2.2.1 Responsibilities

All DTC employees have a general environmental duty to prevent environmental harm, or, where environmental harm is observed, to report all incidents with the potential to cause environmental harm, with incidents reported to NRETAS.

The allocation of responsibilities for implementation of environmental management tasks is shown in Table 1.

Table 1 Environmental Responsibilities

Responsibility	Personnel
Monitor overall performance	Project and Operations Manager
Ensure regulatory compliance (external)	Chief Operating Officer
Ensure the EMP compliance (internal)	Project and Operations Manager
Update and maintain the EMP	Project and Operations Manager
Ensure continuous improvement	Project and Operations Manager
Develop and maintain environmental management procedures	Chief Operating Officer
Approval for used oil application from NRETAS	Project and Operations Manager

2.3 Staff Involvement

All personnel engaged in the application of oil to the site must read and understand the EMP and acknowledge their understanding by signing the acknowledgement form, Appendix G.

2.4 Incident Reporting Procedures and Timeframes

All incidents (including near miss incidents) occurring at the site must be immediately reported to the Project and Operations Manager. In the event of an emergency, all members of the project team shall assemble at the nominated assembly point and wait for further instruction from the Project and Operations Manager or delegate at the assembly area. The Project and Operations Manager will then assess the situation and, if required, inform other affected parties including Council, neighbours and site staff.

If there is an incident, which creates an immediate risk to the surrounding environment requiring an emergency response, the Project and Operations Manager will contact a suitably qualified hazardous materials contractor to contain the issue and mitigate the risk, as far as possible. Following the emergency response actions, the Project and Operations Manager should engage a suitably qualified environmental professional to assess the extent of impact to the environment and propose appropriate remedial actions to mitigate the risk to an acceptable level.

Contact details of the Project and Operations Manager will be distributed to adjoining neighbours.

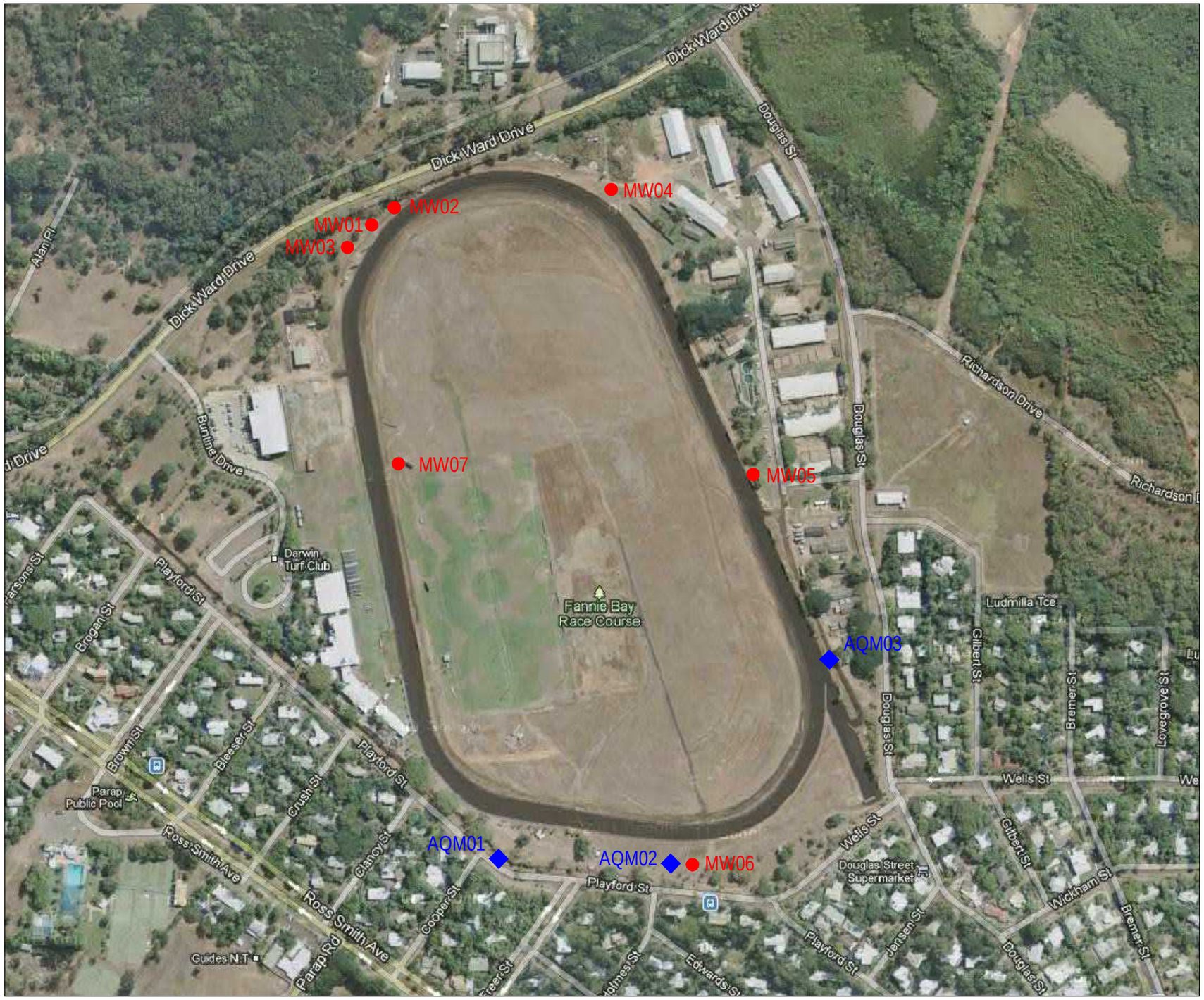
3. Site Setting

3.1 Site Identification

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 and are situated approximately 40 m from the track.

A general layout of the site including environmental monitoring locations is provided in Figure 1. The racecourse is located in close proximity to Ludmilla Primary School, residential areas of Fannie Bay, and Ludmilla and coastal areas.

N



LEGEND

- AIR QUALITY MONITORING LOCATIONS
- MONITORING WELL LOCATIONS

SITE LAYOUT PLAN
NTS

GHD

DARWIN TURF CLUB INCORPORATED
ENVIROMENTAL MONITORING
DARWIN TURF CLUB

ENVIROMENTAL 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 - 10:42 AM Plotted by: Ron Fernandez/Darwin/GHD/AU Cad File No: G:\43\21851\CADD\Drawings\43-21851-FIGURE_01.dwg

3.2 Climate

Climate statistics were obtained in October 2011 from the Bureau of Meteorology Website (Ref. 1). The site is located in the wet-dry tropics and is subject to annual periods of flood and drought. The dry season extends from approximately March to September, typified by moderate temperatures, low humidity and winds predominately from the east. The wet season occurs for the remaining months and tropical cyclones, thunderstorms and monsoon rain with winds predominantly from the northwest are common, in association with high temperatures and humidity.

Based on the Bureau of Meteorology website (Ref. 1) statistical rainfall and temperature observations from 1941 to present day are presented below:

Rainfall (mm):

Annual mean rainfall: 1,729;

Highest monthly mean rainfall: 1,110 (February); and

Lowest monthly mean rainfall: 0 (May to October).

Temperature (°C):

Highest mean maximum: 34.8 (October);

Lowest mean maximum: 28.7 (June);

Highest mean minimum: 27.3 (December); and

Lowest mean minimum: 15.9 (July).

3.3 Topography

The site is flat with the track approximately 0.5 m above the surrounding ground level. Surface water drainage at the site generally flows from south to north. Drainage from the track and grassed areas runs through storm drains into a mangrove area and ultimately into Ludmilla Creek which discharges into the Beagle Gulf.

3.4 Geology

The superficial geology underlying the site comprises unconsolidated sand, ferruginous and clayey, sandy and gravelly soils underlain by Kaolinitic Claystone (Ref. 2).

3.5 Hydrogeology

The Department of Infrastructure, Planning and Environment (2003), Groundwater Resource of the Darwin Area Map, 1:25,000 indicates the site to be divided into two hydrogeological regimes. The southern portion of the site is shown to be underlain by a shallow fresh water aquifer, potentially suitable for human consumption and garden watering. The groundwater yield is less than 0.5 L/s (Ref. 3). The northernmost portion

of the site is likely to be underlain by shallow groundwater which is brackish to saline and unsuitable for most uses with a yield less than 0.5 L/s (Ref. 3). It is likely that the groundwater towards the northern area of the site is subject to saline influence from the Ludmilla Creek estuary.

At depth, approximately 40 to 80 m below ground level (BGL), the site is underlain by the regional aquifer, within the Upper Proterozoic Burrell Creek Formation. The Burrell Creek Formation is classified as a minor groundwater resource with a yield less than 0.5 L/s (Ref. 4).

3.6 Hydrology

The closest surface water feature is Ludmilla Creek, situated approximately 500 m to the northeast of the site. Drainage from the track and grassed areas runs through storm drains into a mangrove area and ultimately into Ludmilla Creek which discharges into the Beagle Gulf.

4. Risk Assessment

The following section identifies activities, historical monitoring and the environmental receptors potentially impacted from the application of oil to the racecourse (including subsequent tilling). The risk assessment includes the potential causes of impacts, management procedures to be adopted to mitigate foreseeable impacts, and protocols for monitoring environmental conditions

These are the practical components of the EMP and are intended to prevent or minimise environmental impacts through appropriate management.

4.1 Activities on Site

Fannie Bay Racecourse is utilised for horse racing and training, with horse racing events held approximately 41 times a year. In addition, a touch football field is present within the centre of the racecourse, which is used on a regular basis.

4.2 Past Monitoring and Contaminants of Concern

Air, soil and groundwater quality studies were conducted by GHD in 2011. The full report can be found in Appendix C. The findings can be summarised as follows:

Two rounds of air quality monitoring were undertaken at three locations on site: the first prior to the application of oil to the track and the second during the application of oil using SilcoCan Canisters with calibrated passive air sampling kits.

Five groundwater wells were installed to provide groundwater data from across the racecourse and to supplement two existing groundwater wells on the site. During the installation of groundwater wells representative soil samples were collected.

In addition, a sample from the treated sands on the track was taken to establish concentrations present.

One round of groundwater monitoring was undertaken in all seven monitoring wells at the site and samples sent for laboratory analysis.

Based on the laboratory results, the following conclusions were made:

- One exceedance of an air quality guideline was identified at the site; with benzene being recorded at 4.6 ppb, which is slightly above the NEPM guideline value of 3.0 ppb. The exceedence was considered to be anomalous in that it was not linked to a detection of benzene in the oil treated sand on the track. There was considered to be insufficient evidence to conclude that benzene was likely to pose an unacceptable risk to human health. It was also noted that, although an eight hour test was not conducted, the 4.6 ppb result was substantially less than the Safework Australia time weighted average (TWA) for benzene of 1000 ppb.

- Soil samples from MW3 at 3.0 m BGL and MW4 at 1.0 m BGL were analysed for heavy metals, BTEX and TPH. No exceedances of the adopted site investigation criteria were recorded.
- A sample from the oil-treated track sand indicated that the majority of oil present was in the total recoverable hydrocarbons (TRH) C_{15} – C_{28} and C_{29} – C_{36} fractions, at 6,500 and 7,500 mg/kg respectively. The concentrations were identified to exceed the NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites guideline value of 1,000 mg/kg. However, it was noted that the service station guidelines are derived for sensitive sites and likely to be overly conservative for the current site use as a racecourse. Comparison of the results with CRC Care Health Screening Levels (HSLs; 2011) for commercial/industrial use suggests that these concentrations are unlikely to pose an unacceptable risk to human health through direct contact.
- Exceedances of the adopted investigation levels were identified in groundwater for lead at MW4 and MW7 and zinc in MW4. The margins of exceedances were generally low, and given that the adopted trigger values have assumed a low alkalinity, it was considered unlikely that these contaminants posed an unacceptable risk to Ludmilla Creek. There was also insufficient data linking these metals to the activities on site.
- TRH C_{15} – C_{28} fractions were present in excess of the adopted site investigation level in groundwater at MW1, down hydraulic gradient of the track. The detected hydrocarbon fractions at MW1 were the same as those elevated in the sample of oil-treated track sand, indicating that the application of oil may be locally impacting shallow groundwater. However, on the basis of the relatively low margin of exceedance, and the likely attenuation of hydrocarbons in groundwater as it moves further off-site, it was considered unlikely that the concentrations observed would pose an unacceptable risk to local freshwater ecosystems, in the form of Ludmilla Creek.

Based on the findings of the investigations carried out, the contaminants of potential concern associated with the used oil application are considered to be:

- TRH C_6-C_{36}; and
- BTEX compounds.

4.3 Used Oil Characterisation

A sample of used oil was collected and sent for analysis at a NATA accredited laboratory (MGT Labmark) on 1 May 2012, The laboratory certificate is provided in Appendix A. The results indicate that the used oil comprises a mixture of diesel and motor oil or a similar hydrocarbon product. The composition of the used oil is provided in Table 2.

Table 2 Used Oil Characterisation

Analyte	Used Oil Sample	
	mg/kg	% of TRH*
Total Recovering Hydrocarbons		
C6 – C9	4,000	1.46
C10 – C14	53,000	19.34
C15 – C28	160,000	58.40
C29 – C36	57,000	20.80
BTEX		
Benzene	<5	-
Toluene	190	-
Ethylbenzene	67	-
Xylenes (ortho, meta and para)	380	-

The used oil, provided by Waste Solutions, prior to its application at the Fannie Bay Racecourse the oil is polished (a process in which the hydrocarbons are separated from potential water in the mix) and settled in a pond followed by air-sparging the oil by a compressor to minimise the odour produced by the used oil in application and use.

It is noted that benzene, a contaminant of potential concern identified in the air quality monitoring carried out, was recorded below the laboratory detection limit, which indicates that the used oil application is not contaminating the site with significant concentrations of this contaminant.

4.4 Conceptual Site Model

The Conceptual Site Model (CSM) is a qualitative analysis tool which identifies the contamination sources, transport mechanisms, exposure pathways and receptors considered. A conceptual site model (CSM) has been developed based on GHD's understanding of the site setting, including geology, hydrogeology and surrounding land use in order to identify potentially significant source-pathway-receptor (SPR) linkages in respect of risks to human health and the environment.

4.4.1 Sources

The single primary source of potential contamination under consideration at the site is

the application of used oil to the track sands. Secondary potential sources of contamination comprise the treated track sands themselves, and potential spillages/leaks associated with temporary storage of the oil on site.

4.4.2 Exposure Pathways

For an exposure to occur, a complete pathway must exist between the source of contamination and the receptor. Where the exposure pathway is incomplete, there is no exposure, and hence no risk.

An exposure pathway consists of the following elements:

- Source (e.g. spills, leaks, etc);
- Release mechanism (e.g. leaching, volatilisation);
- Transport media (e.g. soil, groundwater, sediment, surface water, air);
- Exposure point, where the receptor comes in contact with the contamination (e.g. groundwater from an extraction bore, vapours inside a building or in ambient air); and
- Exposure route (e.g. inhalation, ingestion, dermal contact).

Where the pathway for a chemical from the source to the receptor is incomplete, there is no incremental risk due to the presence of contamination. A review of the possible exposure pathways has been undertaken for the identified receptors as part of the CSM. The primary pathways by which humans and the environment could be exposed to the sources of contamination are considered to be:

- Volatilisation of hydrocarbons from soil to outdoor air and subsequent inhalation on and off site;
- Volatilisation of hydrocarbons and generation of nuisance odour;
- Direct contact with hydrocarbon contaminated soils, including incidental ingestion on site;
- Leaching of hydrocarbons in soil to groundwater; and
- Lateral migration of dissolved phase hydrocarbons via shallow groundwater transport and subsequent discharge to surface water systems.

4.4.3 Populations of Interest (Receptors)

When evaluating potential adverse health effects to people or the environment from exposure to a contaminated site all potentially exposed populations should be considered.

For the site, the populations or receptors of interest include:

- On site commercial users (jockeys, ground staff etc);

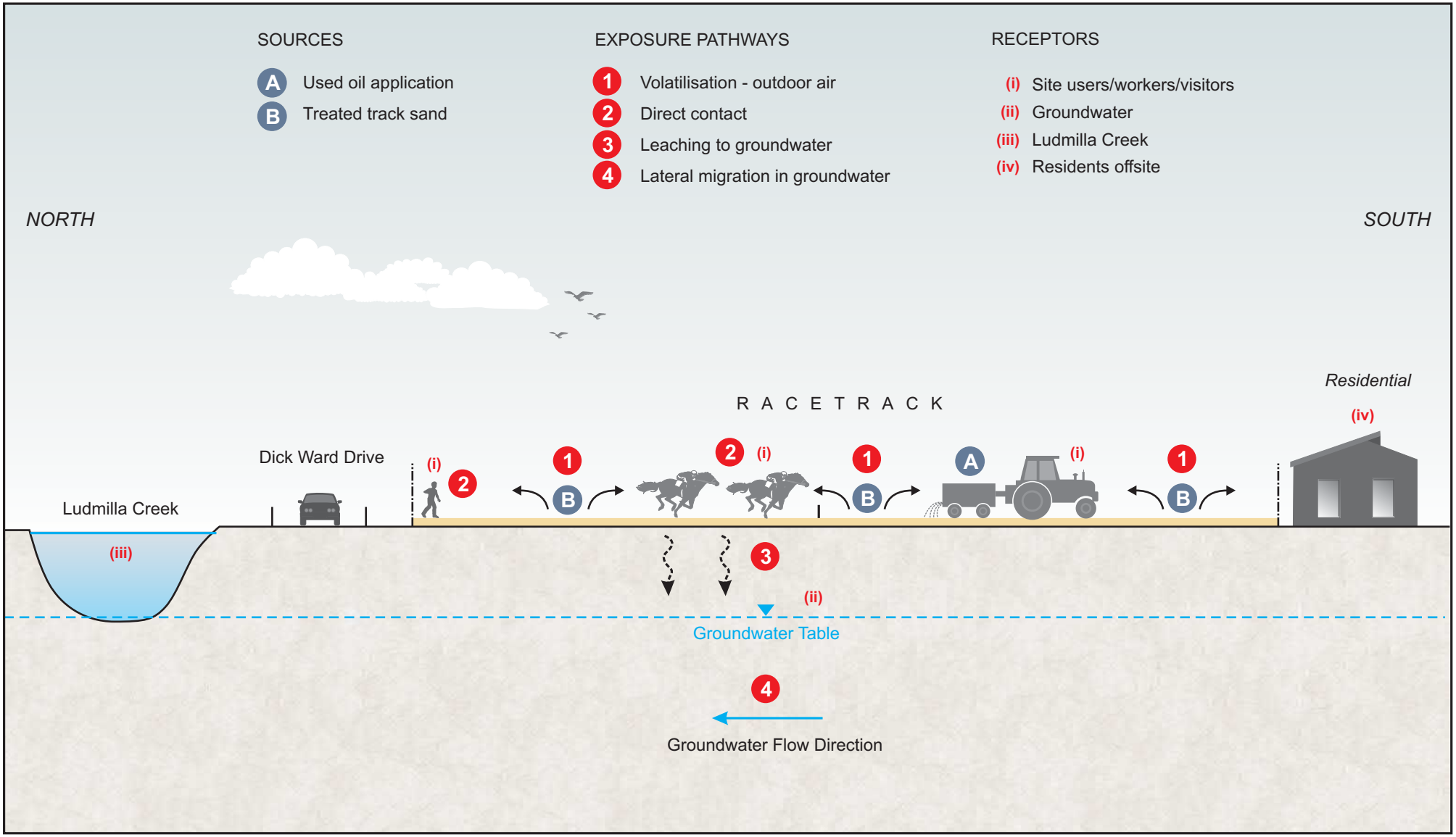
- Site visitors;
- Off-site residents;
- Groundwater beneficial uses (e.g. drinking water); and
- Ludmilla Creek 500 m north east of the site.

Potential source pathway receptor (SPR) linkages based on the conceptual site model are presented in Table 3 below and presented graphically on Figure 2.

Table 3 Site Conceptual Model

Source	Pathway	Receptor	Linkage complete?
Oil application to track sands (including accidental spillages)	Volatilisation from treated soil to outdoor air and generation of nuisance odour	Residents off site	Yes. Complaints have been received from off-site residents.
	Volatilisation from soils to outdoor air and subsequent inhalation of contaminants	Residents off site	No. Air quality monitoring has not demonstrated unacceptable risk to off-site receptors
		Commercial users on site	No. Air quality monitoring has not demonstrated unacceptable risks on site.
	Direct contact with treated soil (including accidental ingestion)	Commercial users on site	No. Soil testing has demonstrated concentrations of the identified contaminants of concern are below health based screening levels.
	Leaching of hydrocarbons from treated soils to groundwater	Groundwater (beneficial uses on site)	No. Groundwater is not used for any beneficial uses on site.
Dissolved phase petroleum hydrocarbons in groundwater beneath the site and lateral transport	Lateral migration	Surface water (Ludmilla Creek)	No. An evaluation of groundwater monitoring results indicated only one, marginal exceedance for TPH in groundwater near the site boundary. Unacceptable risks to Ludmilla creek were considered unlikely based on the low mobility of the heavier chain hydrocarbons and distance to receptor.

	Groundwater (beneficial uses on site)	No. Groundwater off site in the direction of flow is brackish to saline and unsuitable for most uses with a yield less than 0.5 L/s (Ref. 3). There are no identified abstractions of groundwater down-gradient.



GHD CLIENTS | PEOPLE | PERFORMANCE

Darwin Turf Club
Darwin Turf Club EMP

Conceptual Site Model

scale | nts | date | 11 May 2012

job no | 43-21851
file ref | 4321851_LTN_01.cdr

Figure 2

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

5. Risk Management

5.1 Potential Environmental Impacts

The following environmental parameters and potential impacts are identified as being of potential significance. Significance is based on assessment of risk in accordance with *AS/NZS 4390: Risk Management.* Risk is assessed pre- and post-mitigation with mitigation measures presented in the EMP sub-plans. The residual risks (post-mitigation reductions in risk) are primarily the product in reductions in the likelihood of impacts occurring, with additional risk reduction through consequences reduced by any required mitigation. Assessments of the effectiveness of the mitigation measures are based on past implementation of these procedures. See Appendix D for descriptions used to classify likelihood and consequence measures of impact.

Table 4 Environmental Risk Assessment and Potential Impacts of the Application of Used Oil

Parameter	Impact	Pre-mitigation Likelihood	Pre-mitigation Consequence	Pre-mitigation Risk
Odour	Residents affected by adverse odour during oil application/ tilling	Unlikely	Moderate	Moderate
Noise	Residents affected by noise during oil application/ tilling	Likely	Moderate	High
Light	Residents affected by lights from operations during hours of darkness	Possible	Minor	Moderate
Air Quality	Residents affected by reduced air quality during oil application/ tilling	Unlikely	Moderate	Moderate
Groundwater/ Surface water	Oil application results in groundwater or surface water pollution through runoff.	Possible	Minor	Moderate
Waste Generation	Impact to visual amenities and pollution of soils/groundwater from accidental spills	Possible	Minor	Moderate

Note: Post-mitigation risk is detailed in Section 5.10.

5.2 Risk Management Sub-management Plans

Risk management is organised around each of the environmental elements associated with the application of oils including light, noise, odour, air quality, surface / groundwater, soil and waste generation.

Management of elements is structured as sub-plans organised as follows.

Objective: The guiding environmental management objective/s and activities that apply to the element.

Target: Sets the benchmarks by which the successes of the management strategies are judged.

Actions: The procedures to be employed to ensure that the relevant objectives are met.

Monitoring and Reporting: The process of measuring actual performance, or how well the objective has been achieved. This includes the format, timing and responsibility for reporting and auditing of the monitoring results.

Contingency: The action to be implemented in the case of non-compliance. This includes strategies of remediation and the person(s) responsible for the actions.

5.3 Odour Sub-management Plan

Table 5 Odour Sub-management Plan

Objective	Minimise potential for odour nuisance
Targets	No reports of potential hydrocarbon odour from neighbouring properties.
Actions	Application of oil and tilling operations to take place in the early morning / night time hours when temperatures are lowest and the wind is calm in order to minimise potential odour generation. Application of oil should only take place when winds are blowing away from resident properties or during times when wind speeds are less than 7.2 km/h (half annual average wind speed). The Bureau of Meteorology website should be checked to confirm wind direction (website: http://www.bom.gov.au/products/IDD60901/IDD60901.94120.shtml). Installation of wind vane to provide wind direction and speed. During application and two hours subsequently, mobile odour elimination units will be operated at the site. These units are to be placed at locations on the site boundary taking wind direction and sensitive receptors into account. The units will emit water vapour from a solution of an odour suppressant (eg nil-odour) mixed with potable water at a ratio of no less than 7.5 to 500 mL.

Monitoring	The Project and Operations Manager is to maintain a log of odour complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.
Reporting	All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Chief Operating Officer.
Contingency	Should odour generation still occur despite the above management controls being implemented, the following contingency measures should be considered: ◗ Increasing pine oil content in used oil before application. However, the potential impact on oil viscosity and the track sand consistency would need to be considered. ◗ An increase in the duration and/or quantity of odour mitigation units around the site. ◗ Construction of a fixed odour control system along the track boundary adjacent to sensitive receptors. This should be built to manufacturers specification, but could nominally comprise the following: – Raised irrigation line at least 1.5 m above ground level with sprinkler heads approximately 1.5 m apart. The sprinkler heads should be able to deliver a fine mist with no discernible droplets; and – Supply of an odour control solution such as ANOTEC 0307 or approved equivalent) to the irrigation line at a sufficient volume to supply sprinkler heads.

5.4 Air Quality Sub-management Plan

Table 6 Air Quality Sub-management Plan

Objective	Minimise potential for reduced air quality
Targets	No exceedances of relevant National Environment Protection (Air Toxics) Measure targets.
Actions	Application of oil and tilling operations to take place in the early morning / night time hours when temperatures are lowest and the wind is calm in order to minimise potential odour generation. Application of oil should only take place when winds are blowing away from resident properties or during times when wind speeds are less than 7.2 km/h (half annual average wind speed). The Bureau of Meteorology website should be check to confirm wind direction (website: http://www.bom.gov.au/products/IDD60901/IDD60901.94120.shtml). Installation of wind vane to provide wind direction and speed.
Monitoring	Should complaints regarding air quality be consistently made from residents, supplementary air quality monitoring will be undertaken to establish if concentrations pose a risk to human health. **Air sampling should be undertaken at the following locations:** one Silco Canister to the north, two to the east, one to the south and two to the west, thereby enabling samples to be taken upwind and downwind of the track with any given wind direction. The samples should be taken between 1.2 and 1.5 metres above ground level, and in accordance with the methodology in the National Environmental Protection (Air Toxics) Measure over a 24 hour period.
Reporting	All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. Monitoring results should be assessed against the National Environmental Protection (Air Toxics) Measure, 2004. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Chief Operating Officer.

5.5 Light Sub-management Plan

Table 7 Light Sub-management Plan

Objective	Minimise potential for light pollution or nuisance.
Targets	No reports of light nuisance from neighbouring properties.
Actions	Activities which require lights are to be undertaken with minimum lighting required to carry out operations safely. Stray, non-directional lighting should be avoided during operations. . Neighbouring residents to be informed of planned activities and lighting times.
Monitoring	The Project and Operations Manager is to maintain a log of lighting outside of daylight hours.
Reporting	All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Chief Operating Officer.
Contingency	Should night-time operations cause unacceptable light pollution despite the above management controls, consideration should be given to changing plant/operating protocols. Strategic placement of light screens should also be considered.

5.6 Noise Sub-management Plan

Table 8 Noise Sub-management Plan

Objective	Minimise potential for noise pollution or nuisance

Targets	◗ No reports of noise nuisance from neighbouring properties. ◗ Noise limits as set by local regulatory authorities shall be adhered to. In the absence of any guideline limits, the following should apply: – Where possible, on site machinery should have a maximum operating noise level of 85 A-weighted decibels (dBA). – The LA10 (15 minutes) emitted by the works to specific residences should not exceed the LA90 background level by more than 20 dBA.
Actions	There are three main areas where noise mitigation measures can be applied: ◗ at the source ◗ in the transmission path ◗ at the noise receiver. Control of noise at the source is always the preferred method of noise control as it reduces the impact on the entire surrounding area. Noise path control or mitigation at the receiver usually requires measures that block the transmission of noise such as erecting barriers or making architectural modifications to building facades. As the benefit from these measures would only apply to a limited area, in general, this should only be done after endeavouring to control noise at the source. Noise control at the source is a combination of the use of noise-efficient technology and best management practices. Considerations to noise efficient technologies are as follows: ◗ Choosing quiet equipment: noise should be a factor in selecting equipment; ◗ Ensure equipment is operated in such a way as to manage noise; and ◗ Using broad band or other low impact reversing alarms in place of beeper and tonal alarms. These alternative systems can reduce off-site noise impacts while maintaining on-site worker safety. Best management practice considerations are as follows: ◗ Consider alternative methods; ◗ Change the activity to reduce noise impact; ◗ Conducting regular maintenance of equipment so that it works efficiently; ◗ Keeping neighbours informed of the activities; and ◗ Educating staff and contractors about noise and quiet work practises.

Monitoring	The Project and Operations Manager is to maintain a log of noise complaints, establishing which activities and times cause the most frequent complaints. The Project and Operations Manager is to review and implement changes to the schedule of activities.
Reporting	All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Chief Operating Officer.
Contingency	Should the actions listed above be inadequate to mitigate noise and targets are not achieved, the following contingency measures should be considered: ◗ Erection of noise barriers constructed of sound absorptive material. Barriers are most effective when placed in the line of sight between the noise source and the receptor. The amount of noise reduction achieved will depend on the height and mass of the barrier and noise frequency. ◗ Implementation of a noise monitoring program at the site boundary to assess exceedence levels.

5.7 Groundwater Quality Sub-management Plan

Table 9 Groundwater Quality Sub-management Plan

Objective	Prevent contamination of groundwater. Prevent contamination of groundwater in neighbouring areas such as residential areas and surrounding environment.
Targets	Groundwater concentrations should be at levels not deemed to constitute an unacceptable risk to human health or the environment. For the purpose of assessing groundwater for potentiation discharge into surface water, the water results must be compared to the criteria outlined in ANZECC (2000) for Freshwater Aquatic Ecosystems.

Actions	Application of oil to be avoided immediately before or during heavy rain. Machinery/plant used to maintain the track to be stored 20 m away from exposed drains and within bunded areas. No storage of used oil on site is preferred. However, if storage is required on site the storage should be surrounded by an impervious bund with a containment volume of 120% of the maximum possible spillage volume.
Monitoring	A groundwater monitoring event should be carried out in all accessible monitoring wells at the site at a minimum frequency of once every five years. The monitoring should be carried out in accordance with the procedures and analysis described in GHD (2012). If used oil is stored on site, the Project and Operations Manager is to conduct inspections of hydrocarbon storage areas monthly. If a spillage of used oil occurs or site conditions change (i.e. excessive surface erosions) a groundwater monitoring plan should be prepared and consideration given to carrying out a supplementary groundwater monitoring event.
Reporting	All groundwater sampling results should be reported to NRETAS. All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. Monitoring results should be assessed against the National Environmental Protection (Assessment of Site Contamination) Measure Water Investigation Level for Freshwater Ecosystems and Drinking water levels for reference. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Project and Operations Manager.

Contingency	◗ Should the used oil application be identified to be impacting groundwater and causing exceedances of the nominated criteria the following contingencies should be considered: ◗ Use of an environmentally safe alternative to the used oil; ◗ If an alternative cannot be sourced, consideration should be given to lining the track with an impermeable barrier to prevent downward migration of oil to groundwater. The track drainage would need to be modified so as to divert any impacted rainwater into an appropriate oil/water separator.

5.8 Surface Water and Erosion Sub-management Plan

Table 10 Surface Water and Erosion Sub-management Plan

Objective	Prevent contamination of surface water in neighbouring areas such as Ludmilla Creek. Prevention of sediments containing used oil leaving site.
Targets	Surface water concentrations should be at levels not deemed to constitute an unacceptable risk to human health or the environment. For the purpose of assessing surface water for potentiation discharge into surface water, the water results must be compared to the criteria outlined in ANZECC (2000) for Freshwater Aquatic Ecosystems (95%) species protection.
Actions	Application of oil to be avoided immediately before or during heavy rain. Machinery/plant used to maintain the track to be stored 20 m away from exposed drains and within bunded areas. No storage of used oil on site is preferred. However, if storage is required on site the storage should be surrounded by an impervious bund with a containment volume of 120% of the maximum possible spillage volume Installation of erosion and sediment control measures at drainage lines (potential installation of Stiff Grass Barriers surrounding concrete stormwater channels).
Monitoring	If used oil is stored on site, the Property and Operations Manager is to conduct inspections of hydrocarbon storage areas monthly.

Reporting	All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. Monitoring results should be assessed against the National Environmental Protection (Assessment of Site Contamination) Measure Water Investigation Level for Freshwater Ecosystems and Drinking water levels for reference. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Project and Operations Manager.
Contingency	Should the identified control measures be ineffective, oil application should be postponed until the issue can be rectified.

5.9 Waste Management Sub-management Plan

Table 11 Waste Generation Sub-management Plan

Objective	Appropriate disposal of accidental spillages of used oil. Management of any surface oil. Prevent contamination of surrounding environment.
Targets	All oily waste to be managed and disposed of in accordance with regulatory requirements.
Actions	No storage of used oil on site is preferred. However, if storage is required on site the storage should be surrounded by an impervious bund with a containment volume of 120% of the maximum possible spillage volume. Oil should not be stored within 20 m of concentrated water flows / poorly drained areas or within drip line of trees. Used oil not applied to the track is to be taken off site and returned to the contractor. Spill kits to be maintained on site and relevant persons trained for the use of spill kit (outside tracked area). Waste generated to be disposed of offsite at an appropriately licensed facility.

Monitoring	The Site staff and Property and Operations Manager to monitor for spillage during application, delivery and transport offsite. If used oil is stored on site, the Project and Operations Manager is to conduct inspections of hydrocarbon storage areas monthly.
Reporting	All waste taken offsite is to be documented, details should include, volume, type, characteristics and disposal location. All non-conformances, incidents, corrective actions and complaints are to be documented and reported to the Project and Operations Manager. The Project and Operations Manager is to keep a register of all non-conformances, corrective actions, incidents, and complaints. The Project and Operations Manager is to report all non-conformances, incidents, corrective actions and complaints to the Chief Operating Officer who will report to NRETAS. The following are to be undertaken when an incident or non-conformance is identified: ◗ an investigation into the incident or non-conformance is to be immediately undertaken by the Project and Operations Manager; ◗ the identified cause/s is/are to be rectified to prevent additional incidents or non-conformance; and ◗ results of the investigation are to be reported to the Project and Operations Manager.
Contingency	Not applicable

5.10 Assessment of Residual Risks

Pre-mitigation risks are identified in Section 5.1, following the use of sub-plans for each environmental parameter identified as having an impact from the application of oil Table 12 indicates the residual risk.

Table 12 Environmental Risk Assessment and Potential Impacts, Residual Risk

Parameter	Impact	Post-mitigation Likelihood	Post-mitigation Consequence	Pre-mitigation Risk	Residual Risk
Odour	Residents affected by adverse odour during oil application/ tilling	Unlikely	Minor	Moderate	**Low**

Parameter	Impact	Post-mitigation Likelihood	Post-mitigation Consequence	Pre-mitigation Risk	Residual Risk
Noise	Residents affected by noise during oil application/ tilling	Unlikely	Minor	High	**Low**
Light	Residents affected by lights from operations during hours of darkness	Unlikely	Minor	Moderate	**Low**
Air Quality	Residents affected by reduced air quality during oil application/ tilling	Rare	Moderate	Moderate	**Moderate**
Groundwater / Surface water	Oil application results in groundwater or surface water pollution through runoff.	Unlikely	Minor	Moderate	**Low**
Waste Generation	Impact to visual amenities and pollution of soils/groundwater from accidental spills	Unlikely	Minor	Moderate	**Low**

6. Consultation and Communication Plan

To address consultation and communication with key stakeholders in respect of the used oil application, a consultation and communication plan has been prepared. The consultation and communication plan provides a strategy for communication with members with identified stakeholders who have a real interest in the application of used oil / or who may be affected by this activity.

The consultation and communication is provided in Appendix E.

7. EMP Review

An EMP is a working document which requires review and amendments during the life of the project.

The EMP should be reviewed by the Project and Operations Manager as follows:

- when there is a change in the application of oil or tilling of the track;
- following a significant environmental incident; and
- when there is a need to improve performance of an environmental parameter.

The review process should include an assessment of the environmental controls in place, consultation with site staff and neighbouring properties to make sure the plan remains effective. All reviews and changes made should be documented and versions kept for record purposes.

An environmental management checklist is provided in Appendix F.

8. References

1. Bureau of Meteorology, Climate Data Online [online] http://www.bom.gov.au/climate/data/ [Accessed 11 October 2011].
2. Australia Geological Series (1988) Darwin Northern Territory, SD 52-4, 1:250,000.
3. Northern Territory Government, Department of Infrastructure, Planning and Environment (2003) Groundwater Resource of the Darwin Area, 1:25,000.
4. Northern Territory Government, Department of Infrastructure, Planning and Environment (2003) Water Resources Map of Darwin, Sheet 5073, 1:100,000.

Appendix A

Used Oil Analysis Results

mgt LabMark ENVIRONMENTAL LABORATORIES

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

GHD Pty Ltd NT
Level 5, 66 Smith Street
Darwin
Northern Territory 0800

Attention:Alex Koscielski

Report	**335793-S**
Client Reference	GHD NT
Received Date	May 02, 2012

Client Sample ID			**UNLABELED**
Sample Matrix			**Oil**
mgt-LabMark Sample No.			**M12-My02059**
Date Sampled			**May 02, 2012**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	4000
TRH C10-C14	20	mg/kg	53000
TRH C15-C28	50	mg/kg	160000
TRH C29-C36	50	mg/kg	57000
TRH C10-36 (Total)	50	mg/kg	270000
BTEX			
Benzene	0.05	mg/kg	< 5
Toluene	0.05	mg/kg	190
Ethylbenzene	0.05	mg/kg	67
o-Xylene	0.05	mg/kg	120
Total m+p-Xylenes	0.10	mg/kg	260
Xylenes(ortho.meta and para)	0.15	mg/kg	380
Fluorobenzene (surr.)	1	%	79
TRH Fingerprint			
TRH Fingerprint			See attached

Sample History

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

Description	Testing Site	Extracted	Holding Time
mgt-LabMark Suite 1			
BTEX - Method: USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons	Melbourne	May 09, 2012	14 Day
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - MGT 100A	Melbourne	May 09, 2012	14 Day
TRH Fingerprint - Method: TRH Fingerprint	Melbourne	May 02, 2012	14 Day

mgt LabMark ENVIRONMENTAL LABORATORIES

ABN – 50 005 085 521 e.mail : enviro@mgtlabmark.com.au web : www.mgtlabmark.com.au

Melbourne
3-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 9564 7055
NATA # 1261
Site # 1254

Sydney
Unit F6, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 8215 6222
NATA # 1261 Site # 18217

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

Company Name: GHD Pty Ltd NT
Address: Level 5, 66 Smith Street
Darwin
Northern Territory 0800

Order No.:
Report #: 335793
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: May 2, 2012 3:06 PM
Due: May 9, 2012 4:00 PM
Priority: 5 Day
Contact name: Alex Koscielski

Client Job No.: GHD NT

mgt-LabMark Client Manager: Onur Mehmet

Sample Detail					TRH Fingerprint	mgt-LabMark Suite 1
Laboratory where analysis is conducted						
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
External Laboratory						
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
UNLABELED	May 02, 2012		Liquid	M12-My02059	X	X

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. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis.
7. 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 Sample Receipt Acknowledgment

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.

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

UNITS

mg/kg:milligrams per Kilogram

mg/L:milligrams per litre

µg/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 milliltres

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.
	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.
Batch Duplicate:	A second piece of analysis from a sample outside of the client's batch of samples but run within the laboratory batch of analysis.
Batch SPIKE:	Spike recovery reported on a sample from outside of the client's batch of samples but run within the laboratory batch of analysis.
USEPA:	U.S Environmental Protection Agency
APHA:	American Public Health Association
ASLP:	Australian Standard Leaching Procedure (AS4439.3)
TCLP:	Toxicity Characteristic Leaching Procedure
COC:	Chain Of Custody
SRA:	Sample Receipt Advice
CP:	Client Parent - QC was performed on samples pertaining to this report
NCP:	Non-Client Parent - QC was performed on samples not pertaining to this report, however QC is representative of the sequence or batch that client samples were analysed within

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 50-150% - Phenols 20-130%.

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, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene 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 Arochlor 1260 in Matrix Spikes and LCS's.
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 RPD's are calculated from raw analytical data thus it is possible to have two sets of data below the LOR with a positive RPD - eg: LOR 0.1, Result A = <0.1 (raw data is 0.02) & Result B = <0.1 (raw data is 0.03) resulting in a RPD of 40% calculated from the raw data.

Test	Units	Result 1			Acceptance	Pass	Qualifying
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
TRH C6-C9	mg/kg	< 20			20	Pass	
Method Blank							
BTEX USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	mg/kg	< 0.05			0.05	Pass	
Toluene	mg/kg	< 0.05			0.05	Pass	
Ethylbenzene	mg/kg	< 0.05			0.05	Pass	
o-Xylene	mg/kg	< 0.05			0.05	Pass	
Total m+p-Xylenes	mg/kg	< 0.1			0.10	Pass	
Xylenes(ortho.meta and para)	mg/kg	< 0.15			0.15	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
TRH C6-C9	%	89			70-130	Pass	
LCS - % Recovery							
BTEX USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	%	88			70-130	Pass	
Toluene	%	94			70-130	Pass	
Ethylbenzene	%	95			70-130	Pass	
Total m+p-Xylenes	%	88			70-130	Pass	
Xylenes(ortho.meta and para)	%	87			70-130	Pass	

Test	Lab Sample ID	QA	Units	Result 1			Acceptance	Pass	Qualifying
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	M12-My00467	NCP	%	92			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M12-My00467	NCP	%	104			70-130	Pass	
Toluene	M12-My00467	NCP	%	100			70-130	Pass	
Ethylbenzene	M12-My00467	NCP	%	98			70-130	Pass	
o-Xylene	M12-My00467	NCP	%	86			70-130	Pass	
Total m+p-Xylenes	M12-My00467	NCP	%	92			70-130	Pass	
Xylenes(ortho.meta and para)	M12-My00467	NCP	%	90			70-130	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M12-My00467	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M12-My00467	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toluene	M12-My00467	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Ethylbenzene	M12-My00467	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
o-Xylene	M12-My00467	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Total m+p-Xylenes	M12-My00467	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes(ortho.meta and para)	M12-My00467	NCP	mg/kg	< 0.15	< 0.15	<1	30%	Pass	

Comments

Sample Integrity

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

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Uncertainty data is available on request

mgt LabMark ENVIRONMENTAL LABORATORIES

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GHD Pty Ltd NT

ANALYTICAL REPORT

Mgt-LabMark REPORT No. 335793a

On 2nd May 2012 a sample was received from GHD Pty Ltd NT. We were requested to perform a TPH characterisation using "fingerprint" analysis.

A portion of the sample was extracted with dichloromethane, and the resultant extract was analysed by Gas Chromatography using FID (Flame Ionization Detection).

A series of standards consisting of a number of common petroleum products including unleaded petrol, kerosene, turpentine, diesel fuel and motor oil were run for comparison purposes.

The chromatograms that resulted from this procedure are attached for reference.

Comments.

Sample: UNLABELLED (M12-My02059)

Comparison of the sample chromatogram with the chromatograms of various standard products suggests that the sample is a mixture of diesel and motor oil or a similar hydrocarbon products.

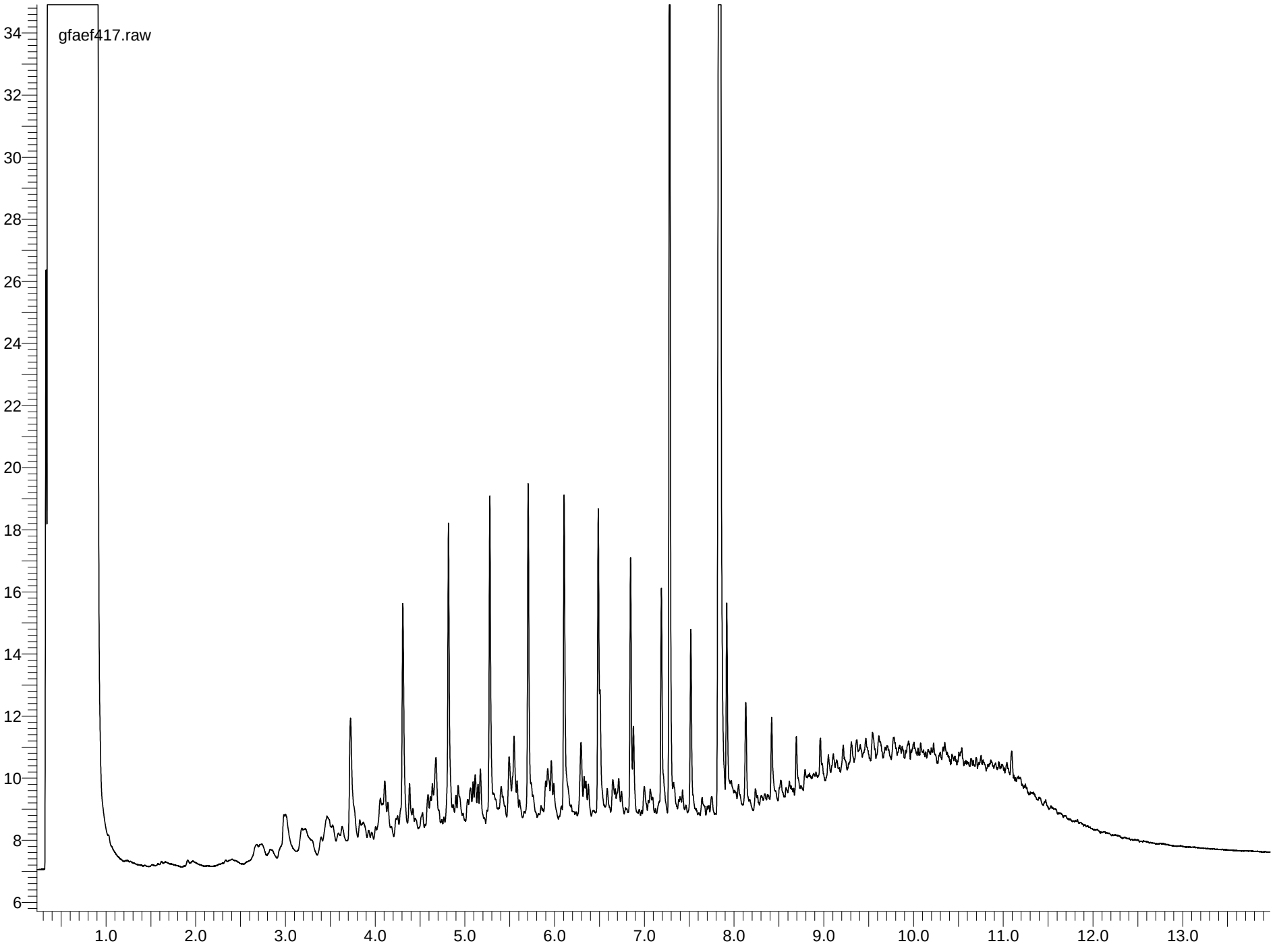
Onur Mehmet

10 May 2012

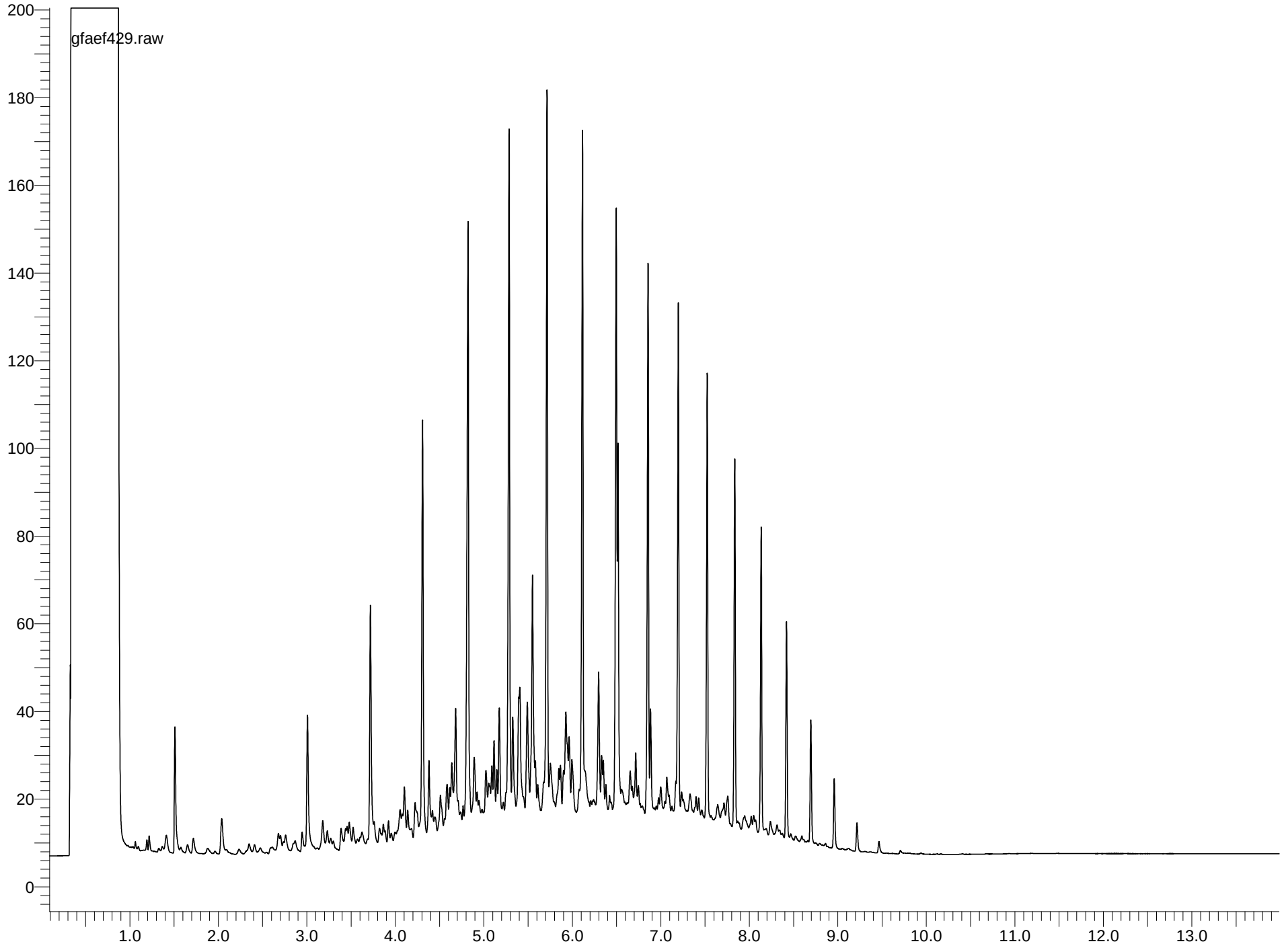
Melbourne, Sydney, Perth, Brisbane, Adelaide, Darwin, Newcastle

Postal: mgt-LabMark
PO Box 276
Oakleigh Victoria, 3166

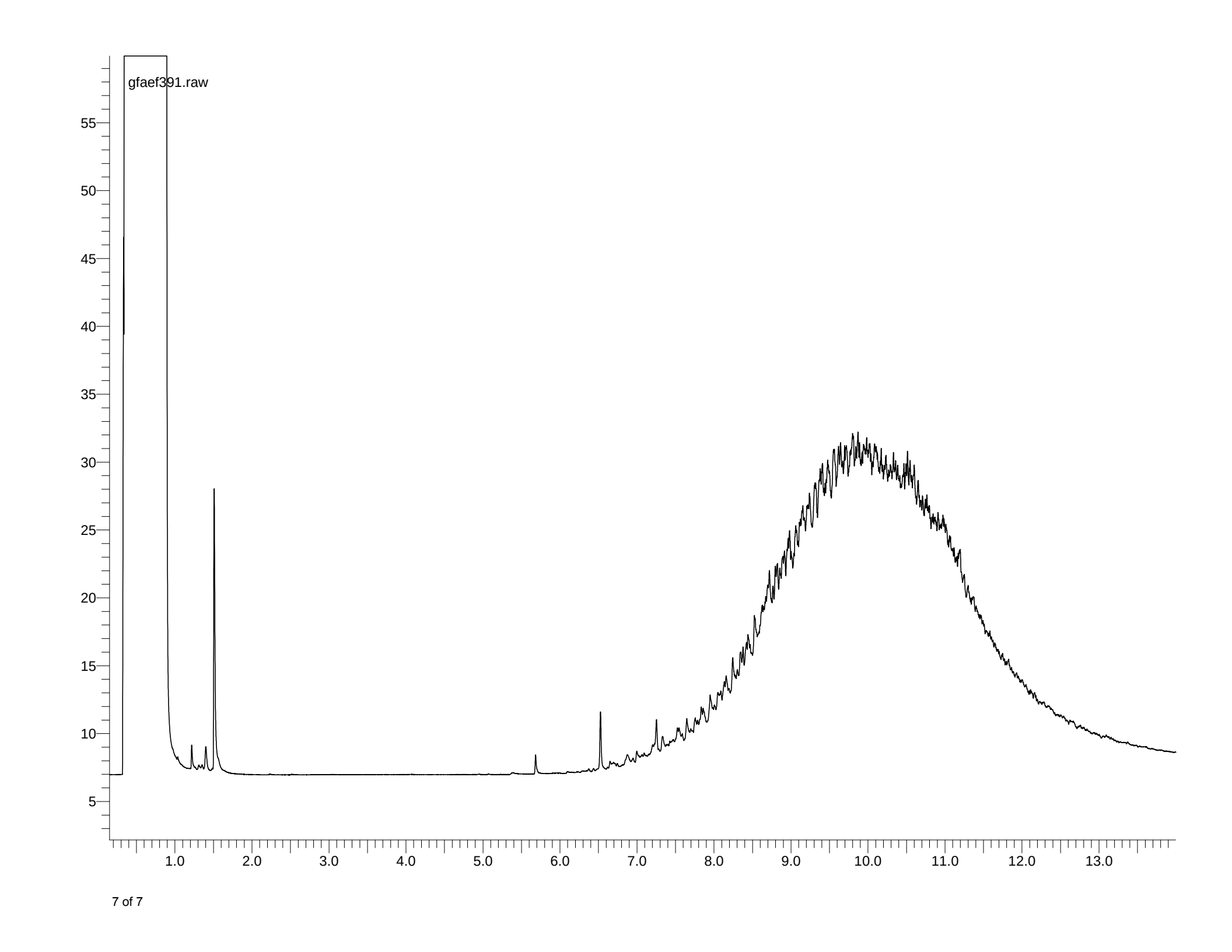
Plot Title		Start Time	End Time	Scale	Offset
gfaef417.raw		0.23	13.97	29.21	5.70
Sample Name :	my02059 1/1000				
Sample Number:	291				
Instrument File Name:	c:\penexe\tcws\agilent6\ag6_trh_gfaef_010512				


gfaef417.raw
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0

Plot Title		Start Time	End Time	Scale	Offset
gfaef429.raw		0.09	13.99	206.10	-5.67
Sample Name :	diesel				
Sample Number:	291				
Instrument File Name:	c:\penexe\tcws\agilent6\ag6_trh_gfaef_010512				


gfaef429.raw
200
180
160
140
120
100
80
60
40
20
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0

Plot Title		Start Time	End Time	Scale	Offset
gfaef391.raw		0.15	14.00	57.75	2.16
Sample Name :	motor oil				
Sample Number:	291				
Instrument File Name:	c:\penexe\tcws\agilent6\ag6_trh_gfaef_010512				


gfaef391.raw
55
50
45
40
35
30
25
20
15
10
5
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0

Appendix B

Complaint Report Form

Complaint Report Form

Complaint taken by _____ Date _____ Time _____

Details of Complainant (make a note if no details were provided)	
Name	
Address	
Phone number	
Information received by:	
☐ Letter	☐ Site inspection
☐ Phone	☐ Community Environment Liaison Committee
☐ Visit	☐ Other

Nature of Complaint

Action Taken: (To be completed by EMR)

Name of EMR: _____

Description of action taken (if no action was taken, provide reasons why); _____

_____

_____

Is the job completed? ☐ Yes ☐ No Completion Date: _____

First Action Date: _____

Customer Advised? ☐ Yes ☐ No ☐ Not required

Date Advised: _____

Customer advised by ☐ Letter ☐ Phone ☐ Visit ☐ Other _____

Office Use:

Noted Environmental Management Representative: _____ Date: _____

Action entered on computer: By: _____ Date: _____

Complaint No.	Date complaint received	Complaint/s issue eg. noise, dust	Complaint received from	Method of complaint	Action Taken	Signature	Date

Complaint No.	Date complaint received	Complaint/s issue eg. noise, dust	Complaint received from	Method of complaint	Action Taken	Signature	Date

Appendix C

GHD Environmental Monitoring Report November 2011

CLIENTS | PEOPLE | PERFORMANCE

Darwin Turf Club

Report for Environmental Monitoring Darwin Turf Club

Environmental Monitoring Report

November 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

This Environmental Monitoring Report for the Darwin Turf Club ("Report"):

1. *has been prepared by GHD Australia Pty Ltd] ("GHD") for Darwin Racing;*
2. *may only be used and relied on by Darwin Racing;*
3. *must not be copied to, used by, or relied on by any person other than Darwin Racing without the prior written consent of GHD;*
4. *may only be used for the purpose of a preliminary contaminated land assessment (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Darwin Racing arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to those specifically detailed in Section 1.3 of this Report;*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions").

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation.

Contents

Table Index

Appendices

Executive Summary

GHD Pty Ltd (GHD) was commissioned by Darwin Racing to undertake environmental monitoring at Fannie Bay Racecourse. Environmental monitoring was required to address comments made by the Department of Natural Resources, Environment, The Arts and Sports (NRETAS) in relation to the application of oil to the racecourse.

Oil is applied to the racecourse twice a year; at the end of April and September by Waste Solutions, involving the application of approximately 60,000 Litres which is subsequently tilled into the track (Appendix C, Photos 4 to 8). Tilling of the track also occurs daily after morning training sessions.

The oil is of relatively high viscosity and is applied to the sand to maintain cohesiveness between the sand particles. The relatively high viscosity reduces potential erosion of the sand due to the local climate, which produces monsoonal rain in the wet season.

Site Investigation

Two rounds of air quality monitoring were undertaken at three locations prior to the application of oil and during the application of oil using SilcoCan Canisters with calibrated passive air sampling kits.

Five groundwater wells were installed to provide groundwater data from across the racecourse and to supplement two existing groundwater wells on the site. During the installation of groundwater wells representative soil samples were taken at surface, 0.2 m, 0.5 m, 1.0 m and each subsequent metre thereafter until the target depth was achieved. All soil samples were screened for volatile organic compounds (VOCs) using a calibrated photo-ionisation detector (PID) and two soil samples were scheduled for laboratory analysis.

In addition, a sample from the treated sands on the track was taken to establish concentrations present.

, One round of groundwater monitoring was undertaken in all seven wells at the site and samples sent for laboratory analysis.

Air Quality Results

The air quality monitoring results indicated that the majority of benzene, toluene, ethylbenzene and xylene (BTEX), total petroleum hydrocarbons (TPH) and VOCs were either below detection or below the adopted investigation criteria, with the exception of the following result:

- Benzene exceeded the guideline value of 3.0 ppb at AQM03, recording 4.6 ppb prior to application of oil on 16 September 2011.

TPH C_5 – C_8 aliphatic, C_9 – C_{12} aliphatic and C_9 – C_{10} aromatic compounds were detected in five out of the six samples collected. At present there are no applicable criteria to assess these results. However, it was noted that the concentrations were generally higher during the second round of air quality monitoring completed during the

application of oil to the track (average concentration prior to application is 527 µg/m^3 compared to 1,216 µg/m^3 during application).

Soil Results

The majority of heavy metals, BTEX and total petroleum hydrocarbons (TPH) were recorded below the adopted investigation criteria.

However, the analysis of the track provided elevated concentrations of TPH above the NSW EPA (1994), "*Contaminated Sites: Guidelines for Assessing Service Station Sites*" of 1,000 mg/kg. Concentrations recorded are as follows:

- 6,500 mg/kg of TPH C_{15} – C_{28}; and
- 7,500 mg/kg of TPH C_{29} – C_{36}.

Groundwater Results

The majority of heavy metals, BTEX, total recoverable hydrocarbons (TRH), VOCs and semi-volatile organic compounds (SVOCs) were recorded below the adopted investigation criteria for freshwater ecosystems and drinking water standards with the exception of the following:

- Elevated concentrations of lead were identified above the freshwater ecosystems guideline value of 0.005 mg/L in MW4 and MW7 at 0.026 and 0.007 mg/L;
- Elevated concentrations of zinc were identified above the freshwater ecosystems guideline value of 0.05 mg/L but below the drinking water standard of 3 mg/L in MW4 at 0.052 mg/L; and
- Elevated concentrations of TRH were identified above the adopted investigation level of 0.6 mg/L in MW1. The total TRH at this location comprised C_{15} – C_{28} (0.6 mg/L), C_{10} – C_{14} (0.1 mg/L) and C_{29} – C_{36} (0.1 mg/L). All other groundwater samples recorded TRH results below the laboratory practical quantitation limit (PQL).

Conclusions

Based on the available data and the stated limitations, the following conclusions are made in relation to the objectives of the project:

- One exceedances of an air quality guideline was identified at the site; benzene was recorded at 4.6 ppb above the NEPM guideline value of 3.0 ppb. The exceedence is anomalous in that it is not linked to a detection of benzene in the treated sand on the track. There is insufficient evidence to conclude that benzene is likely to pose an unacceptable risk to human health at present. Although an eight hour test was not conducted, the 4.6 ppb result was substantially less than the Safework Australia TWA of 1000 ppb.
- Soil samples from MW3 at 3.0 m BGL and MW4 at 1.0 m BGL were analysed for heavy metals, BTEX and TPH, no concentrations were identified above the adopted investigation criteria.

- A sample from the oil-treated track sand indicated that the majority of oil present was in the C_{15} – C_{28} and C_{29} – C_{36} fractions, at 6,500 and 7,500 mg/kg respectively. The concentrations are in excess of the NSW EPA *Contaminated Sites: Guidelines for Assessing Service Station Sites* guideline value of 1,000 mg/kg. The service station guidelines are derived for sensitive sites and are considered overly conservative for the use of the site as a racecourse. Comparison of these results with CRC Care HSLs for commercial/industrial use suggests that these concentrations are unlikely to pose an unacceptable risk to human health.
- Exceedances of the adopted investigation levels were identified in groundwater for lead within MW4 and MW7 and zinc in MW4. The margin of exceedances are generally low, and given that the adopted trigger values have assumed a low alkalinity, it is considered unlikely that these contaminants pose an unacceptable risk to Ludmilla Creek. There is also insufficient data linking these metals to the activities on site.
- TRH C_{15} – C_{28} fractions were present in exceedance of the adopted site investigation level in groundwater at MW1, down hydraulic gradient of the track. The detected hydrocarbon fractions at MW1 correlate with those elevated in the sample of oil-treated track sand, indicating the application of oil may be locally impacting shallow groundwater. However, on the basis of the current data, which indicates a small margin of exceedance, and the likely attenuation of hydrocarbons in groundwater as it moves further off-site, it is considered unlikely that the concentrations observed would pose an unacceptable risk to local freshwater ecosystems, in the form of Ludmilla Creek.

GHD recommends that the following work is carried out in order to refine the conceptual understanding of the site and whether there is a risk to human health and/or the environment:

- **Supplementary air sampling** – data is currently inconclusive with regards to risk posed by migration of volatile contaminants in air. Although benzene has been recorded as present above the guideline value, this was prior to the application of oil and is considered to be anomalous. At least one further monitoring round should be carried out to confirm the presence or absence of benzene at significant concentrations.
- **Supplementary air sampling locations** – to reduce the effect of wind direction on the nominated day of monitoring, sampling at additional locations should be carried out; including one to the north, two to the east, one to the south and two to the west, thereby enabling samples to be taken upwind and downwind of the track with any given wind direction. The samples should also be taken between 1.2 and 1.5 m above ground level, which is less conservative and more targeted at potential concentrations at breathing height.
- **Sampling over a longer duration** – sampling was undertaken over a 30 minute period to provide a snapshot of potential air quality issues at the site. The short duration of sampling would result in exaggerated concentrations from short lived 'spikes' of contamination, which would be averaged out over a longer time. It is recommended further sampling undertaken in line with the National Environmental

Protection (Air Toxics) Measure over a 24 hour period. This would enable a more accurate comparison with the adopted investigation levels.

- **Source Characterisation** – the air sampling detected a number of VOC compounds of uncertain origin. Additional samples from the track sands should be collected and tested for VOCs in order to assess the potential linkage between soil and air concentrations. The testing should also include TPH and heavy metals so that a robust dataset of the source material can be used for further assessment. Investigation into the sources of the oils used for application should also be carried out, including laboratory testing if required.

An investigation should be conducted into possible alternative substances to waste oil for use in treating the track sands, which might pose less potential risk to the environment and human health.

1. Introduction

1.1 Background

GHD Pty Ltd (GHD) was commissioned by Darwin Racing to undertake environmental monitoring at Fannie Bay Racecourse. Environmental monitoring was required to address comments made by the Department of Natural Resources, Environment, The Arts and Sports (NRETAS) in relation to the application of oil to the racecourse.

Oil is applied to the racecourse twice a year; at the end of April and September by Waste Solutions, involving the application of approximately 60,000 Litres which is subsequently tilled into the track (Appendix C, Photos 4 to 8). Tilling of the track also occurs daily after morning training sessions.

The oil is of relatively high viscosity and is applied to the sand to maintain cohesiveness between the sand particles. The relatively high viscosity reduces potential erosion of the sand due to the local climate, which produces monsoonal rain in the wet season.

Fannie Bay Racecourse is located off Dick Ward Drive, Fannie Bay, approximately four kilometres to the north of Darwin CBD. The site is shown in Figure 1 in Appendix A.

1.2 Scope of Works

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

- Installation of five groundwater wells to provide groundwater data from across the racecourse and to supplement two existing groundwater wells;
- One groundwater sampling event at all seven groundwater wells present on site;
- Testing of soil samples from the boreholes and track;
- Air quality monitoring at three locations across the southern section of the site on three separate occasions:
  - Prior to the application of oil;
  - During the application of oil; and
  - During subsequent tilling of the track (monitoring yet to be undertaken).

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 (Assessment of Site Contamination) Measure (NEPM), 1999;
- National Environment Protection (Air Toxics) Measure (NEPM), 2004;

- Australian Standard *Guide to the investigation and sampling of sites with potentially contaminated soil*. *Part 1: Non-volatile and semi-volatile compounds*, AS 4482.1, 2005;
- Australian Standard Guide to the investigation and sampling of sites with potentially contaminated soil. *Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances*, AS 4482.1, 2005; and
- NRETAS *Guideline for Consultants Reporting on Environmental Issues*, 2010.

2. Site Details

2.1 Site Location

Fannie Bay Racecourse comprises approximately 47 hectares and is situated approximately 4 km north of Darwin CBD. The site is located off Dick Ward Drive.

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.

A general layout of the site is provided on Figure 1 in Appendix A.

2.2 Weather

Climate statistics were obtained in October 2011 from the Bureau of Meteorology Website (Ref. 1). The site is located in the wet-dry tropics and is subject to annual periods of flood and drought. The dry season extends from approximately March to September, displaying moderate temperatures, low humidity and winds predominately from the east. The wet season occurs for the remaining months and tropical cyclones, thunderstorms and monsoon rain with winds predominately from the northwest are common, in association with high temperatures and humidity.

Based on the Bureau of Meteorology website (Ref. 1) statistical rainfall and temperature observations from 1941 to present day are presented below:

Rainfall (mm):

Annual mean rainfall: 1,738.4;

Highest monthly mean rainfall: 426.2 (January); and

Lowest monthly mean rainfall: 1.2 (July).

Temperature (°C):

Highest mean maximum: 33.3 (November);

Lowest mean maximum: 30.5 (July);

Highest mean minimum: 25.3 (November/December); and

Lowest mean minimum: 19.3 (July).

2.3 Topography

The site is relatively flat with the track approximately 0.5 m above the surrounding ground level. Surface water drainage at the site generally flows from south to north and is assumed to enter the Ludmilla Creek which discharges into the Beagle Gulf.

2.4 Geology

The superficial geology underlying the site comprises unconsolidated sand, ferruginous and clayey, sandy and gravelly soils (commonly containing limonite pisolites) and pisolites and mottled laterite, in situ reworked remnants of standard laterite profile (Ref. 2).

The bedrock geology underlying the site comprises Kaolinitic Claystone. Kaolinitic Claystone is described as commonly radiolarian-rich, silty in places, montmorillontic, glauconitic and calcareous when fresh (Ref. 2). It includes basal conglomerate, minor bioturbated siltstone, carbonate, sandy claystone and clayey sandstone. The Kaolinitic Claystone is underlain by the Proterozoic Burrell Creek Formation.

2.5 Hydrogeology

The Department of Infrastructure, Planning and Environment (2003), Groundwater Resource of the Darwin Area Map, 1:25,000 indicates the southern portion of the site is underlain by a shallow fresh water aquifer, potentially suitable for human consumption and garden watering. The groundwater yield is less than 0.5 L/s (Ref. 3). However, the map indicates that the northernmost 200 m of the site is likely to be underlain by shallow groundwater which is brackish to saline and unsuitable for most uses with a yield less than 0.5 L/s (Ref. 3). It is likely that the groundwater towards the north is subject to saline influence from the Ludmilla Creek estuary.

At depth, approximately 40 to 80 m below ground level (BGL), the site is underlain by the regional aquifer, the Upper Proterozoic Burrell Creek Formation. The Burrell Creek Formation is classified as a minor groundwater resource with a yield less than 0.5 L/s (Ref. 4).

2.6 Hydrology

The closest surface water feature is Ludmilla Creek, situated approximately 500 m to the northeast of the site. It is assumed the surface water on the site ultimately drains into Ludmilla Creek.

3. Sampling and Analytical Programme

3.1 Data Quality Objectives

The Data Quality Objective (DQO) Process was applied to the project, as described below, to ensure data collection activities were appropriate and to achieve the project objectives.

The process for establishing data quality objectives for this project was defined by AS4482.1. The DQO process involved seven steps as follows:

- Step 1: State the problem;
- Step 2: Identify the decision;
- Step 3: Identify inputs to the decision;
- Step 4: Define the study boundaries;
- Step 5: Develop a decision rule;
- Step 6: Specify limits on decision errors; and
- Step 7: Optimise the design for obtaining data.

The DQO steps for this project defined above are addressed in Table 1 below.

Table 1 Data Quality Objectives

Process	Response
Step 1. State the Problem	Oil is applied to the racecourse twice a year at the end of April and September by Waste Solutions, involving approximately 60,000 Litres being applied and subsequently tilled into the track. Tilling of the track also occurs daily after morning training sessions. Neighbouring properties have registered complaints due to potential hydrocarbon odours coming from the track and concerns have been raised over the impact of hydrocarbon on the soils and local groundwater.
Step 2. Identify the Decision	Air quality sampling in addition to the installation of five groundwater wells to supplement two existing wells and provide an indication of potential soil and groundwater contamination was undertaken to asses if the application of oil presents a risk to human health and/or the environment. National guidelines were used to provide investigation levels for air quality, soils and groundwater sampling programmes. The levels are identified in 3.2.1, 3.3.1 and 3.4.1.

Process	Response
Step 3. Identify Inputs to the Decision	Data from previous investigations, preliminary study (desk based) and quantitative data gained through intrusive sampling and analytical works.
Step 4. Define the Study Boundaries	Physical boundaries of the property as stated in Section 2.1 and provided on Figure 1. The vertical boundary will depend on the distance to sensitive receptors, the depth at which contamination is found. Air quality samples will be undertaken at approximately 0.20 m above ground level (AGL).
Step 5. Develop a Decision Rule	Air quality, soils and groundwater concentrations should be at levels not deemed to constitute an unacceptable risk to human health or the environment. Reference to relevant guidelines will be made to provide preliminary indications.
Step 6. Specify Limits on Decision Error	Data Quality Indicators (DQIs) – data completeness, data comparability, data representativeness, sampling and analysis accuracy and precision. The DQIs are a measure of the data quality controls implemented during the assessment. The quality control measures to be adopted are discussed further below.
Step 7. Optimise Design for Obtaining Data	The sampling plan has been prepared to address potential site contamination issues in a manner consistent with relevant guidelines, including the NEPM 1999 and the ANZECC 2000. A figure showing the proposed air quality and groundwater sampling locations is provided in Appendix A.

3.2 Air Quality Sampling Programme

GHD carried out two air sampling events at the Fannie Bay Racecourse. The dates and rationale for the selection of the sample locations are provided in Table 2.

The locations of air quality sampling ranged from approximately 10 to 15 m south of the track. Neighbouring residential properties are located approximately 25 m from the track at the closest point.

Table 2 Air Quality Sampling Programme

Date	Samples	COPC	Context of Sampling
16/09/2011	AQM01, AQM02, AQM03	VOCs (inc. BTEX), TPH C_5 – C_{12}	Sampling prior to the application of oil to provide a background level.
29/09/2011	AQM01, AQM02, AQM03	VOCs (inc. BTEX), TPH C_5 – C_{12}	Sampling during the application of oil to provide 'worst case' scenario (Photographs 1 – 4, Appendix C).

3.2.1 Air Quality Sampling Assessment Criteria

The adopted site guideline for some of the contaminants of concern are summarised in Table 3. The assessment criteria have been based on National Environment Protection (Air Toxics) Measure. The assessment criteria are predominantly based on annual averages, for the purposes of the measure the annual average concentrations are the arithmetic mean concentrations of a 24 hour monitoring period. However, the criteria will be used against a 30 minute sampling period which provides a snapshot of air quality.

Table 3 Air Quality Assessment Criteria

Analyte	Assessment Criteria (ppb)
	NEPM (Air Toxics)
BTEX	
Benzene	3
Toluene	1,000
o-Xylene	250
m & p Xylene	250

3.2.2 Air Quality Sampling

SilcoCan Canisters were provided by EnviroLab with calibrated passive air sampling kits. The canisters were provided with a vacuum present allowing a sample to be drawn into the inert canister through the passive air sampling kit providing a restricted flow of air into the canister.

Air sampling was completed prior to and during application of oil to the race track area (an additional sampling event during tilling of the track will be undertaken at a later date).

Three air samples were collected during each monitoring event, with each sample collected over a sampling period of 30 minutes (Photographs 1 to 3 show the air sampling apparatus at each location).

All samples were placed in laboratory supplied transport containers and transported under Chain of Custody (COC) documentation to the analytical laboratory for air quality, EnviroLab.

3.3 Soil Sampling Programme

GHD installed five groundwater wells as part of the groundwater monitoring programme, as discussed in Section 3.4. Soil samples were collected at regular intervals and submitted to MGT for laboratory analysis.

During the installation of wells, a calibrated photo-ionisation detector (PID) was used to assess volatile organic compounds (VOCs) emitted from the soils in order to assist in the selection of samples for laboratory analysis.

3.3.1 Soil Assessment Criteria

The adopted site guidelines for the selected chemicals of concern are summarised in Table 4. The assessment criteria have been derived from the following sources:

- NEPM (1999), "*National Environment Protection (Assessment of Site Contamination) Measure*", National Environment Protection Council (NEPC); and
- NSW EPA (1994), "*Contaminated Sites: Guidelines for Assessing Service Station Sites*".

Table 4 Soil Assessment Criteria

Analyte	Assessment Criteria (mg/kg)	
	NEPM – HIL (F)	NSW EPA (1994) – Sensitive Land Use
Heavy Metals		
Arsenic	500	
Cadmium	100	
Chromium (VI)	500	
Copper	5,000	
Lead	1,500	
Mercury	75	
Nickel	3,000	
Zinc	35,000	
BTEX		
Benzene		1

Analyte	Assessment Criteria (mg/kg)	
	NEPM – HIL (F)	NSW EPA (1994) – Sensitive Land Use
Toluene		130
Ethylbenzene		50
Total Xylene		25
Total Petroleum Hydrocarbons		
C_6 – C_9 Fraction		65
C_{10} – C_{36} Fraction		1,000

3.3.2 Soil Sampling

Representative soil samples were taken at surface, 0.2 m, 0.5 m, 1.0 m and at metre intervals thereafter until completion of the wells on 12/10/11. Samples were placed in suitable containers for the anticipated laboratory testing suite. Borehole logs are attached in Appendix B. In addition, a sample of the track sand/oil was collected and sent for analysis.

All soil samples were screened for volatile organic compounds (VOCs) using a calibrated PID. Samples for PID screening were collected in a separate zip locked bag. Equipment calibration certificates are attached in Appendix D.

Selected soil samples were sent for laboratory analysis, based on PID screening and location of groundwater impacts.

Sample containers were placed in a cool box containing ice packs to reduce volatilisation of the lighter hydrocarbon fractions and were transported under COC documentation to the analytical laboratory for soils, MGT.

3.4 Groundwater Sampling Programme

GHD undertook the latest groundwater monitoring round at the seven boreholes at the Fannie Bay Racecourse on 19/10/11. The groundwater sampling included five boreholes recently installed by GHD to provide a greater coverage of the site as well as the two existing wells. Borehole logs are provided in Appendix B.

Samples collected are detailed in Table 5.

Table 5 Groundwater Sampling Programme

Sample ID	Location (in relation to the track)	COPC	Context of Sampling
MW1	North	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater assumed to be exiting the site to the north.

Sample ID	Location (in relation to the track)	COPC	Context of Sampling
MW2	North	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater assumed to be exiting the site to the north.
MW3	Northwest	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater assumed to be exiting the site to the north.
MW4	Northeast	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater assumed to be exiting the site to the north.
MW5	East	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater to the east of the site.
MW6	South	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater to the south of the site (assumed to be the background).
MW7	West[2]	Heavy Metals[1], TRH, BTEX, SVOCs, VOCs	Capture the quality of groundwater to the west of the site.

Notes: 1) Heavy metals (Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Nickel and Zinc).

2) Situated to on the inside of the track, all other bores are situated on the outside of the track.

3) TRH (Total Recoverable Hydrocarbons), BTEX (Benzene, Toluene, Ethyl Benzene and Xylenes), SVOCs (Semi-Volatile Organic Compounds) and VOCs (Volatile Organic Compounds).

3.4.1 Groundwater Assessment Criteria

The adopted site guidelines for a number of the contaminants of concern are summarised in Table 6. The assessment criteria derived from the following sources:

- *National Environment Protection (Assessment of Site Contamination) Measure (NEPM) - Water Investigation Levels for Drinking and Freshwater Ecosystems*; and
- *Australian Drinking Water Guidelines* (NHMRC & ARMCANZ, 2004).

Hydrocarbons do not have assessment criteria proposed in the abovementioned assessment criteria. The assessment criteria for hydrocarbons have been based on the Dutch Intervention Value for mineral oil (2000).

Groundwater assessment criteria are summarised in Table 6 below.

Table 6 Groundwater Assessment Criteria

Analyte	Assessment Criteria (mg/L)	
	Freshwater Aquatic Ecosystems[#]	Drinking Water
Heavy Metals		
Arsenic	0.05	0.007
Cadmium	0.002	0.002
Chromium	0.01	
Copper	0.005	2.0
Lead	0.005	0.01
Mercury	0.0001	0.001
Nickel	0.15	0.02
Zinc	0.05	3.0
Total Recoverable Hydrocarbons (TRH)		
Total TPH C_{10} – C_{36}	0.6[1]	
BTEX		
Benzene	0.3	0.001
Toluene	0.3	0.8
Ethylbenzene	0.005[2]	0.3
Xylenes	0.075[2]	0.6
VOCS		
1,2-dichloroethane		0.003
Carbon tetrachloride		0.003
Chlorobenzene		0.3
Dichloromethane (methylene chloride)		0.004
SVOCs		
Aldrin	0.00001	0.0003
Benzo(a)pyrene		0.00001
DDT	0.000001	0.02
Dieldrin	0.000002	0.0003
Heptachlor	0.00001	0.0003
Hexachlorobutadiene	0.1	0.0007

Analyte	Assessment Criteria (mg/L)	
	Freshwater Aquatic Ecosystems[#]	Drinking Water
Phenol	0.05	

Notes: 1) Dutch Intervention Value for Mineral Oil, 2000.

2) ANZECC low reliability trigger value

[#] Most appropriate guideline value due to proximity of Ludmilla Creek and no known abstraction of local groundwater for drinking water.

3.4.2 Groundwater Sampling

After inspection of the individual bores, static water levels were measured with a dip meter at the seven bores (Appendix C, Photos 9 to 14).

All monitoring bores were fitted with a bailer for sampling purposes. Prior to sampling all bores were purged a minimum of three well volumes. Field water quality measurements were measured during purging operations using a calibrated AquaRead water quality meter. Physical parameters recorded include:

- pH;
- Dissolved oxygen (DO);
- Electrical conductivity (EC);
- Total dissolved solids (TDS); and
- Temperature.

Post purging, samples were collected at approximately 0.5 L/min, placed in laboratory supplied containers with appropriate preservatives required for analytes and cooled on ice for storage and transported under COC documentation to the analytical laboratory for groundwater, MGT Labmark.

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

3.5 Quality Control and Assurance

3.5.1 Field Quality Control Methods

All field works were conducted by an experienced environmental scientist in general 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 duplicates: Comprise a single sample that is divided into two separate sampling containers. Both samples are sent anonymously to the primary project 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.

One blind duplicate sample 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.

Trip Blank: A sample of laboratory supplied deionised water is bottled and accompanies the other samples over the course of the groundwater sampling event and is submitted to the laboratory for analyses. Trip blanks provide an indication of contamination introduced during sample transport and handling, and also ensure that the testing laboratory is not reporting "false positives".

One trip blank sample was submitted for analysis of TPH (C_6 – C_9) and BTEX.

3.6 Laboratory Program

The groundwater project laboratory (Envirolab and MGT Labmark) adopted their internal procedures and NATA accredited methods in accordance with their quality assurance systems.

3.6.1 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 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)'.

4. Air Quality Sampling Results

4.1 Metrological Observations

Meteorological observations were made on-site during the air quality sampling. These observations were supplemented by data from the Bureau of Meteorology weather station located at Darwin Airport (Ref. 5) to confirm observations.

Meteorological observations are summarised in Table 7.

Table 7 Metrological Observations

Sample ID	Sampling Duration		Wind		Temp (°C)	Relative Humidity (%)
	On	Off	Speed (km/h)	Direction		
16/09/2011: Prior to Application						
AQM01	10:21	10:51	13	SE	29.4	47
AQM02	10:10	10:40	11	ESE	28.6	54
AQM03	11:07	11:37	13	S	30	44
29/09/2011: During Application						
AQM01	09:58	10:28	13	N	29.5	55
AQM02	09:46	10:16	10	N	29	57
AQM03	09:36	10:06	9	N	28.8	59

4.2 Laboratory Results

The results analysis of the air quality samples are summarised in Appendix E. Copies of the certified laboratory reports are presented in Appendix F.

The results noted that the majority of BTEX, TPH and VOCs were either below detection or below the adopted investigation criteria, with the exception of the following result:

- Benzene exceeded the guideline value of 3.0 ppb at AQM03, recording 4.6 ppb prior to application of oil on 16 September 2011.

A number of other VOCs (without assessment criteria) were detected in one or more samples, including ethanol (up to 41 ppb) and isopropyl alcohol (up to 75 ppb). These are not contaminants normally associated with waste oil.

It was noted that TPH C_5 – C_8 aliphatic, C_9 – C_{12} aliphatic and C_9 – C_{10} aromatic compounds were detected in five out of the six samples collected. At present there are no applicable criteria to assess these results. However, the concentrations were generally higher during the second round of air quality monitoring completed during the

application of oil to the track (average concentration prior to application is 527 µg/m^3 compared to 1,216 µg/m^3 during application).

Table 8 provides the concentrations recorded in air samples collected during the two rounds of sampling. Concentrations of TPH were generally higher during the application of oil to the track.

Table 8 Total Petroleum Hydrocarbon Air Concentrations

Analyte (µg/m^3)	AQM01		AQM02		AQM03	
	16/09/2011	29/09/2011	16/09/2011	29/09/2011	16/09/2011	29/09/2011
Total Petroleum Hydrocarbon						
TPH C_5 – C_8 Aliphatic	<200	580	310	1,400	510	630
TPH C_9 – C_{12} Aliphatic	<50	91	<50	480	<50	220
TPH C_9 – C_{10} Aromatic	<100	<100	<100	160	<100	100

5. Soil Results

5.1 Site observations

During the installation of groundwater bores at Fannie Bay Racecourse, a calibrated PID was used to assess VOCs emitted from the soils. Readings are summarised on borehole logs in Appendix B.

Generally, soil samples from the boreholes recorded VOC concentrations within the range of <0.1 to 0.3 ppm. However, at MW4 1.0 m BGL, a PID reading of 35 ppm was recorded. This sample was subsequently sent for analysis.

A surface soil sample from the track was also collected (designated “Sand”). This sample comprised sand which was heavily stained with hydrocarbons and was observed to be cohesive with a dense consistency and distinct hydrocarbon odours.

5.2 Laboratory Results

The results of the soil analysis are summarised in Appendix E. Copies of the certified laboratory reports are presented in Appendix F.

For the borehole samples, heavy metals, BTEX and total petroleum hydrocarbons (TPH) were recorded at concentrations less than the adopted investigation criteria.

However, the analysis of the surface sample on the track indicated elevated concentrations of heavy chain TPH above the NSW EPA (1994), “*Contaminated Sites: Guidelines for Assessing Service Station Sites*” of 1,000 mg/kg. Concentrations recorded are as follows:

- 6,500 mg/kg of TPH C_{15} – C_{28}; and
- 7,500 mg/kg of TPH C_{29} – C_{36}.

5.3 Laboratory QA/QC

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; and
- Samples were extracted and analysed within appropriate holding times.

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

6. Groundwater Sampling Results

6.1 Physico-Chemical Field Parameters

Field water quality measurements were measured during purging operations using a calibrated AquaRead water quality meter.

Water quality measurements were not possible in MW2 and MW5; as MW2 was dry to 2.4 m BTOC (Below Top of Casing) while MW5 contained insufficient groundwater to provide representative water quality measurements.

Recorded water quality measurements are provided in Table 9.

6.1.1 Temperature

Groundwater temperatures ranged from 30.2 to 35°C with the northern most bores recording the lowest temperatures.

6.1.2 Dissolved Oxygen

Dissolved oxygen (DO) concentrations ranged from 56.6 to 75.8 percent.

6.1.3 pH

Field pH data indicates groundwater at the site was slightly acidic to near neutral, ranging from 5.61 to 6.8.

6.1.4 Electrical Conductivity

Electrical conductivity (EC) values ranged from 317 to 1,534 µS/cm, ranging from fresh water to mildly brackish water. The higher levels of EC were recorded to the north of the site where marine influence may be greater.

6.1.5 Total Dissolved Solids

Field Total Dissolved Solids (TDS) values ranged from 206 to 997 mg/L with the higher levels corresponding to the higher EC readings to the north of the site.

Table 9 Groundwater Physical Characteristics

Well ID	Well Depth (m)	SWL (m below TOC)	Physical Parameters					Comments
			Temp (°C)	DO (%)	pH	EC (µS/cm)	TDS (mg/L)	
MW1	3.2	1.72	32.5	59.6	6.25	503	326	Slight sheen, no hydrocarbon odour, moderate grey / orange sediment load.
MW2	2.4	Dry	-	-	-	-	-	Well dry.
MW3	4.0	2.50	30.2	56.6	6.8	1,534	997	No odour or sheen, high grey / orange sediment load.
MW4	5.0	2.40	32.4	58.8	6.53	558	362	No odour or sheen, moderate grey / orange sediment load.
MW5	5.0	5.20	-	-	-	-	-	Insufficient sample available.
MW6	6.0	5.08	35	69.4	5.61	317	206	No odour or sheen, low grey / orange sediment load.
MW7	5.0	3.11	33.2	75.8	5.71	426	276	Light odour and sheen, moderate grey / orange sediment load.

6.2 Laboratory Results

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

The majority of heavy metals, BTEX, TRH, VOCs and SVOCs were recorded below the adopted investigation criteria for freshwater ecosystems and drinking water standards with the exception of the following:

- Elevated concentrations of lead were identified above the freshwater ecosystems guideline value of 0.005 mg/L in MW4 and MW7 at 0.026 and 0.007 mg/L respectively;
- Elevated concentrations of zinc were identified above the freshwater ecosystems guideline value of 0.05 mg/L, but below the drinking water standard of 3 mg/L in MW4 at 0.052 mg/L; and
- Elevated concentrations of Total Recoverable Hydrocarbons (TRH) were identified above the Dutch Intervention Value of 0.6 mg/L in MW1. The total TRH of 0.8 mg/L at this location comprised C_{15} – C_{28} (0.6 mg/L), C_{10} – C_{14} (0.1 mg/L) and C_{29} – C_{36} (0.1 mg/L). All other groundwater samples recorded TRH results below the laboratory PQL.

6.3 Field Quality Control

To augment laboratory quality procedures one field QC sample was collected and analysed. The sample was collected as a duplicate and analysed as a blind duplicate. Details are provided in Table 10. Relative Percentage Difference (RPD) calculations are presented in Appendix E.

Table 10 QC Duplicate Sample

Parent Sample	Duplicate Sample	Laboratory	Analysis
MW3	QA1	MGT	Heavy metals, BTEX, TRH, VOCs and SVOCs

The analytes had RPD values below the nominated data quality indicator of 50%, ranging from 0 – 17%. The duplicate RPD is displayed in Appendix E.

6.4 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 relative percentage differences (RPDs) of the internal duplicated samples met the acceptable limit of 30% for all analytes, excluding TRH $C_{29} – C_{36}$ which recorded 31% (within the laboratory acceptable limit); and
- 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 F.

7. Discussion of Results

7.1 Air Quality

The results of the air quality sampling completed at the Site indicated a single exceedance of the adopted criterion for benzene (3 ppb) for the sample collected from AQM03 (4.6 ppb) during the air quality sampling round completed prior to the application of oil to the track. The result obtained from location AQM03 during the air quality sampling round completed during the application of oil to the track was actually lower (0.6 ppb). However, it should be noted that the wind direction in the second round of sampling was in a different direction and the results are not considered to be directly comparable.

Benzene was below the laboratory PQL of 0.5 ppb in all other samples except in AQM02 during the application of oil, recording 1.9 ppb.

The detection of benzene above the adopted criterion is not considered necessarily an indication of the oil application posing unacceptable risks to human health through inhalation for the following reasons:

- The exceeding sample was captured over a 30 minute period, compared to the 24 hour period upon which the criterion is based. The implication of this is that a temporary point source of benzene could have caused a spike in the 30 minute sample, which could have averaged out to well below the criterion over a longer period;
- The samples were collected at 0.2 m above ground level, which is highly conservative compared to an average breathing height of 1.2 to 1.5 m. Significant levels of dilution and degradation would be expected to attenuate potential benzene volatilising from surface soil before it reached off-site receptors, and
- There is currently no direct linkage with the recorded benzene in the air sample to the oil used on the sand, as the track sand sample indicated benzene to be below the laboratory PQL.

It should also be taken into consideration that the Safe Work Australia time weighted average (TWA) exposure limit for benzene is 1000 ppb over an 8 hour period, which is far higher than the recorded result. It is recognised that the TWA is an occupational exposure standard, however, it is relevant for the workers on the site.

Concentrations of TPH $C_9 – C_{12}$ aliphatic and $C_9 – C_{10}$ aromatic compounds were reported below the laboratory PQL during the first sampling event. However, during application of oil $C_9 – C_{12,}$ aliphatic concentrations were recorded in all sampling locations ranging from 91 to 480 µg/m^3. $C_9 – C_{10}$ aromatic concentrations were also recorded at AQM02 and AQM03 at 160 and 100 µg/m^3 respectively during the oil application. TPH $C_5 – C_8$ aliphatic was recorded in each air sample, except AQM01 on the first sampling event. Concentrations recorded during the first sampling event ranged from 310 to 510 ppb and during the second sampling event from 580 to 1,400 ppb.

It is noted that the volatile TPH fractions detected in the air samples were generally not detected in the sample of sand from the track, as with benzene. This suggests that these fractions, if present in the oil when applied, rapidly volatilise after application. Regular tilling of the soil would increase the rate of subsequently degradation.

A number of VOCs other than petroleum hydrocarbons were detected in the air samples during both rounds, including alcohols, at concentrations higher than the BTEX compounds. The source of these volatiles has not been determined as VOC analysis has not been carried out on soil samples (apart from BTEX). It is possible that some of these VOCs could be contributing to the observed odours; benzene itself is odourless, and would not be contributing to any off-site odour issues.

Meteorological conditions can have a significant effect on the concentrations of the target volatile compounds (BTEX, TPH and VOCs) in the air during air quality sampling. Higher temperatures can volatilise greater amounts of these compounds and higher wind speeds can dilute and disperse these compounds reducing the detectable concentrations at a given location.

In addition, the location of sampling points either downwind or upwind of a source can have a significant effect on the data. The sampling locations at the site were along the southern boundary of the Site (south east, south and west), adjacent to the neighbouring residential areas and in what was thought to be the prevailing downwind direction of the track.

This may provide some context to the pattern of results recorded during the two rounds of air quality sampling.

7.2 Soil

Laboratory results from MW3 and MW4, situated to the north of the track, indicated no TPH above the laboratory PQL. Elevated levels of TPH were recorded from the track sample, the majority of the TPH was in the heavy C_{15} – C_{28} and C_{29} – C_{36} fractions, 6,500 and 7,500 mg/kg respectively. These exceed the adopted site investigation level of 1,000 mg/kg (Service Station Guidelines).

The Service Station Guidelines are derived for sensitive sites and the adopted values are considered to be conservative in the context of the use of the site as a racecourse. It is noted that NEPM provides guideline concentrations for speciated TPH for a commercial/industrial use; aromatic (450 mg/kg for HIL (F)) and aliphatic (28,000 mg/kg for HIL (F)). This indicates that the samples did not exceed the aliphatic guideline value; although additional speciated testing would be required to establish the aromatic fraction of the results.

It is also noted that the maximum concentrations above are well below the CRC Care Health Screening Levels – which have been acknowledged by a number of the environmental regulators in Australia – (HSLs; Friebel and Nadebaum, 2011) for direct contact in commercial/industrial use for analogous hydrocarbon fractions (C_{16} – C_{34} HSL-D = 27,000 mg/kg and C_{34} – C_{40} = 38,000 mg/kg). The risk driving pathways for these fractions are dominated by direct contact (including ingestion), and there is no significant vapour pathway. On this basis it is considered unlikely that the recorded

concentrations of the TPH C_{15} – C_{28} and C_{29} – C_{36} fractions in the track sand would pose an unacceptable risk to human health on and off site.

The TPH fractions greater than C_{16} are not considered to be particularly soluble or mobile in the environment; However, there is some evidence that the oil application to the track is impacting groundwater in respect of hydrocarbons (see below).

The soil results also indicate slightly elevated lead and zinc in the sample of treated sand relative to the soil samples from MW3 and MW4 (although these are still well below the adopted site investigation levels). There is currently insufficient data to assess whether these metals are being contributed to the soil by the application of oil.

7.3 Groundwater

Elevated levels of lead and zinc were identified above the adopted investigation levels in MW4 and MW7 (lead only). These wells are situated to the north east and north west of the racecourse, down hydraulic gradient of the track and within close proximity of site drainage structures. It is noted that the adopted site investigation levels are unmodified with respect to alkalinity of the receiving water, i.e. Ludmilla Creek. The ANZECC trigger values conservatively assume a low alkalinity in the surface water receptor, which increases aquatic toxicity of dissolved lead and zinc. Depending on the actual alkalinity of Ludmilla Creek it is possible that a modified trigger value would result in a reduced number of actual exceedances.

Total recoverable hydrocarbons (TRH) C_{10} – C_{36} were identified in excess of the adopted site investigation level of 0.6 mg/L in MW1 (0.8 mg/L). Further examination of the banded results indicates the majority of hydrocarbons are in the C_{15} – C_{28} band, which correlates with elevated concentrations of this TRH band in the sand sample from the track. It is also notable that some of the TRH at MW1 is in the lighter, more mobile C_{10}-C_{14} fraction. Previous investigations undertaken by URS (Ref. 6) found total TRH concentrations below PQL of 0.1 mg/L. There is therefore some limited evidence that the application of oil is impacting groundwater down hydraulic gradient in the vicinity of MW1. The exceedance is not large, and the current concentration is likely to have attenuated by the time impacted groundwater reaches Ludmilla Creek; this could be confirmed with more detailed fate and transport modelling in groundwater.

8. Conclusions and Recommendations

This investigation was limited to the objectives and scope of works identified in Section 1.2 including the following:

- Installation of five groundwater wells to provide groundwater data from across the racecourse and to supplement two existing groundwater wells;
- One sampling round of seven groundwater wells present on site;
- Testing of impacted soils relating to hydrocarbon impacted groundwater or VOC readings during the installation of wells;
- Air quality monitoring at three locations across the southern section of the site on three separate occasions:
  - Prior to the application of oil;
  - During the application of oil; and
  - During subsequent tilling of the track (to be undertaken and provided within an updated version of this report).

In accordance with the scope of works undertaken and subject to the stated limitations the following conclusions are made:

- One exceedances of an air quality guideline was identified at the site; benzene was recorded at 4.6 ppb above the NEPM guideline value of 3.0 ppb. The exceedence is anomalous in that it is not linked to a detection of benzene in the treated sand on the track. There is insufficient evidence to conclude that benzene is likely to pose an unacceptable risk to human health at present. Although an eight hour test was not conducted, the 4.6 ppb result was substantially less than the Safework Australia TWA of 1,000 ppb.
- Soil samples from MW3 at 3.0 m BGL and MW4 at 1.0 m BGL were analysed for heavy metals, BTEX and TPH, no concentrations were identified above the adopted investigation criteria.
- A sample from the oil-treated track sand indicated that the majority of oil present was in the C_{15} – C_{28} and C_{29} – C_{36} fractions, at 6,500 and 7,500 mg/kg respectively. The concentrations are in excess of the NSW EPA *Contaminated Sites: Guidelines for Assessing Service Station Sites* guideline value of 1,000 mg/kg. The service station guidelines are derived for sensitive sites and are considered overly conservative for the use of the site as a racecourse. Comparison of these results with CRC Care HSLs for commercial/industrial use suggests that these concentrations are unlikely to pose an unacceptable risk to human health.
- Exceedances of the adopted investigation levels were identified in groundwater for lead within MW4 and MW7 and zinc in MW4. The margin of exceedances are generally low, and given that the adopted trigger values have assumed a low alkalinity, it is considered unlikely that these contaminants pose an unacceptable

risk to Ludmilla Creek. There is also insufficient data linking these metals to the activities on site.

- TRH C_{15} – C_{28} fractions were present in exceedance of the adopted site investigation level in groundwater at MW1, down hydraulic gradient of the track. The detected hydrocarbon fractions at MW1 correlate with those elevated in the sample of oil-treated track sand, indicating the application of oil may be locally impacting shallow groundwater. However, on the basis of the current data, which indicates a small margin of exceedance, and the likely attenuation of hydrocarbons in groundwater as it moves further off-site, it is considered unlikely that the concentrations observed would pose an unacceptable risk to local freshwater ecosystems, in the form of Ludmilla Creek.

GHD recommends that the following work is carried out in order to refine the conceptual understanding of the site and whether there is a risk to human health and/or the environment:

- **Supplementary air sampling** – data is currently inconclusive with regards to risk posed by migration of volatile contaminants in air. Although benzene has been recorded as present above the guideline value, this was prior to the application of oil and is considered to be anomalous. At least one further monitoring round should be carried out to confirm the presence or absence of benzene at significant concentrations.
- **Supplementary air sampling locations** – to reduce the effect of wind direction on the nominated day of monitoring, sampling at additional locations should be carried out; including one to the north, two to the east, one to the south and two to the west, thereby enabling samples to be taken upwind and downwind of the track with any given wind direction. The samples should also be taken between 1.2 and 1.5 m above ground level, which is less conservative and more targeted at potential concentrations at breathing height.
- **Sampling over a longer duration** – sampling was undertaken over a 30 minute period to provide a snapshot of potential air quality issues at the site. The short duration of sampling would result in exaggerated concentrations from short lived ‘spikes’ of contamination, which would be averaged out over a longer time. It is recommended further sampling undertaken in line with the National Environmental Protection (Air Toxics) Measure over a 24 hour period. This would enable a more accurate comparison with the adopted investigation levels.
- **Source Characterisation** – the air sampling detected a number of VOC compounds of uncertain origin. Additional samples from the track sands should be collected and tested for VOCs in order to assess the potential linkage between soil and air concentrations. The testing should also include TPH and heavy metals so that a robust dataset of the source material can be used for further assessment. Investigation into the sources of the oils used for application should also be carried out, including laboratory testing if required.

An investigation should be conducted into possible alternative substances to waste oil for use in treating the track sands, which might pose less potential risk to the environment and human health.

9. References

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Appendix A

Figures

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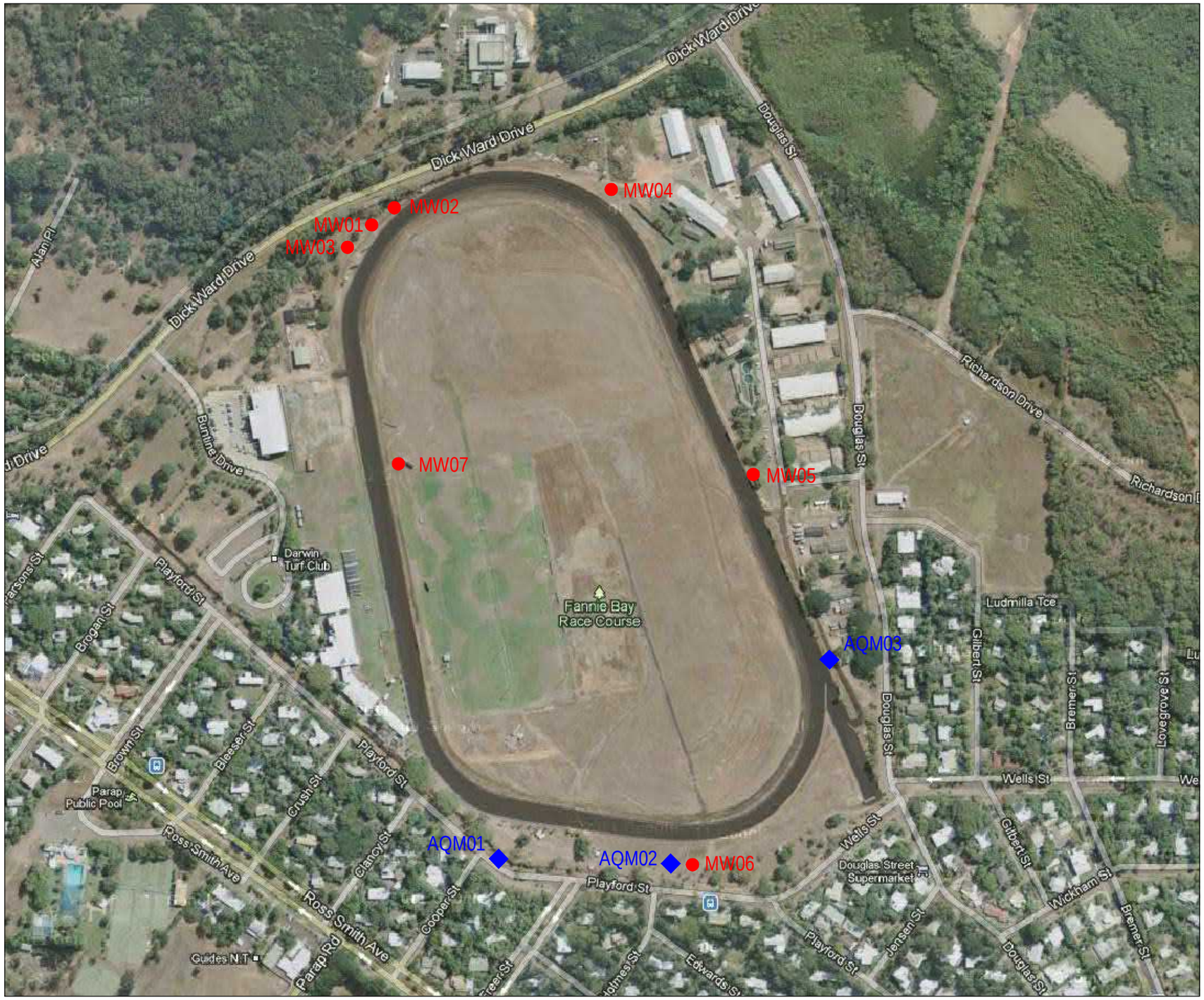

LEGEND

- AIR QUALITY MONITORING LOCATIONS
- MONITORING WELL LOCATIONS

SITE LAYOUT PLAN
NTS

GHD

DARWIN TURF CLUB INCORPORATED
ENVIROMENTAL MONITORING
DARWIN TURF CLUB

ENVIROMENTAL 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 - 10:42 AM Plotted by: Ron Fernandez/Darwin/GHD/AU Cad File No: G:\43\21851\CADD\Drawings\43-21851-FIGURE_01.dwg

Appendix B

Borehole Logs

BOREHOLE LOG

ENVIRONMENTAL - GROUNDWATER

Bore No.: MW3
Page: 1 of 1

Client: Darwin
Project: Darwin Turf Club
Project No.: 4321851
Location: Fannie Bay Racecourse
Date Drilled: 12/10/2011 to: 12/10/2011

Drill Co: Bores NT
Driller: Bore NT
Rig Type: RW(A)
Total Depth (m): 4
Diameter (mm):

Easting:
Northing:
Grid Ref: GDA94_MGA_zone_52
Collar RL: n/a Elevation: n/a
Logged by: A. Koscielski Checked by: A. Koscielski

B.C.L. No.: Casing: uPVC Class 18 (50mm) Screen: uPVC Class 18 (50mm) Screen Slot Size (mm): 0.4

DRILLING											
Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation / Depth (m)
							Ground Surface:				0.00
0.0	RW(A)	0.1	MW3_0.0		Cem / Bent		sandy clayey GRAVEL Fine to medium grain sand, dark brown to grey, dry.	D		No odours or staining.	0.00
		0.1	MW3_0.2								
		0.1	MW3_0.5								
1.0		0.2	MW3_1.0								
		0.1	1.5 (PID only)								-1.90
2.0		0	MW3_2.0		Screen / Sand		sandy CLAYSTONE Fine to medium grain sand, orange, weathered, damp.	D/M		No odours or staining.	1.90
		0	2.5 (PID only)								
3.0		0	MW3_3.0								-3.20
							CLAYSTONE Very fine, grey/orange, low strength, damp.	D/M		No odours or staining.	3.20
		0	4.0 (PID only)								-4.00
4.0							End of borehole at 4.0m				4.00
5.0											
6.0											
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

BOREHOLE LOG

ENVIRONMENTAL - GROUNDWATER

Bore No.: MW4
Page: 1 of 1

Client: Darwin
Project: Darwin Turf Club
Project No.: 4321851
Location: Fannie Bay Racecourse
Date Drilled: 12/10/2011 to: 12/10/2011

Drill Co: Bores NT
Driller: Bores NT
Rig Type: RW(A)
Total Depth (m): 5
Diameter (mm): 50

Easting: n/a
Northing: n/a
Grid Ref: GDA94_MGA_zone_52
Collar RL: n/a Elevation: n/a
Logged by: A. Koscielski Checked by: A. Koscielski

B.C.L. No.: Casing: uPVC Class 18 (50mm) Screen: uPVC Class 18 (50mm) Screen Slot Size (mm): 0.4

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation / Depth (m)
							Ground Surface:				0.00
0.0	RW(A)	0.1	MW4_0.0		Cement		gravelly SAND Fine to medium grain, dark brown, dry.	D		Tyres and aluminium cans present.	0.00
		0.1	MW4_0.2								
		0.2	MW4_0.5								-0.70
1.0		35	MW4_1.0				sandy CLAYSTONE Fine to medium grain sand, orange, weathered, low strength, damp.	D/M		No staining, mild odours.	0.70
											-1.50
		0.2	1.5 (PID only)		B		sandy gravelly CLAYSTONE Fine to medium grain sand, orange to grey, weathered, dry.	D/W		No odours or staining.	1.50
											-1.90
2.0		0.1	MW4_2.0		Sand		CLAYSTONE Very fine, grey/orange, very low strength, dry.	D		No odours or staining.	1.90
3.0		0	3.0 (PID only)		Screen						-3.50
							CLAYSTONE Very fine, grey, low strength, damp.	D/M		No odours or staining.	3.50
4.0		0	MW4_4.0								
5.0							End of borehole at 5.0 m.				-5.00 5.00
6.0											
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

BOREHOLE LOG

ENVIRONMENTAL - GROUNDWATER

Bore No.: MW5

Page: 1 of 1

Client: Darwin Racing
Project: Darwin Turf Club
Project No.: 4321851
Location: Fannie Bay Racecourse
Date Drilled: 12/10/2011 to: 12/10/2011

Drill Co: Bores NT
Driller: Bores NT
Rig Type: RW(A)
Total Depth (m): 5
Diameter (mm): 50

Easting: n/a
Northing: n/a
Grid Ref: GDA94_MGA_zone_52
Collar RL: n/a Elevation: n/a
Logged by: A. Koscielski Checked by: A. Koscielski

B.C.L. No.: Casing: uPVC Class 18 (50mm) Screen: uPVC Class 18 (50mm) Screen Slot Size (mm): 0.4

DRILLING											
Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation / Depth (m)
							Ground Surface:				0.00
0.0	RW(A)	0.1	0.0 (PID only)		Cement		gravelly SAND Fine to medium grain sand, dark brown, dry.	D		No odours or staining.	0.00 -0.20
		0.2	MW5_0.2				sandy clayey GRAVEL Fine to medium grain sand, orange, dry.	D		No odours or staining.	0.20
		0	MW5_0.5								
1.0		0	MW5_1.0		Bentonite						-1.90
2.0		0	MW5_2.0				CLAYSTONE Very fine, orange/greyish, low strength, dry.	D		No odours or staining.	1.90 -3.00
3.0		0	MW5_3.0		Sand		CLAYSTONE Very fine, grey/white, damp from 4 m.	D/M		No odours or staining.	3.00
4.0		0	4.0 (PID only)		Screen						-5.00
5.0							End of borehole at 5.0 m.				5.00
6.0											
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

BOREHOLE LOG

ENVIRONMENTAL - GROUNDWATER

Bore No.: MW6

Page: 1 of 1

Client: Darwin Racing
Project: Darwin Turf Club
Project No.: 4321851
Location: Fannie Bay Racecourse
Date Drilled: 12/10/2011 to: 12/10/2011

Drill Co: Bores NT
Driller: Bores NT
Rig Type: RW(A)
Total Depth (m): 6
Diameter (mm): 50

Easting: n/a
Northing: n/a
Grid Ref: GDA94_MGA_zone_52
Collar RL: n/a Elevation: n/a
Logged by: A. Koscielski Checked by: A. Koscielski

B.C.L. No.: Casing: uPVC Class 18 (50mm) Screen: uPVC Class 18 (50mm) Screen Slot Size (mm): 0.4

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation / Depth (m)
							Ground Surface:				0.00
0.0	RW(A)	0.3	MW6_0.1		Cement		gravelly SAND Fine to medium grain sand, dark brown, dry.	D		No odours or staining.	0.00
		0.2	MW6_0.2								-0.60
		0	MW6_0.5				silty sandy CLAYSTONE Fine to medium grain sand, orange, low strength, dry.	D		No odours or staining.	0.60 -0.80
1.0		0.6	MW6_1.0		Bentonite		CLAYSTONE Very fine, orange/greyish, medium strength, angular.			No odours or staining.	0.80 -2.00
2.0		0.5	MW6_2.0		Screen / Sand		CLAYSTONE Very fine, orange/greyish, low strength.			No odours or staining.	2.00 -2.40
3.0		0	MW6_3.0				CLAYSTONE very fine, orange/greyish, medium strength, angular, damp from 4.3 m.	D/M		No odours or staining.	2.40
4.0		0	4.0 (PID only)								
5.0		0	5.0 (PID only)								
		0	6.0 (PID only)								-6.00
6.0							End of borehole at 6.0 m.				6.00
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

BOREHOLE LOG

ENVIRONMENTAL - GROUNDWATER

Bore No.: MW7
Page: 1 of 1

Client: Darwin Racing
Project: Darwin Turf Club
Project No.: 4321851
Location: Fannie Bay Racecourse
Date Drilled: 12/10/2011 to: 12/10/2011

Drill Co: Bores NT
Driller: Bores NT
Rig Type: RW(A)
Total Depth (m): 5
Diameter (mm): 50

Easting: n/a
Northing: n/a
Grid Ref: GDA94_MGA_zone_52
Collar RL: n/a Elevation: n/a
Logged by: A. Koscielski Checked by: A. Koscielski

B.C.L. No.: Casing: uPVC Class 18 (50mm) Screen: uPVC Class 18 (50mm) Screen Slot Size (mm): 0.4

DRILLING											
Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation / Depth (m)
							Ground Surface:				0.00
0.0	RW(A)	0.2	MW7_0.0		Cement		gravelly SAND Fine to medium grain sand, dark brown.	D		No odours or staining.	0.00
		0	MW7_0.2								-0.30
							silty sandy CLAYSTONE Fine to medium grain sand, orange, low strength, dry.	D		No odours or staining.	0.30
		0	MW7_0.5								
1.0		0	MW7_1.0		Bentonite		CLAYSTONE Orange, low strength, dry.	D		No odours or staining.	1.00
2.0		0	MW7_2.0		Sand						-3.00
3.0		0	MW7_3.0		Screen		CLAYSTONE Very fine, orange/greyish, low to medium strength.	D/M		No odours or staining.	3.00
4.0		0	4.0 (PID only)								
		0	5.0 (PID only)								-5.00
5.0							End of borehole at 5.0 m.				5.00
6.0											
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

Appendix C

Site Photograph Log

Appendix C: Site Photographs

First Sampling Round: 16 September 2011

Photo 1: Location of AQM01 during sampling event.

Photo 2: Location of AQM02 during sampling event.

Photo 3: Location of AQM03 during sampling event.

Application of Oil: 29 September 2011

Photo 4: Tilling of track surface during oil application.

Photo 5: Tilling of track surface.

Photo 6: Application of oil to the track surface.

Photo 7: Application of oil to track surface.

Photo 8: Inner track marks indicate latest application and tilling of track.

Groundwater Sampling Event: 19 October 2011

Photo 9: A view of MW2 in the foreground and MW1 in the background

Photo 10: A view of MW3 from north to south.

Photo 11: A view of MW4 from north to south.

Photo 12: A view of MW5 from east to west.

Photo 13: A view of MW6 from south to north.

Photo 14: A view of MW7 from north to south.

Appendix D

Calibration Certificates

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105425

airmet

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	795AD		99.6ppm

Calibrated by: **Dale Gazzard**

Calibration date: **21-Sep-11**

Next calibration due: **21-Oct-11**

ThermoFisher SCIENTIFIC

The world leader in serving science

RENTALS

Equipment Report – Aquameter- Water Quality Meter

This Aquameter Water Quality Instrument has been performance checked / calibrated* as follows:

Electrodes cleaned/checked	☑		
pH (Acidity/Alkalinity)	☑ pH 7.00	☑ pH4.00	
Electrical Conductivity	☐ 1413uS/cm	☑ 2570uS/cm	☐ 12880uS/cm
ORP	☑ 231 mV		
Dissolved Oxygen	☐ 0.00ppm in Sodium Sulphite	☑ 100% Saturation in moist Air	
Turbidity	☑ 0.00 NTU	☑ 1000NTU	☑ Temperature

Batteries (x 5 AA) 100 % Rechargable

Aquameter S/N 10420 2427 Probe S/N 12930608

* Calibration solution traceability information is available upon request.

Date: 13/10/2011 Checked by: Martin

MS

Signed: _____

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Received	Returned	Item
☑	☐	☐	Aquameter unit
☑	☐	☐	Aquameter Ops check / Batteries 100 %.
☑	☐	☐	Instruction Manual / Quick use guide
☑	☐	☐	Protective sleeve cap
☑	☐	☐	Spare Batteries x 5 (Alkaline / ~~Rechargeable~~ 7.5 volts)
☐	☐	☐	Aquameter flow cell (AQR200____)
☑	☐	☐	Cross Head screw driver
☑	☐	☐	Software & USB cable
☑	☐	☐	Quick release lanyard (Blue shoulder strap)
☑	☐	☐	Ph/ORP cap (with red strap)
☑	☐	☐	Carry case
☐	☐	☐	

Processors Signature/ Initials _____

Quote TFS Reference	27106	Condition on return
Customer Ref	4321851	
Equipment ID	AQR800 MA	
Equipment serial no.		
Return Date	/ /	
Return Time		

"We do more than give you great equipment… We give you great solutions!"

Phone: (Free Call) 1300 735 295	Environmental Assessment Technologies			Fax: (Free Call) 1800 675 123
Melbourne Branch 5 Caribbean Drive, Scoresby 3179 Email: RentalsEnviroVIC@thermofisher.com	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113 Email: RentalsEnviroNSW@thermofisher.com	Adelaide Branch 27 Beulah Road, Norwood, South Australia 5067 Email: RentalsEnviroSA@thermofisher.com	Brisbane Branch Unit 2/5 Ross St Newstead 4006 Email: RentalsEnviroQLD@thermofisher.com	Perth Branch 121 Beringarra Ave Malaga WA 6090 Email: RentalsEnviroWA@thermofisher.com

Appendix E

Tabulated Results

Air Quality Results

Soil Results

Groundwater Results

Duplicate RPD

Appendix F - Tabulated Results

Air Quality Results

Analyte	Guideline Value	LOR	Sample Identity	AQM01		AQM02		AQM03	
			Sampling Date	16/09/2011	29/09/2011	16/09/2011	29/09/2011	16/09/2011	29/09/2011
			Wind Speed (km/h)*	13	13	11	10	13	9
			Direction*	Southeast	North	East Southeast	North	South	North
			Sample Type	Air (Canister)	Air (Canister)	Air (Canister)	Air (Canister)	Air (Canister)	Air (Canister)
	NEPM Air Toxics		Units						
BTEX & MTBE									
Benzene	3	0.5	ppb	<0.5	<0.5	<0.5	1.9	4.6	0.6
Toluene	1,000	0.5	ppb	2	3.6	1.3	16	23	7
Ethylbenzene		0.5	ppb	0.6	0.7	<0.5	3.4	2.9	1.8
o-Xylene	250	0.5	ppb	<0.5	0.7	<0.5	4.5	1.8	2.5
m-& p-Xylene	250	0.5	ppb	1.1	2.1	<1	13	8.9	5.9
MTBE		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TPH									
TPH C5 - C8 Aliphatic		200	µg/m^3	<200	580	310	1400	510	630
TPH C9 - C12 Aliphatic		50	µg/m^3	<50	91	<50	480	<50	220
TPH C9 - C10 Aromatic		100	µg/m^3	<100	<100	<100	160	<100	100
VOCs									
1,1- Dichloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichlorotrifluoroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene		0.5	ppb	0.9	1.3	<0.5	0.5	0.6	<0.5
1,2,4-Trimethylbenzene		0.5	ppb	<0.5	0.6	<0.5	5.3	2	3.2
1,2-Dibromoethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichlorobenzene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichlorotetrafluoroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene		0.5	ppb	<0.5	<0.5	<0.5	1.7	0.5	1
1,3-Butadiene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene		0.5	ppb	0.5	0.6	<0.5	<0.5	0.5	<0.5
1,4-Dioxane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-ethyl toluene		0.5	ppb	<0.5	<0.5	<0.5	1.5	0.7	0.9
Acrolein		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzyl chloride		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform		0.5	ppb	0.8	1.1	0.6	1.5	0.5	1
Bromomethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Disulfide		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane		0.5	ppb	<0.5	0.6	<0.5	0.7	<0.5	0.6
cis-1,2-Dichloroethene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyclohexane		0.5	ppb	<0.5	0.7	<0.5	5.5	1.8	3
Dibromochloromethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane		0.5	ppb	0.5	0.8	0.5	0.8	0.5	0.8
Ethanol		0.5	ppb	4.8	8.6	<0.5	41	<0.5	29
Ethyl Acetate		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptane		0.5	ppb	0.6	<0.5	<0.5	<0.5	3.6	<0.5
Hexachloro-		0.5	ppb	<0.5	<0.5	<0.5	<0.5	0.6	<0.5
Hexane		0.5	ppb	0.6	0.7	<0.5	5	6.1	1.7
Isopropyl Alcohol		0.5	ppb	54	53	34	75	29	65
MEK		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Butyl Ketone		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Methacrylate		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MIBK		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene		0.5	ppb	<0.5	<0.5	<0.5	0.9	0.6	0.5
Propylene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrahydrofuran		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-dichloroethene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl Acetate		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride		0.5	ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate-Bromochloromethane		-	% rec	97	111	89	89	89	94
Surrogate-1,4-Difluorobenzene		-	% rec	89	108	79	94	81	99
Surrogate-Chlorobenzene-D5		-	% rec	92	108	84	97	84	103

Notes: * Wind speed and direction taken from the Bureau of Meterology site located 4.5 km east of the site.

Appendix F - Tabulated Results

Soil Results

Analyte	Guideline Value		LOR	Sample Identity	Track	MW3	MW4
				Depth	0.00	3.00	1.00
				Sample Type	Soil	Soil	Soil
	NEPM - HIL (F)	NSW EPA (1994) – Sensitive Land Use		Units			
Heavy Metals							
Arsenic	500		2	mg/kg	9.2	27	39
Cadmium	100		0.4	mg/kg	< 0.4	1.3	1.1
Chromium	500		5	mg/kg	20	64	100
Copper	5,000		5	mg/kg	7.4	8.7	5.9
Lead	1,500		5	mg/kg	69	8.6	11
Mercury	75		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Nickel	3,000		5	mg/kg	< 5	< 5	< 5
Zinc	35,000		5	mg/kg	45	< 5	29
Other							
Moisture Content			0.1	%	6.9	13	12
Total Organic Carbon			50	mg/kg	-	830	1400
BTEX							
Benzene		1	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Toluene		130	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Ethylbenzene		50	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Xylenes(ortho.meta and para)		25	0.15	mg/kg	< 0.15	< 0.15	< 0.15
o-Xylene		25	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Total m+p-Xylenes		25	0.10	mg/kg	< 0.1	< 0.1	< 0.1
Fluorobenzene (surr.)			1	%	72	77	71
Total Petroleum Hydrocarbons (TPH)							
TPH C6-C9 (GC)		65	20	mg/kg	< 20	< 20	< 20
TPH C10-C14 (GC)		1,000	50	mg/kg	100	< 20	< 20
TPH C15-C28 (GC)		1,000	100	mg/kg	6,500	< 50	< 50
TPH C29-C36 (GC)		1,000	100	mg/kg	7,500	< 50	< 50
TPH C10-36 (Total)		1,000	100	mg/kg	14,000	< 50	< 50

Appendix F - Tabulated Results

Groundwater Results

Analyte	Guideline Value		LOR	Sample Identity	MW1	MW3	MW4	MW5	MW6	MW7
				Sample Type	Water	Water	Water	Water	Water	Water
	Freshwater Aquatic Ecosystems	Drinking Water Standard		Units						
Heavy Metals										
Arsenic	0.05	0.007	mg/L		0.002	0.001	0.002	0.003	< 0.001	0.002
Cadmium	0.002	0.002	mg/L		< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002
Chromium	0.01		mg/L		< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
Copper	0.005	2	mg/L		< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
Lead	0.005	0.01	mg/L		< 0.001	< 0.001	0.026	0.005	< 0.001	0.007
Mercury	0.0001	0.001	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.15	0.02	mg/L		< 0.001	< 0.001	0.018	< 0.001	< 0.001	< 0.001
Zinc	0.05	3	mg/L		0.038	0.005	0.052	0.007	0.007	0.015
Other										
Conductivity			µs/cm		300	490	14000	790	350	650
BTEX										
Benzene	0.3	0.001	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.3	0.8	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.005 [2]	0.3	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes(ortho.meta and para)		0.6	mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
o-Xylene		0.003	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Total m+p-Xylenes	0.075 [2]	0.003	mg/L		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Fluorobenzene (surr.)			%		81	92	84	84	92	78
Total Recoverable Hydrocarbons (TRH)										
TRH C6-C9			mg/L		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14			mg/L		0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28			mg/L		0.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36			mg/L		0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.6 [1]		mg/L		0.8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
VOCs										
1.1.1.2-Tetrachloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1.1-Trichloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1.2.2-Tetrachloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1.2-Trichloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1-Dichloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1-Dichloroethene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2.3-Trichloropropane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2.4-Trimethylbenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dibromoethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichlorobenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichloroethane		0.003	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichloropropane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.3.5-Trimethylbenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.3-Dichlorobenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.3-Dichloropropane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.4-Dichlorobenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
2-Butanone (MEK)			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
2-Propanone (Acetone)			mg/L		0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
4-Chlorotoluene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
4-Methyl-2-pentanone (MIBK)			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Allyl chloride			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Bromobenzene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Bromochloromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Bromodichloromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Bromoform			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Bromomethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Carbon disulfide			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Carbon Tetrachloride		0.003	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chlorobenzene		0.3	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chloroethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001
Chloroform			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.004
Chloromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
cis-1.2-Dichloroethene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
cis-1.3-Dichloropropene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dibromochloromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dibromomethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorodifluoromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Iodomethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Isopropyl benzene (Cumene)			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Methylene Chloride			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Styrene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tetrachloroethene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
trans-1.2-Dichloroethene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
trans-1.3-Dichloropropene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Trichloroethene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Trichlorofluoromethane			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Vinyl chloride			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
4-Bromofluorobenzene (surr.)			%		75	86	80	59	82	61
SVOCs										
1.2.3.4-Tetrachlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.2.3.5-Tetrachlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.2.3-Trichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.2.4.5-Tetrachlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.2.4-Trichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.2-Dichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.3.5-Trichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.3-Dichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1.4-Dichlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1-Chloronaphthalene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1-Naphthylamine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2.3.4.6-Tetrachlorophenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2.4.5-Trichlorophenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2.4.6-Trichlorophenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2.4-Dichlorophenol			mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2.4-Dimethylphenol			mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2.4-Dinitrophenol			mg/L		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
2.4-Dinitrotoluene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2.6-Dichlorophenol			mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2.6-Dinitrotoluene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Chloronaphthalene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Chlorophenol			mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2-Methyl-4.6-dinitrophenol			mg/L		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
2-Methylnaphthalene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Methylphenol (o-Cresol)			mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
2-Naphthylamine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Nitroaniline			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Nitrophenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Appendix F - Tabulated Results

Groundwater Results

Analyte	Guideline Value		LOR	Sample Identity	MW1	MW3	MW4	MW5	MW6	MW7
				Sample Type	Water	Water	Water	Water	Water	Water
	Freshwater Aquatic Ecosystems	Drinking Water Standard		Units						
2-Picoline			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
3&4-Methylphenol (m&p-Cresol)			mg/L		< 0.006	< 0.006	< 0.006	< 0.006	< 0.006	< 0.006
3.3'-Dichlorobenzidine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
3-Methylcholanthrene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4.4'-DDD			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4.4'-DDE			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4.4'-DDT	0.000001	0.02	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4-Aminobiphenyl			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4-Bromophenyl phenyl ether			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4-Chloro-3-methylphenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-Chlorophenyl phenyl ether			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
4-Nitrophenol			mg/L		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
7.12-Dimethylbenz(a)anthracene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
a-BHC			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Acenaphthene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthylene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Acetophenone			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Aldrin	0.00001	0.0003	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Aniline			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Anthracene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
b-BHC			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benz(a)anthracene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(a)pyrene		0.00001	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(b)fluoranthene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(g.h.i)perylene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(k)fluoranthene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzyl chloride			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-chloroethoxy)methane			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-chloroisopropyl)ether			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-ethylhexyl)phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Butyl benzyl phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chrysene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
d-BHC			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dibenz(a.h)anthracene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dibenz(a.j)acridine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dibenzofuran			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dieldrin	0.000002	0.0003	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Diethyl phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dimethyl phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dimethylaminoazobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Di-n-butyl phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Di-n-octyl phthalate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Diphenylamine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan I			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan II			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan sulphate			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endrin			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endrin aldehyde			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Endrin ketone			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Fluoranthene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Fluorene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
g-BHC (Lindane)			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Heptachlor	0.00001	0.0003	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Heptachlor epoxide			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorobutadiene	0.100	0.001	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorocyclopentadiene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Hexachloroethane			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Indeno(1.2.3-cd)pyrene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Methoxychlor			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Naphthalene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nitrobenzene			mg/L		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Nitrosodibutylamine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
N-Nitrosodipropylamine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
N-Nitrosopiperidine			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Pentachlorobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Pentachloronitrobenzene			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Pentachlorophenol			mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Phenol	0.050		mg/L		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Pronamide			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Pyrene			mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Trifluralin			mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Phenol-d6 (surr.)			%		29	27	31	26	30	34
Nitrobenzene-d5 (surr.)			%		76	88	87	73	83	97
2-Fluorobiphenyl (surr.)			%		57	96	94	81	85	106
2.4.6-Tribromophenol (surr.)			%		70	118	107	99	96	105

Notes: [1] Dutch Intervention Value for Mineral Oil, 2000.

[2] ANZECC low reliability trigger value

Appendix F - Tabulated Results

Duplicate RPD

Analyte	Sample Identity	MW3	QA1	RPD (%)
	Sample Type	Water	Water	
	Units			
Heavy Metals				
Arsenic		0.001	0.001	0
Cadmium		< 0.0002	< 0.0002	0
Chromium		< 0.001	< 0.001	0
Copper		< 0.001	< 0.001	0
Lead		< 0.001	< 0.001	0
Mercury		< 0.0001	< 0.0001	0
Nickel		< 0.001	< 0.001	0
Zinc		0.005	0.006	17
Other				
Conductivity		490	470	4
BTEX				
Benzene		< 0.001	< 0.001	0
Toluene		< 0.001	< 0.001	0
Ethylbenzene		< 0.001	< 0.001	0
Xylenes(ortho.meta and para)		< 0.003	< 0.003	0
o-Xylene		< 0.001	< 0.001	0
Total m+p-Xylenes		< 0.002	< 0.002	0
Fluorobenzene (surr.)		92	90	2
Total Petroleum Hydrocarbons (TPH)				
TRH C6-C9		< 0.02	< 0.02	0
TRH C10-C14		< 0.05	< 0.05	0
TRH C15-C28		< 0.1	< 0.1	0
TRH C29-C36		< 0.1	< 0.1	0
TRH C10-36 (Total)		< 0.1	< 0.1	0
VOCs				
1.1.1.2-Tetrachloroethane		< 0.001	< 0.001	0
1.1.1-Trichloroethane		< 0.001	< 0.001	0
1.1.2.2-Tetrachloroethane		< 0.001	< 0.001	0
1.1.2-Trichloroethane		< 0.001	< 0.001	0
1.1-Dichloroethane		< 0.001	< 0.001	0
1.1-Dichloroethene		< 0.001	< 0.001	0
1.2.3-Trichloropropane		< 0.001	< 0.001	0
1.2.4-Trimethylbenzene		< 0.001	< 0.001	0
1.2-Dibromoethane		< 0.001	< 0.001	0
1.2-Dichlorobenzene		< 0.001	< 0.001	0
1.2-Dichloroethane		< 0.001	< 0.001	0
1.2-Dichloropropane		< 0.001	< 0.001	0
1.3.5-Trimethylbenzene		< 0.001	< 0.001	0
1.3-Dichlorobenzene		< 0.001	< 0.001	0
1.3-Dichloropropane		< 0.001	< 0.001	0
1.4-Dichlorobenzene		< 0.001	< 0.001	0
2-Butanone (MEK)		< 0.001	< 0.001	0
2-Propanone (Acetone)		< 0.001	< 0.001	0
4-Chlorotoluene		< 0.001	< 0.001	0
4-Methyl-2-pentanone (MIBK)		< 0.001	< 0.001	0
Allyl chloride		< 0.001	< 0.001	0
Bromobenzene		< 0.001	< 0.001	0
Bromochloromethane		< 0.001	< 0.001	0
Bromodichloromethane		< 0.001	< 0.001	0
Bromoform		< 0.001	< 0.001	0
Bromomethane		< 0.001	< 0.001	0
Carbon disulfide		< 0.001	< 0.001	0
Carbon Tetrachloride		< 0.001	< 0.001	0
Chlorobenzene		< 0.001	< 0.001	0
Chloroethane		< 0.001	< 0.001	0
Chloroform		< 0.001	< 0.001	0
Chloromethane		< 0.001	< 0.001	0
cis-1.2-Dichloroethene		< 0.001	< 0.001	0
cis-1.3-Dichloropropene		< 0.001	< 0.001	0
Dibromochloromethane		< 0.001	< 0.001	0
Dibromomethane		< 0.001	< 0.001	0
Dichlorodifluoromethane		< 0.001	< 0.001	0
Iodomethane		< 0.001	< 0.001	0
Isopropyl benzene (Cumene)		< 0.001	< 0.001	0
Methylene Chloride		< 0.001	< 0.001	0
Styrene		< 0.001	< 0.001	0
Tetrachloroethene		< 0.001	< 0.001	0
trans-1.2-Dichloroethene		< 0.001	< 0.001	0
trans-1.3-Dichloropropene		< 0.001	< 0.001	0
Trichloroethene		< 0.001	< 0.001	0
Trichlorofluoromethane		< 0.001	< 0.001	0
Vinyl chloride		< 0.001	< 0.001	0
4-Bromofluorobenzene (surr.)		86	85	1
SVOCs				
1.2.3.4-Tetrachlorobenzene		< 0.005	< 0.005	0
1.2.3.5-Tetrachlorobenzene		< 0.005	< 0.005	0
1.2.3-Trichlorobenzene		< 0.005	< 0.005	0
1.2.4.5-Tetrachlorobenzene		< 0.005	< 0.005	0
1.2.4-Trichlorobenzene		< 0.005	< 0.005	0
1.2-Dichlorobenzene		< 0.005	< 0.005	0
1.3.5-Trichlorobenzene		< 0.005	< 0.005	0
1.3-Dichlorobenzene		< 0.005	< 0.005	0
1.4-Dichlorobenzene		< 0.005	< 0.005	0
1-Chloronaphthalene		< 0.005	< 0.005	0
1-Naphthylamine		< 0.005	< 0.005	0
2.3.4.6-Tetrachlorophenol		< 0.01	< 0.01	0
2.4.5-Trichlorophenol		< 0.01	< 0.01	0
2.4.6-Trichlorophenol		< 0.01	< 0.01	0
2.4-Dichlorophenol		< 0.003	< 0.003	0
2.4-Dimethylphenol		< 0.003	< 0.003	0
2.4-Dinitrophenol		< 0.03	< 0.03	0

Appendix F - Tabulated Results

Duplicate RPD

Analyte	Sample Identity	MW3	QA1	RPD (%)
	Sample Type	Water	Water	
	Units			
2.4-Dinitrotoluene		< 0.005	< 0.005	0
2.6-Dichlorophenol		< 0.003	< 0.003	0
2.6-Dinitrotoluene		< 0.005	< 0.005	0
2-Chloronaphthalene		< 0.005	< 0.005	0
2-Chlorophenol		< 0.003	< 0.003	0
2-Methyl-4.6-dinitrophenol		< 0.03	< 0.03	0
2-Methylnaphthalene		< 0.005	< 0.005	0
2-Methylphenol (o-Cresol)		< 0.003	< 0.003	0
2-Naphthylamine		< 0.005	< 0.005	0
2-Nitroaniline		< 0.005	< 0.005	0
2-Nitrophenol		< 0.01	< 0.01	0
2-Picoline		< 0.005	< 0.005	0
3&4-Methylphenol (m&p-Cresol)		< 0.006	< 0.006	0
3.3'-Dichlorobenzidine		< 0.005	< 0.005	0
3-Methylcholanthrene		< 0.005	< 0.005	0
4.4'-DDD		< 0.005	< 0.005	0
4.4'-DDE		< 0.005	< 0.005	0
4.4'-DDT		< 0.005	< 0.005	0
4-Aminobiphenyl		< 0.005	< 0.005	0
4-Bromophenyl phenyl ether		< 0.005	< 0.005	0
4-Chloro-3-methylphenol		< 0.01	< 0.01	0
4-Chlorophenyl phenyl ether		< 0.005	< 0.005	0
4-Nitrophenol		< 0.03	< 0.03	0
7.12-Dimethylbenz(a)anthracene		< 0.005	< 0.005	0
a-BHC		< 0.005	< 0.005	0
Acenaphthene		< 0.001	< 0.001	0
Acenaphthylene		< 0.001	< 0.001	0
Acetophenone		< 0.005	< 0.005	0
Aldrin		< 0.005	< 0.005	0
Aniline		< 0.005	< 0.005	0
Anthracene		< 0.001	< 0.001	0
b-BHC		< 0.005	< 0.005	0
Benz(a)anthracene		< 0.001	< 0.001	0
Benzo(a)pyrene		< 0.001	< 0.001	0
Benzo(b)fluoranthene		< 0.001	< 0.001	0
Benzo(g.h.i)perylene		< 0.001	< 0.001	0
Benzo(k)fluoranthene		< 0.001	< 0.001	0
Benzyl chloride		< 0.005	< 0.005	0
Bis(2-chloroethoxy)methane		< 0.005	< 0.005	0
Bis(2-chloroisopropyl)ether		< 0.005	< 0.005	0
Bis(2-ethylhexyl)phthalate		< 0.005	< 0.005	0
Butyl benzyl phthalate		< 0.005	< 0.005	0
Chrysene		< 0.001	< 0.001	0
d-BHC		< 0.005	< 0.005	0
Dibenz(a.h)anthracene		< 0.001	< 0.001	0
Dibenz(a.j)acridine		< 0.005	< 0.005	0
Dibenzofuran		< 0.005	< 0.005	0
Dieldrin		< 0.005	< 0.005	0
Diethyl phthalate		< 0.005	< 0.005	0
Dimethyl phthalate		< 0.005	< 0.005	0
Dimethylaminoazobenzene		< 0.005	< 0.005	0
Di-n-butyl phthalate		< 0.005	< 0.005	0
Di-n-octyl phthalate		< 0.005	< 0.005	0
Diphenylamine		< 0.005	< 0.005	0
Endosulfan I		< 0.005	< 0.005	0
Endosulfan II		< 0.005	< 0.005	0
Endosulfan sulphate		< 0.005	< 0.005	0
Endrin		< 0.005	< 0.005	0
Endrin aldehyde		< 0.005	< 0.005	0
Endrin ketone		< 0.005	< 0.005	0
Fluoranthene		< 0.001	< 0.001	0
Fluorene		< 0.001	< 0.001	0
g-BHC (Lindane)		< 0.005	< 0.005	0
Heptachlor		< 0.005	< 0.005	0
Heptachlor epoxide		< 0.005	< 0.005	0
Hexachlorobenzene		< 0.005	< 0.005	0
Hexachlorobutadiene		< 0.005	< 0.005	0
Hexachlorocyclopentadiene		< 0.005	< 0.005	0
Hexachloroethane		< 0.005	< 0.005	0
Indeno(1.2.3-cd)pyrene		< 0.001	< 0.001	0
Methoxychlor		< 0.005	< 0.005	0
Naphthalene		< 0.001	< 0.001	0
Nitrobenzene		< 0.05	< 0.05	0
N-Nitrosodibutylamine		< 0.005	< 0.005	0
N-Nitrosodipropylamine		< 0.005	< 0.005	0
N-Nitrosopiperidine		< 0.005	< 0.005	0
Pentachlorobenzene		< 0.005	< 0.005	0
Pentachloronitrobenzene		< 0.005	< 0.005	0
Pentachlorophenol		< 0.01	< 0.01	0
Phenanthrene		< 0.001	< 0.001	0
Phenol		< 0.003	< 0.003	0
Pronamide		< 0.005	< 0.005	0
Pyrene		< 0.001	< 0.001	0
Trifluralin		< 0.005	< 0.005	0
Phenol-d6 (surr.)		27	31	13
Nitrobenzene-d5 (surr.)		88	92	4
2-Fluorobiphenyl (surr.)		96	95	1
2.4.6-Tribromophenol (surr.)		118	101	17

Appendix F

Official Laboratory Results

Air Quality Results

Soil Results

Groundwater Results

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

CERTIFICATE OF ANALYSIS 61957

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**Darwin Turf Club**
No. of samples:	1 Air Sample
Date samples received / completed instructions received	19/09/11 / 19/09/11

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

Report Details:

Date results requested by: / Issue Date:	21/09/11 / 22/09/11
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags		
Our Reference:	UNITS	61957-1
Your Reference	----------	AQM01 (333)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:21
Date analysed	-	20/9/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.5
Chloromethane	ppbv	<0.5
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	4.8
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	54
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1-Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	0.6
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	<0.5
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	<0.5
Heptane	ppbv	0.6
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	2.0

TO15 in Canisters/Bags		
Our Reference:	UNITS	61957-1
Your Reference	----------	AQM01 (333)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:21
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	0.6
m-& *p*-Xylene	ppbv	1.1
Styrene	ppbv	<0.5
o-Xylene	ppbv	<0.5
Bromoform	ppbv	0.8
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	<0.5
1,3,5-Trimethylbenzene	ppbv	<0.5
1,2,4-Trimethylbenzene	ppbv	<0.5
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	0.5
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	0.9
Naphthalene	ppbv	<0.5
Hexachloro- 1,3-butadiene	ppbv	<0.5
Surrogate-Bromochloromethane	% rec	97
Surrogate-1,4-Difluorobenzene	% rec	89
Surrogate-Chlorobenzene-D5	% rec	92

TPH in Air		
Our Reference:	UNITS	61957-1
Your Reference	----------	AQM01 (333)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:21
Date analysed	-	20/9/2011
TPHC$_5$ - C$_8$ Aliphatic*	µg/m^3	<200
TPHC$_9$ - C$_{12}$ Aliphatic*	µg/m^3	<50
TPHC$_9$ - C$_{10}$ Aromatic*	µg/m^3	<100

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	118%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	102%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	115%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	85%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	84%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	92%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	91%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	111%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	93	[NT]	[NT]	LCS	98%
Surrogate-1,4-Difluorobenzene	% rec		TO15	91	[NT]	[NT]	LCS	109%
Surrogate-Chlorobenzene-D5	% rec		TO15	94	[NT]	[NT]	LCS	102%

Client Reference: Darwin Turf Club

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			20/9/2011	[NT]	[NT]	LCS	20/9/2011
TPH C_5 - C_8 Aliphatic*	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	92%
TPH C_9 - C_{12} Aliphatic*	µg/m^3	50	AT-005	<50	[NT]	[NT]	LCS	NT
TPH C_9 - C_{10} Aromatic*	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	85%

Report Comments:

See attached report for SVOCs library scan.

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

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CERTIFICATE OF ANALYSIS 61958

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**Darwin Turf Club**
No. of samples:	1 Air Sample
Date samples received / completed instructions received	19/09/11 / 19/09/11

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

Report Details:

Date results requested by: / Issue Date:	21/09/11 / 22/09/11
Date of Preliminary Report:	Not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags		
Our Reference:	UNITS	61958-1
Your Reference	----------	AQM02 (327)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:10
Date analysed	-	20/9/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.5
Chloromethane	ppbv	<0.5
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	<0.5
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	34
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1-Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	<0.5
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	<0.5
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	<0.5
Heptane	ppbv	<0.5
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	1.3

TO15 in Canisters/Bags		
Our Reference:	UNITS	61958-1
Your Reference	----------	AQM02 (327)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:10
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	<0.5
m-& *p*-Xylene	ppbv	<1.0
Styrene	ppbv	<0.5
o-Xylene	ppbv	<0.5
Bromoform	ppbv	0.6
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	<0.5
1,3,5-Trimethylbenzene	ppbv	<0.5
1,2,4-Trimethylbenzene	ppbv	<0.5
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	<0.5
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	<0.5
Naphthalene	ppbv	<0.5
Hexachloro- 1,3-butadiene	ppbv	<0.5
Surrogate-Bromochloromethane	% rec	89
Surrogate-1,4-Difluorobenzene	% rec	79
Surrogate-Chlorobenzene-D5	% rec	84

TPH in Air		
Our Reference:	UNITS	61958-1
Your Reference	----------	AQM02 (327)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		10:10
Date analysed	-	20/9/2011
TPH C_5 - C_8 Aliphatic*	µg/m^3	310
TPH C_9 - C_{12} Aliphatic*	µg/m^3	<50
TPH C_9 - C_{10} Aromatic*	µg/m^3	<100

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	118%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	102%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	115%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	85%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

Client Reference: Darwin Turf Club

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	84%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	92%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	91%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	111%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	93	[NT]	[NT]	LCS	98%
Surrogate-1,4-Difluorobenzene	% rec		TO15	91	[NT]	[NT]	LCS	109%
Surrogate-Chlorobenzene-D5	% rec		TO15	94	[NT]	[NT]	LCS	102%

Client Reference: Darwin Turf Club

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			20/9/2011	[NT]	[NT]	LCS	20/9/2011
TPH C_5 - C_8 Aliphatic*	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	92%
TPH C_9 - C_{12} Aliphatic*	µg/m^3	50	AT-005	<50	[NT]	[NT]	[NR]	[NR]
TPH C_9 - C_{10} Aromatic*	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	85%

Report Comments:

See attached report for SVOCs library scan

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

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CERTIFICATE OF ANALYSIS 61959

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**Darwin Turf Club**
No. of samples:	1 Air Sample
Date samples received / completed instructions received	19/09/11 / 19/09/11

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

Report Details:

Date results requested by: / Issue Date:	21/09/11 / 22/09/11
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags		
Our Reference:	UNITS	61959-1
Your Reference	----------	AQM03 (322)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		11:07
Date analysed	-	20/9/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.5
Chloromethane	ppbv	<0.5
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	<0.5
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	29
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1-Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	6.1
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	4.6
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	1.8
Heptane	ppbv	3.6
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	23

TO15 in Canisters/Bags		
Our Reference:	UNITS	61959-1
Your Reference	----------	AQM03 (322)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		11:07
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	2.9
m-& *p*-Xylene	ppbv	8.9
Styrene	ppbv	<0.5
o-Xylene	ppbv	1.8
Bromoform	ppbv	0.5
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	0.7
1,3,5-Trimethylbenzene	ppbv	0.5
1,2,4-Trimethylbenzene	ppbv	2.0
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	0.5
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	0.6
Naphthalene	ppbv	0.6
Hexachloro- 1,3-butadiene	ppbv	0.6
Surrogate-Bromochloromethane	% rec	89
Surrogate-1,4-Difluorobenzene	% rec	81
Surrogate-Chlorobenzene-D5	% rec	84

TPH in Air		
Our Reference:	UNITS	61959-1
Your Reference	----------	AQM03 (322)
Date Sampled	----------	16/09/2011
Type of sample		Air (Canister)
Time Sampled		11:07
Date analysed	-	20/9/2011
TPHC$_5$ - C$_8$ Aliphatic*	µg/m^3	510
TPHC$_9$ - C$_{12}$ Aliphatic*	µg/m^3	<50
TPHC$_9$ - C$_{10}$ Aromatic*	µg/m^3	<100

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	118%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	102%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	115%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	85%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

Client Reference: Darwin Turf Club

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	84%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	92%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	91%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	111%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	89%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	93	[NT]	[NT]	LCS	98%
Surrogate-1,4-Difluorobenzene	% rec		TO15	91	[NT]	[NT]	LCS	109%
Surrogate-Chlorobenzene-D5	% rec		TO15	94	[NT]	[NT]	LCS	102%

Client Reference: Darwin Turf Club

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			20/9/2011	[NT]	[NT]	LCS	20/9/2011
TPH C_5 - C_8 Aliphatic*	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	92%
TPH C_9 - C_{12} Aliphatic*	µg/m^3	50	AT-005	<50	[NT]	[NT]	[NR]	[NR]
TPH C_9 - C_{10} Aromatic*	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	85%

Report Comments:

See attached report for SVOCs library scan.

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

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CERTIFICATE OF ANALYSIS 62716

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**4321851, Darwin Turf Club**
No. of samples:	1 canister
Date samples received / completed instructions received	30/09/11 / 30/09/11

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

Report Details:

Date results requested by: / Issue Date:	10/10/11 / 6/10/11
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags Our Reference: Your Reference Date Sampled	UNITS ---------- ----------	62716-1 AQM01 29/09/11
Date analysed	-	30/09/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.8
Chloromethane	ppbv	0.6
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	8.6
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	53
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1- Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	0.7
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	<0.5
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	0.7
Heptane	ppbv	<0.5
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	3.6
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5

TO15 in Canisters/Bags		
Our Reference:	UNITS	62716-1
Your Reference	----------	AQM01
Date Sampled	----------	29/09/11
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	0.7
m-& *p*-Xylene	ppbv	2.1
Styrene	ppbv	<0.5
o-Xylene	ppbv	0.7
Bromoform	ppbv	1.1
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	<0.5
1,3,5-Trimethylbenzene	ppbv	<0.5
1,2,4-Trimethylbenzene	ppbv	0.6
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	0.6
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	1.3
Naphthalene	ppbv	<0.5
Hexachloro- 1,3-butadiene	ppbv	<0.5
Surrogate-Bromochloromethane	% rec	111
Surrogate-1,4-Difluorobenzene	% rec	108
Surrogate-Chlorobenzene-D5	% rec	108

TPH in Air		
Our Reference:	UNITS	62716-1
Your Reference	----------	AQM01
Date Sampled	----------	29/09/11
Date analysed	-	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	580
TPH C_9 - C_{12} Aliphatic	µg/m^3	91
TPH C_9 - C_{10} Aromatic	µg/m^3	<100

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	113%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	110%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	119%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	98%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	93%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	94%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	86%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	94%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	90%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	82%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	81%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	96	[NT]	[NT]	LCS	106%
Surrogate-1,4-Difluorobenzene	% rec		TO15	92	[NT]	[NT]	LCS	101%
Surrogate-Chlorobenzene-D5	% rec		TO15	102	[NT]	[NT]	LCS	97%

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			30/09/2011	[NT]	[NT]	LCS	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	101%
TPH C_9 - C_{12} Aliphatic	µg/m^3	50	AT-005	<50	[NT]	[NT]	[NR]	[NR]
TPH C_9 - C_{10} Aromatic	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	120%

Report Comments:

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

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CERTIFICATE OF ANALYSIS 62718

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**4321851, Darwin Turf Club**
No. of samples:	1 canister
Date samples received / completed instructions received	30/09/11 / 30/09/11

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

Report Details:

Date results requested by: / Issue Date:	10/10/11 / 6/10/11
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags Our Reference: Your Reference	UNITS --- ---	62718-1 AQM02
Date analysed	-	30/09/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.8
Chloromethane	ppbv	0.7
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	41
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	75
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1-Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	5.0
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	1.9
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	5.5
Heptane	ppbv	<0.5
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	16
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5

TO15 in Canisters/Bags Our Reference: Your Reference	UNITS ---------- ----------	62718-1 AQM02
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	3.4
m-& *p*-Xylene	ppbv	13
Styrene	ppbv	<0.5
o-Xylene	ppbv	4.5
Bromoform	ppbv	1.5
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	1.5
1,3,5-Trimethylbenzene	ppbv	1.7
1,2,4-Trimethylbenzene	ppbv	5.3
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	<0.5
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	0.5
Naphthalene	ppbv	0.9
Hexachloro- 1,3-butadiene	ppbv	<0.5
Surrogate-Bromochloromethane	% rec	89
Surrogate-1,4-Difluorobenzene	% rec	94
Surrogate-Chlorobenzene-D5	% rec	97

TPH in Air Our Reference: Your Reference	UNITS ---------- ----------	62718-1 AQM02
Date analysed	-	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	1,400
TPH C_9 - C_{12} Aliphatic	µg/m^3	480
TPH C_9 - C_{10} Aromatic	µg/m^3	160

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	113%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	110%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	119%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	98%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	93%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	94%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	86%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	94%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	90%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	82%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	81%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	96	[NT]	[NT]	LCS	106%
Surrogate-1,4-Difluorobenzene	% rec		TO15	92	[NT]	[NT]	LCS	101%
Surrogate-Chlorobenzene-D5	% rec		TO15	102	[NT]	[NT]	LCS	97%

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			30/09/2011	[NT]	[NT]	LCS	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	101%
TPH C_9 - C_{12} Aliphatic	µg/m^3	50	AT-005	<50	[NT]	[NT]	[NR]	[NR]
TPH C_9 - C_{10} Aromatic	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	120%

Report Comments:

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

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CERTIFICATE OF ANALYSIS 62717

Client:
GHD Pty Ltd (Darwin)
Level 5, 66 Smith St
Darwin
NT 0800

Attention: Alex Koscielski

Sample log in details:

Your Reference:	**4321851, Darwin Turf Club**
No. of samples:	1 canister
Date samples received / completed instructions received	30/09/11 / 30/09/11

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

Report Details:

Date results requested by: / Issue Date:	10/10/11 / 6/10/11
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Giovanni Agosti
Technical Manager

TO15 in Canisters/Bags Our Reference: Your Reference Date Sampled	UNITS ---------- ----------	62717-1 AQM03 29/09/11
Date analysed	-	30/09/2011
Propylene	ppbv	<0.5
Dichlorodifluoromethane	ppbv	0.8
Chloromethane	ppbv	0.6
1,2-Dichlorotetrafluoroethane	ppbv	<0.5
Vinyl chloride	ppbv	<0.5
1,3-Butadiene	ppbv	<0.5
Bromomethane	ppbv	<0.5
Chloroethane	ppbv	<0.5
Ethanol	ppbv	29
Acrolein	ppbv	<0.5
Trichlorofluoromethane (Freon 11)	ppbv	<0.5
Isopropyl Alcohol	ppbv	65
1,1-Dichloroethene	ppbv	<0.5
1,1,2-Trichlorotrifluoroethane	ppbv	<0.5
Carbon Disulfide	ppbv	<0.5
trans-1,2-dichloroethene	ppbv	<0.5
MTBE	ppbv	<0.5
1,1- Dichloroethane	ppbv	<0.5
Vinyl Acetate	ppbv	<0.5
MEK	ppbv	<0.5
Hexane	ppbv	1.7
cis-1,2-Dichloroethene	ppbv	<0.5
Ethyl Acetate	ppbv	<0.5
Chloroform	ppbv	<0.5
Tetrahydrofuran	ppbv	<0.5
1,1,1-Trichloroethane	ppbv	<0.5
1,2-Dichloroethane	ppbv	<0.5
Benzene	ppbv	0.6
Carbon tetrachloride	ppbv	<0.5
Cyclohexane	ppbv	3.0
Heptane	ppbv	<0.5
Trichloroethene	ppbv	<0.5
1,2-Dichloropropane	ppbv	<0.5
1,4-Dioxane	ppbv	<0.5
Bromodichloromethane	ppbv	<0.5
Methyl Methacrylate	ppbv	<0.5
MIBK	ppbv	<0.5
cis-1,3-Dichloropropene	ppbv	<0.5
trans-1,3-Dichloropropene	ppbv	<0.5
Toluene	ppbv	7.0
1,1,2-Trichloroethane	ppbv	<0.5
Methyl Butyl Ketone	ppbv	<0.5

TO15 in Canisters/Bags Our Reference: Your Reference Date Sampled	UNITS ---------- ----------	62717-1 AQM03 29/09/11
Dibromochloromethane	ppbv	<0.5
Tetrachloroethene	ppbv	<0.5
1,2-Dibromoethane	ppbv	<0.5
Chlorobenzene	ppbv	<0.5
Ethylbenzene	ppbv	1.8
m-& *p*-Xylene	ppbv	5.9
Styrene	ppbv	<0.5
o-Xylene	ppbv	2.5
Bromoform	ppbv	1.0
1,1,2,2-Tetrachloroethane	ppbv	<0.5
4-ethyl toluene	ppbv	0.9
1,3,5-Trimethylbenzene	ppbv	1.0
1,2,4-Trimethylbenzene	ppbv	3.2
1,3-Dichlorobenzene	ppbv	<0.5
Benzyl chloride	ppbv	<0.5
1,4-Dichlorobenzene	ppbv	<0.5
1,2-Dichlorobenzene	ppbv	<0.5
1,2,4-Trichlorobenzene	ppbv	<0.5
Naphthalene	ppbv	0.5
Hexachloro- 1,3-butadiene	ppbv	<0.5
Surrogate-Bromochloromethane	% rec	94
Surrogate-1,4-Difluorobenzene	% rec	99
Surrogate-Chlorobenzene-D5	% rec	103

TPH in Air		
Our Reference:	UNITS	62717-1
Your Reference	----------	AQM03
Date Sampled	----------	29/09/11
Date analysed	-	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	630
TPH C_9 - C_{12} Aliphatic	µg/m^3	220
TPH C_9 - C_{10} Aromatic	µg/m^3	100

Method ID	Methodology Summary
TO15	USEPA TO15 - Analysis of VOC's in air following USEPA TO15 protocols
AT-005	Measurement of Air-Phase Petroleum Hydrocarbons and Ozone Precursors by GC/MS

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Propylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	113%
Dichlorodifluoromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorotetrafluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,3-Butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromomethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethanol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Acrolein	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane (Freon 11)	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Isopropyl Alcohol	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2-Trichlorotrifluoroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Carbon Disulfide	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,2-dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MTBE	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1- Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Vinyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MEK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	110%
cis-1,2-Dichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethyl Acetate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chloroform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrahydrofuran	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,1-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	107%
Carbon tetrachloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Cyclohexane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	119%
Heptane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	101%
Trichloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichloropropane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dioxane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Bromodichloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Methacrylate	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
MIBK	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
cis-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
trans-1,3-Dichloropropene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	98%
1,1,2-Trichloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Methyl Butyl Ketone	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL TO15 in Canisters/Bags	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Dibromochloromethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dibromoethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	93%
m-& *p*-Xylene	ppbv	1	TO15	<1.0	[NT]	[NT]	LCS	94%
Styrene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	86%
o-Xylene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	94%
Bromoform	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,1,2,2-Tetrachloroethane	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
4-ethyl toluene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	90%
1,3,5-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	82%
1,2,4-Trimethylbenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	LCS	81%
1,3-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Benzyl chloride	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,4-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2-Dichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
1,2,4-Trichlorobenzene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Naphthalene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Hexachloro- 1,3-butadiene	ppbv	0.5	TO15	<0.5	[NT]	[NT]	[NR]	[NR]
Surrogate-Bromochloromethane	% rec		TO15	96	[NT]	[NT]	LCS	106%
Surrogate-1,4-Difluorobenzene	% rec		TO15	92	[NT]	[NT]	LCS	101%
Surrogate-Chlorobenzene-D5	% rec		TO15	102	[NT]	[NT]	LCS	97%

QUALITY CONTROL TPH in Air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date analysed	-			30/09/2011	[NT]	[NT]	LCS	30/09/2011
TPH C_5 - C_8 Aliphatic	µg/m^3	200	AT-005	<200	[NT]	[NT]	LCS	101%
TPH C_9 - C_{12} Aliphatic	µg/m^3	50	AT-005	<50	[NT]	[NT]	[NR]	[NR]
TPH C_9 - C_{10} Aromatic	µg/m^3	100	AT-005	<100	[NT]	[NT]	LCS	120%

Report Comments:

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

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

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

mgt LabMark ENVIRONMENTAL LABORATORIES

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NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600

Sample Receipt Advice

Company name: **GHD Pty Ltd NT**

Contact name: ANDREW KOHLRUSH
Client job number: DARWIN TURF CLUB 43/21851
COC number: Not provided
Turn around time: 5 Day
Date/Time received: Nov 3, 2011 9:06 AM
MGT lab reference: **317220**

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.

☑ Organic samples had Teflon liners.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Natalie Krasselt on Phone : (03) 9564 7055 or by e.mail: Natalie.Krasselt@mgtlabmark.com.au

Results will be delivered electronically via e.mail to ANDREW KOHLRUSH - andrew.kohlrush@ghd.com.

mgt Sample Receipt

mgt LabMark ENVIRONMENTAL LABORATORIES

Certificate of Analysis

GHD Pty Ltd NT
Level 5, 66 Smith Street
Darwin
Northern Territory 0800

Attention: Alex Koscielski

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Report	317220-S
Client Reference	DARWIN TURF CLUB 43/21851
Received Date	Nov 03, 2011

Client Sample ID			**SAND_0.0**	**MW3_3.0**	**MW4_1.0**
Sample Matrix			**Soil**	**Soil**	**Soil**
mgt-LabMark Sample No.			**M11-No01269**	**M11-No03889**	**M11-No03890**
Date Sampled			**Nov 01, 2011**	**Nov 12, 2011**	**Nov 12, 2011**
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	20	mg/kg	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	100	< 20	< 20
TRH C15-C28	50	mg/kg	6500	< 50	< 50
TRH C29-C36	50	mg/kg	7500	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	14000	< 50	< 50
BTEX					
Benzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Toluene	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Ethylbenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05
o-Xylene	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Total m+p-Xylenes	0.10	mg/kg	< 0.1	< 0.1	< 0.1
Xylenes(ortho.meta and para)	0.15	mg/kg	< 0.15	< 0.15	< 0.15
Fluorobenzene (surr.)	1	%	72	77	71
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *					
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N03]	20	mg/kg	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	250	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	250	< 50	< 50
TRH >C16-C34	100	mg/kg	13000	< 100	< 100
TRH >C34-C40	100	mg/kg	1400	< 100	< 100
Total Organic Carbon	50	mg/kg	-	830	1400
% Moisture	0.1	%	6.9	13	12
Heavy Metals					
Arsenic	2	mg/kg	9.2	27	39
Cadmium	0.4	mg/kg	< 0.4	1.3	1.1
Chromium	5	mg/kg	20	64	100
Copper	5	mg/kg	7.4	8.7	5.9
Lead	5	mg/kg	69	8.6	11
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5
Zinc	5	mg/kg	45	< 5	29

Sample History

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - MGT 100A	Melbourne	Nov 07, 2011	14 Day
BTEX - Method: USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons	Melbourne	Nov 07, 2011	14 Day
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * - Method: LM-LTM-ORG2010	Melbourne	Nov 07, 2011	14 Day
Total Organic Carbon - Method: APHA 5310B Total Organic Carbon	Melbourne	Nov 07, 2011	28 Day
% Moisture - Method: Method 102 - ANZECC - % Moisture	Melbourne	Nov 07, 2011	14 Day
Metals M8 - Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury	Melbourne	Nov 07, 2011	28 Day

mgt-LabMark Internal Quality Control Review

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. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis.
7. 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 Sample Receipt Acknowledgment

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.

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

UNITS

mg/kg:milligrams per Kilogram

mg/L:milligrams per litre

µg/L:micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%:Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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.
	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.
Batch Duplicate:	A second piece of analysis from a sample outside of the client's batch of samples but run within the laboratory batch of analysis.
Batch SPIKE:	Spike recovery reported on a sample from outside of the client's batch of samples but run within the laboratory batch of analysis.
USEPA:	U.S Environmental Protection Agency
APHA:	American Public Health Association
ASLP:	Australian Standard Leaching Procedure (AS4439.3)
TCLP:	Toxicity Characteristic Leaching Procedure
COC:	Chain Of Custody
SRA:	Sample Receipt Advice
CP:	Client Parent - QC was performed on samples pertaining to this report
NCP:	Non-Client Parent - QC was performed on samples not pertaining to this report, however QC is representative of the sequence or batch that client samples were analysed within

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 50-150% - Phenols 20-130%.

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, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene 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 Arochlor 1260 in Matrix Spikes and LCS's.
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 RPD's are calculated from raw analytical data thus it is possible to have two sets of data below the LOR with a positive RPD - eg: LOR 0.1, Result A = <0.1 (raw data is 0.02) & Result B = <0.1 (raw data is 0.03) resulting in a RPD of 40% calculated from the raw data.

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	mg/kg	< 0.05			0.05	Pass	
Toluene	mg/kg	< 0.05			0.05	Pass	
Ethylbenzene	mg/kg	< 0.05			0.05	Pass	
o-Xylene	mg/kg	< 0.05			0.05	Pass	
Total m+p-Xylenes	mg/kg	< 0.1			0.10	Pass	
Xylenes(ortho.meta and para)	mg/kg	< 0.15			0.15	Pass	
Method Blank							
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * LM-LTM-ORG2010							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH C6-C10 less BTEX (F1)	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Total Organic Carbon	mg/kg	< 50			50	Pass	
Method Blank							
Metals M8 USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
TRH C6-C9	%	80			70-130	Pass	
TRH C10-C14	%	97			70-130	Pass	
LCS - % Recovery							
BTEX USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	%	97			70-130	Pass	
Toluene	%	88			70-130	Pass	
Ethylbenzene	%	94			70-130	Pass	
Total m+p-Xylenes	%	85			70-130	Pass	
Xylenes(ortho.meta and para)	%	85			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * LM-LTM-ORG2010							
TRH >C10-C16	%	97			70-130	Pass	
LCS - % Recovery							
Metals M8 USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury							
Arsenic	%	95			80-120	Pass	
Cadmium	%	95			80-120	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium	%	100			80-120	Pass	
Copper	%	105			80-120	Pass	
Lead	%	99			80-120	Pass	
Mercury	%	107			75-125	Pass	
Nickel	%	99			80-120	Pass	
Zinc	%	98			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	M11-No02726	NCP	%	112			70-130	Pass	
TRH C10-C14	M11-Oc16678	NCP	%	77			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M11-No02726	NCP	%	83			70-130	Pass	
Toluene	M11-No02726	NCP	%	98			70-130	Pass	
Ethylbenzene	M11-No02726	NCP	%	87			70-130	Pass	
o-Xylene	M11-No02726	NCP	%	75			70-130	Pass	
Total m+p-Xylenes	M11-No02726	NCP	%	76			70-130	Pass	
Xylenes(ortho.meta and para)	M11-No02726	NCP	%	76			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *				Result 1					
TRH >C10-C16	M11-Oc16678	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Metals M8				Result 1					
Arsenic	M11-No01486	NCP	%	116			75-125	Pass	
Cadmium	M11-No01486	NCP	%	110			75-125	Pass	
Chromium	M11-No00698	NCP	%	96			75-125	Pass	
Copper	M11-No01486	NCP	%	115			75-125	Pass	
Lead	M11-No01486	NCP	%	91			75-125	Pass	
Mercury	M11-No01701	NCP	%	95			70-130	Pass	
Nickel	M11-No01486	NCP	%	87			75-125	Pass	
Zinc	M11-No00698	NCP	%	84			75-125	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M11-No02716	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M11-Oc16678	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M11-Oc16678	NCP	mg/kg	890	810	9	30%	Pass	
TRH C29-C36	M11-Oc16678	NCP	mg/kg	55	< 50	26	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M11-No02716	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toluene	M11-No02716	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Ethylbenzene	M11-No02716	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
o-Xylene	M11-No02716	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Total m+p-Xylenes	M11-No02716	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes(ortho.meta and para)	M11-No02716	NCP	mg/kg	< 0.15	< 0.15	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *				Result 1	Result 2	RPD			
Naphthalene	M11-No02716	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M11-No02716	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C6-C10 less BTEX (F1)	M11-No02716	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M11-Oc16678	NCP	mg/kg	83	78	7	30%	Pass	
TRH >C16-C34	M11-Oc16678	NCP	mg/kg	860	780	9	30%	Pass	
TRH >C34-C40	M11-Oc16678	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Metals M8				Result 1	Result 2	RPD			
Arsenic	M11-No01486	NCP	mg/kg	5.9	5.4	9	30%	Pass	
Cadmium	M11-No01486	NCP	mg/kg	0.50	0.60	3	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium	M11-No01486	NCP	mg/kg	42	42	2	30%	Pass	
Copper	M11-No01486	NCP	mg/kg	21	21	1	30%	Pass	
Lead	M11-No01486	NCP	mg/kg	13	13	<1	30%	Pass	
Mercury	M11-No01701	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M11-No01486	NCP	mg/kg	14	14	1	30%	Pass	
Zinc	M11-No01486	NCP	mg/kg	33	33	1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	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

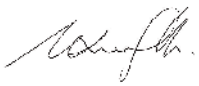
Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the "<C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap GCMS) analysis.
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be indentical. 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 haved passed all QAQC acceptance criteria, and are entirely technically valid.
N03	The method has been audited and technically assessed by NATA. NATA accreditation is pending.

Authorised By

Natalie Krasselt	Client Services

NATA Signatories:

Carroll Lee	Senior Analyst-Volatile (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)
Mary Makarios	Senior Analyst-Metal (VIC)
Orlando Scalzo	Senior Analyst-Organic (VIC)



Michael Wright
National Technical Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Uncertainty data is available on request

mgt LabMark ENVIRONMENTAL LABORATORIES

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Sample Receipt Advice

Company name: **GHD Pty Ltd NT**

Contact name: Alex Koscielski
Client job number: DARWIN TURF CLUB 43/21851
COC number: Not provided
Turn around time: 5 Day
Date/Time received: Oct 21, 2011 9:05 AM
MGT lab reference: **316007**

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.

☑ Organic samples had Teflon liners.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Natalie Krasselt on Phone : (03) 9564 7055 or by e.mail: Natalie.Krasselt@mgtlabmark.com.au

Results will be delivered electronically via e.mail to Alex Koscielski - alex.koscielski@ghd.com.

mgt Sample Receipt

mgt LabMark ENVIRONMENTAL LABORATORIES

Certificate of Analysis

GHD Pty Ltd NT
Level 5, 66 Smith Street
Darwin
Northern Territory 0800

Attention: Alex Koscielski

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Report 316007-W
Client Reference DARWIN TURF CLUB 43/21851
Received Date Oct 21, 2011

Client Sample ID			**MW1**	**MW3**	**MW4**	**MW5**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
mgt-LabMark Sample No.			**M11-Oc10639**	**M11-Oc10640**	**M11-Oc10641**	**M11-Oc10642**
Date Sampled			**Oct 19, 2011**	**Oct 19, 2011**	**Oct 19, 2011**	**Oct 19, 2011**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	0.10	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	0.6	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	0.8	< 0.1	< 0.1	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Total m+p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
Xylenes(ortho.meta and para)	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
Fluorobenzene (surr.)	1	%	81	92	84	84
Volatile Organics						
1.1-Dichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.1-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.1.1-Trichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.1.1.2-Tetrachloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.1.2-Trichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.1.2.2-Tetrachloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dibromoethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2-Dichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2.3-Trichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.2.4-Trimethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.3-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.3-Dichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.3.5-Trimethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
1.4-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
2-Butanone (MEK)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
2-Propanone (Acetone)	0.001	mg/L	0.003	< 0.001	< 0.001	< 0.001
4-Chlorotoluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
4-Methyl-2-pentanone (MIBK)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Allyl chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Bromobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Bromochloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Bromodichloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001

Client Sample ID			MW1	MW3	MW4	MW5
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10639	M11-Oc10640	M11-Oc10641	M11-Oc10642
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
Bromoform	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Bromomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Carbon disulfide	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Carbon Tetrachloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Chlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Chloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.002
Chloroform	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Chloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
cis-1.2-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
cis-1.3-Dichloropropene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dibromochloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dibromomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dichlorodifluoromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Iodomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Isopropyl benzene (Cumene)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Methylene Chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Styrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Tetrachloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
trans-1.2-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
trans-1.3-Dichloropropene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Trichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Trichlorofluoromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Vinyl chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
4-Bromofluorobenzene (surr.)	1	%	75	86	80	59
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *						
Naphthalene[N02]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N03]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16	0.05	mg/L	0.14	< 0.05	< 0.05	< 0.05
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	0.14	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	0.6	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Semivolatile Organics						
2-Methyl-4.6-dinitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	< 0.03
1-Chloronaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1-Naphthylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2.3-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2.3.4-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2.3.5-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2.4-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.2.4.5-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.3-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.3.5-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
1.4-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2-Chloronaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2-Chlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
2-Methylnaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2-Methylphenol (o-Cresol)	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
2-Naphthylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005

Client Sample ID			MW1	MW3	MW4	MW5
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10639	M11-Oc10640	M11-Oc10641	M11-Oc10642
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
2-Nitroaniline	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2-Nitrophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
2-Picoline	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2.3.4.6-Tetrachlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
2.4-Dichlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
2.4-Dimethylphenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
2.4-Dinitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	< 0.03
2.4-Dinitrotoluene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
2.4.5-Trichlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
2.4.6-Trichlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
2.6-Dichlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
2.6-Dinitrotoluene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
3&4-Methylphenol (m&p-Cresol)	0.006	mg/L	< 0.006	< 0.006	< 0.006	< 0.006
3-Methylcholanthrene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
3.3'-Dichlorobenzidine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4-Aminobiphenyl	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4-Bromophenyl phenyl ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4-Chloro-3-methylphenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
4-Chlorophenyl phenyl ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4-Nitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	< 0.03
4.4'-DDD	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4.4'-DDE	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
4.4'-DDT	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
7.12-Dimethylbenz(a)anthracene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
a-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Acenaphthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Acetophenone	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Aldrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Aniline	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
b-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Benz(a)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(b)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzyl chloride	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-chloroethoxy)methane	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-chloroisopropyl)ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Bis(2-ethylhexyl)phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Butyl benzyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Chrysene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
d-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Di-n-butyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Di-n-octyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dibenz(a.j)acridine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Dibenzofuran	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Dieldrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005

Client Sample ID			MW1	MW3	MW4	MW5
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10639	M11-Oc10640	M11-Oc10641	M11-Oc10642
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
Diethyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Dimethyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Dimethylaminoazobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Diphenylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan I	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan II	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endosulfan sulphate	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endrin aldehyde	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Endrin ketone	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Fluorene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
g-BHC (Lindane)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Heptachlor	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Heptachlor epoxide	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorobutadiene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Hexachlorocyclopentadiene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Hexachloroethane	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Methoxychlor	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
N-Nitrosodibutylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
N-Nitrosodipropylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
N-Nitrosopiperidine	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Naphthalene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Nitrobenzene	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Pentachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Pentachloronitrobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Pentachlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Phenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
Pronamide	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Trifluralin	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Phenol-d6 (surr.)	1	%	29	27	31	26
Nitrobenzene-d5 (surr.)	1	%	76	88	87	73
2-Fluorobiphenyl (surr.)	1	%	57	96	94	81
2.4.6-Tribromophenol (surr.)	1	%	70	118	107	99
Conductivity	10	uS/cm	300	490	14000	790
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.002	0.001	0.002	0.003
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	0.0003	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	0.002	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	0.026	0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	0.018	< 0.001
Zinc (filtered)	0.001	mg/L	0.038	0.005	0.052	0.007

Client Sample ID			MW6	MW7	QA1	TRIP BLANK
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10643	M11-Oc10644	M11-Oc10645	M11-Oc10646
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Total m+p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
Xylenes(ortho.meta and para)	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
Fluorobenzene (surr.)	1	%	92	78	90	95
Volatile Organics						
1.1-Dichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.1-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.1.1-Trichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.1.1.2-Tetrachloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.1.2-Trichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.1.2.2-Tetrachloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2-Dibromoethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2-Dichloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2-Dichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2.3-Trichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.2.4-Trimethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.3-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.3-Dichloropropane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.3.5-Trimethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
1.4-Dichlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
2-Butanone (MEK)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
2-Propanone (Acetone)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
4-Chlorotoluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
4-Methyl-2-pentanone (MIBK)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Allyl chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Bromobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Bromochloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Bromodichloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Bromoform	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Bromomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Carbon disulfide	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Carbon Tetrachloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Chlorobenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Chloroethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Chloroform	0.001	mg/L	0.002	0.004	< 0.001	-
Chloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
cis-1.2-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
cis-1.3-Dichloropropene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Dibromochloromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Dibromomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-

Client Sample ID			MW6	MW7	QA1	TRIP BLANK
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10643	M11-Oc10644	M11-Oc10645	M11-Oc10646
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
Dichlorodifluoromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Iodomethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Isopropyl benzene (Cumene)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Methylene Chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Styrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Tetrachloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
trans-1.2-Dichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
trans-1.3-Dichloropropene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Trichloroethene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Trichlorofluoromethane	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Vinyl chloride	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
4-Bromofluorobenzene (surr.)	1	%	82	61	85	-
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *						
Naphthalene[N02]	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH C6-C10 less BTEX (F1)[N03]	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
Semivolatile Organics						
2-Methyl-4.6-dinitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	-
1-Chloronaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1-Naphthylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2.3-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2.3.4-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2.3.5-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2.4-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.2.4.5-Tetrachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.3-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.3.5-Trichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
1.4-Dichlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2-Chloronaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2-Chlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2-Methylphenol (o-Cresol)	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
2-Naphthylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2-Nitroaniline	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
2-Picoline	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2.3.4.6-Tetrachlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
2.4-Dichlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
2.4-Dimethylphenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
2.4-Dinitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	-
2.4-Dinitrotoluene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
2.4.5-Trichlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
2.4.6-Trichlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
2.6-Dichlorophenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
2.6-Dinitrotoluene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
3&4-Methylphenol (m&p-Cresol)	0.006	mg/L	< 0.006	< 0.006	< 0.006	-

Client Sample ID			MW6	MW7	QA1	TRIP BLANK
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10643	M11-Oc10644	M11-Oc10645	M11-Oc10646
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
3-Methylcholanthrene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
3.3'-Dichlorobenzidine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4-Aminobiphenyl	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4-Chloro-3-methylphenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
4-Chlorophenyl phenyl ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4-Nitrophenol	0.03	mg/L	< 0.03	< 0.03	< 0.03	-
4.4'-DDD	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4.4'-DDE	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
4.4'-DDT	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
7.12-Dimethylbenz(a)anthracene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
a-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Acenaphthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Acenaphthylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Acetophenone	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Aldrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Aniline	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
b-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Benz(a)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Benzo(a)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Benzo(b)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Benzyl chloride	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethoxy)methane	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Bis(2-ethylhexyl)phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Butyl benzyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Chrysene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
d-BHC	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Di-n-butyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Di-n-octyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Dibenz(a.j)acridine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Dieldrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Diethyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Dimethyl phthalate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Dimethylaminoazobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Diphenylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endosulfan I	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endosulfan II	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endosulfan sulphate	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endrin	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endrin aldehyde	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Endrin ketone	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Fluorene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
g-BHC (Lindane)	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Heptachlor	0.005	mg/L	< 0.005	< 0.005	< 0.005	-

Client Sample ID			MW6	MW7	QA1	TRIP BLANK
Sample Matrix			Water	Water	Water	Water
mgt-LabMark Sample No.			M11-Oc10643	M11-Oc10644	M11-Oc10645	M11-Oc10646
Date Sampled			Oct 19, 2011	Oct 19, 2011	Oct 19, 2011	Oct 19, 2011
Test/Reference	LOR	Unit				
Heptachlor epoxide	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Hexachlorocyclopentadiene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Hexachloroethane	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Methoxychlor	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
N-Nitrosodibutylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
N-Nitrosodipropylamine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
N-Nitrosopiperidine	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Naphthalene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Nitrobenzene	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
Pentachlorobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Pentachloronitrobenzene	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Pentachlorophenol	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
Phenanthrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Phenol	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
Pronamide	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Trifluralin	0.005	mg/L	< 0.005	< 0.005	< 0.005	-
Phenol-d6 (surr.)	1	%	30	34	31	-
Nitrobenzene-d5 (surr.)	1	%	83	97	92	-
2-Fluorobiphenyl (surr.)	1	%	85	106	95	-
2.4.6-Tribromophenol (surr.)	1	%	96	105	101	-
Conductivity	10	uS/cm	350	650	470	-
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	0.002	0.001	-
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	-
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Lead (filtered)	0.001	mg/L	< 0.001	0.007	< 0.001	-
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	-
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Zinc (filtered)	0.001	mg/L	0.007	0.015	0.006	-

Sample History

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - MGT 100A	Melbourne	Oct 21, 2011	7 Day
BTEX - Method: USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons	Melbourne	Oct 21, 2011	14 Day
Volatile Organics - Method: USEPA 8260 - MGT 350A Volatile Organics by GCMS	Melbourne	Oct 21, 2011	14 Day
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * - Method: LM-LTM-ORG2010	Melbourne	Oct 21, 2011	7 Day
Semivolatile Organics - Method: USEPA 8270 Semivolatile Organics	Melbourne	Oct 21, 2011	7 Day
Conductivity - Method: APHA 2510 Conductivity by Direct Measurement	Melbourne	Oct 26, 2011	28 Day
Metals M8 filtered - Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury	Melbourne	Oct 24, 2011	28 Day

mgt LabMark ENVIRONMENTAL LABORATORIES

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Melbourne
3-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 9564 7055
NATA # 1261 & 1645
Site # 1254 & 14271

Sydney
Unit F6, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 8215 6222
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600

Company Name: GHD Pty Ltd NT
Address: Level 5, 66 Smith Street
Darwin
Northern Territory 0800

Order No.:
Report #: 316007
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Oct 21, 2011 9:05 AM
Due: Oct 28, 2011 4:00 PM
Priority: 5 Day
Contact name: Alex Koscielski

Client Job No.: DARWIN TURF CLUB 43/21851

mgt-LabMark Client Manager: Natalie Krasselt

Sample Detail					Conductivity	TRH C6-C9	BTEX	Semivolatile Organics	Volatile Organics	Metals M8 filtered	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted											
Melbourne Laboratory - NATA Site #1261					X	X	X	X	X	X	X
Sydney Laboratory - NATA Site #1645											
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
MW1	Oct 19, 2011		Water	M11-Oc10639	X		X	X	X	X	X
MW3	Oct 19, 2011		Water	M11-Oc10640	X		X	X	X	X	X
MW4	Oct 19, 2011		Water	M11-Oc10641	X		X	X	X	X	X
MW5	Oct 19, 2011		Water	M11-Oc10642	X		X	X	X	X	X
MW6	Oct 19, 2011		Water	M11-Oc10643	X		X	X	X	X	X
MW7	Oct 19, 2011		Water	M11-Oc10644	X		X	X	X	X	X
QA1	Oct 19, 2011		Water	M11-Oc10645	X		X	X	X	X	X
TRIP BLANK	Oct 19, 2011		Water	M11-Oc10646		X	X				

mgt-LabMark Internal Quality Control Review

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. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis.
7. 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 Sample Receipt Acknowledgment

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.

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

UNITS

mg/kg:milligrams per Kilogram

mg/L:milligrams per litre

µg/L:micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%:Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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.
	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.
Batch Duplicate:	A second piece of analysis from a sample outside of the client's batch of samples but run within the laboratory batch of analysis.
Batch SPIKE:	Spike recovery reported on a sample from outside of the client's batch of samples but run within the laboratory batch of analysis.
USEPA:	U.S Environmental Protection Agency
APHA:	American Public Health Association
ASLP:	Australian Standard Leaching Procedure (AS4439.3)
TCLP:	Toxicity Characteristic Leaching Procedure
COC:	Chain Of Custody
SRA:	Sample Receipt Advice
CP:	Client Parent - QC was performed on samples pertaining to this report
NCP:	Non-Client Parent - QC was performed on samples not pertaining to this report, however QC is representative of the sequence or batch that client samples were analysed within

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 50-150% - Phenols 20-130%.

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, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene 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 Arochlor 1260 in Matrix Spikes and LCS's.
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 RPD's are calculated from raw analytical data thus it is possible to have two sets of data below the LOR with a positive RPD - eg: LOR 0.1, Result A = <0.1 (raw data is 0.02) & Result B = <0.1 (raw data is 0.03) resulting in a RPD of 40% calculated from the raw data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
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 USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Total m+p-Xylenes	mg/L	< 0.002			0.002	Pass	
Xylenes(ortho.meta and para)	mg/L	< 0.003			0.003	Pass	
Method Blank							
Volatile Organics USEPA 8260 - MGT 350A Volatile Organics by GCMS							
1.1-Dichloroethane	mg/L	< 0.001			0.001	Pass	
1.1-Dichloroethene	mg/L	< 0.001			0.001	Pass	
1.1.1-Trichloroethane	mg/L	< 0.001			0.001	Pass	
1.1.1.2-Tetrachloroethane	mg/L	< 0.001			0.001	Pass	
1.1.2-Trichloroethane	mg/L	< 0.001			0.001	Pass	
1.1.2.2-Tetrachloroethane	mg/L	< 0.001			0.001	Pass	
1.2-Dibromoethane	mg/L	< 0.001			0.001	Pass	
1.2-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
1.2-Dichloroethane	mg/L	< 0.001			0.001	Pass	
1.2-Dichloropropane	mg/L	< 0.001			0.001	Pass	
1.2.3-Trichloropropane	mg/L	< 0.001			0.001	Pass	
1.2.4-Trimethylbenzene	mg/L	< 0.001			0.001	Pass	
1.3-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
1.3-Dichloropropane	mg/L	< 0.001			0.001	Pass	
1.3.5-Trimethylbenzene	mg/L	< 0.001			0.001	Pass	
1.4-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
2-Butanone (MEK)	mg/L	< 0.001			0.001	Pass	
2-Propanone (Acetone)	mg/L	< 0.001			0.001	Pass	
4-Chlorotoluene	mg/L	< 0.001			0.001	Pass	
4-Methyl-2-pentanone (MIBK)	mg/L	< 0.001			0.001	Pass	
Allyl chloride	mg/L	< 0.001			0.001	Pass	
Bromobenzene	mg/L	< 0.001			0.001	Pass	
Bromochloromethane	mg/L	< 0.001			0.001	Pass	
Bromodichloromethane	mg/L	< 0.001			0.001	Pass	
Bromoform	mg/L	< 0.001			0.001	Pass	
Bromomethane	mg/L	< 0.001			0.001	Pass	
Carbon disulfide	mg/L	< 0.001			0.001	Pass	
Carbon Tetrachloride	mg/L	< 0.001			0.001	Pass	
Chlorobenzene	mg/L	< 0.001			0.001	Pass	
Chloroethane	mg/L	< 0.001			0.001	Pass	
Chloroform	mg/L	< 0.001			0.001	Pass	
Chloromethane	mg/L	< 0.001			0.001	Pass	
cis-1.2-Dichloroethene	mg/L	< 0.001			0.001	Pass	
cis-1.3-Dichloropropene	mg/L	< 0.001			0.001	Pass	
Dibromochloromethane	mg/L	< 0.001			0.001	Pass	
Dibromomethane	mg/L	< 0.001			0.001	Pass	
Dichlorodifluoromethane	mg/L	< 0.001			0.001	Pass	
Iodomethane	mg/L	< 0.001			0.001	Pass	
Isopropyl benzene (Cumene)	mg/L	< 0.001			0.001	Pass	
Methylene Chloride	mg/L	< 0.001			0.001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Styrene	mg/L	< 0.001			0.001	Pass	
Tetrachloroethene	mg/L	< 0.001			0.001	Pass	
trans-1.2-Dichloroethene	mg/L	< 0.001			0.001	Pass	
trans-1.3-Dichloropropene	mg/L	< 0.001			0.001	Pass	
Trichloroethene	mg/L	< 0.001			0.001	Pass	
Trichlorofluoromethane	mg/L	< 0.001			0.001	Pass	
Vinyl chloride	mg/L	< 0.001			0.001	Pass	
Method Blank							
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * LM-LTM-ORG2010							
Naphthalene	mg/L	< 0.02			0.02	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH C6-C10 less BTEX (F1)	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							
Semivolatile Organics USEPA 8270 Semivolatile Organics							
2-Methyl-4.6-dinitrophenol	mg/L	< 0.03			0.03	Pass	
1-Chloronaphthalene	mg/L	< 0.005			0.005	Pass	
1-Naphthylamine	mg/L	< 0.005			0.005	Pass	
1.2-Dichlorobenzene	mg/L	< 0.005			0.005	Pass	
1.2.3-Trichlorobenzene	mg/L	< 0.005			0.005	Pass	
1.2.3.4-Tetrachlorobenzene	mg/L	< 0.005			0.005	Pass	
1.2.3.5-Tetrachlorobenzene	mg/L	< 0.005			0.005	Pass	
1.2.4-Trichlorobenzene	mg/L	< 0.005			0.005	Pass	
1.2.4.5-Tetrachlorobenzene	mg/L	< 0.005			0.005	Pass	
1.3-Dichlorobenzene	mg/L	< 0.005			0.005	Pass	
1.3.5-Trichlorobenzene	mg/L	< 0.005			0.005	Pass	
1.4-Dichlorobenzene	mg/L	< 0.005			0.005	Pass	
2-Chloronaphthalene	mg/L	< 0.005			0.005	Pass	
2-Chlorophenol	mg/L	< 0.003			0.003	Pass	
2-Methylnaphthalene	mg/L	< 0.005			0.005	Pass	
2-Methylphenol (o-Cresol)	mg/L	< 0.003			0.003	Pass	
2-Naphthylamine	mg/L	< 0.005			0.005	Pass	
2-Nitroaniline	mg/L	< 0.005			0.005	Pass	
2-Nitrophenol	mg/L	< 0.01			0.01	Pass	
2-Picoline	mg/L	< 0.005			0.005	Pass	
2.3.4.6-Tetrachlorophenol	mg/L	< 0.01			0.01	Pass	
2.4-Dichlorophenol	mg/L	< 0.003			0.003	Pass	
2.4-Dimethylphenol	mg/L	< 0.003			0.003	Pass	
2.4-Dinitrophenol	mg/L	< 0.03			0.03	Pass	
2.4-Dinitrotoluene	mg/L	< 0.005			0.005	Pass	
2.4.5-Trichlorophenol	mg/L	< 0.01			0.01	Pass	
2.4.6-Trichlorophenol	mg/L	< 0.01			0.01	Pass	
2.6-Dichlorophenol	mg/L	< 0.003			0.003	Pass	
2.6-Dinitrotoluene	mg/L	< 0.005			0.005	Pass	
3&4-Methylphenol (m&p-Cresol)	mg/L	< 0.006			0.006	Pass	
3-Methylcholanthrene	mg/L	< 0.005			0.005	Pass	
3.3'-Dichlorobenzidine	mg/L	< 0.005			0.005	Pass	
4-Aminobiphenyl	mg/L	< 0.005			0.005	Pass	
4-Bromophenyl phenyl ether	mg/L	< 0.005			0.005	Pass	
4-Chloro-3-methylphenol	mg/L	< 0.01			0.01	Pass	
4-Chlorophenyl phenyl ether	mg/L	< 0.005			0.005	Pass	
4-Nitrophenol	mg/L	< 0.03			0.03	Pass	
4.4'-DDD	mg/L	< 0.005			0.005	Pass	
4.4'-DDE	mg/L	< 0.005			0.005	Pass	
4.4'-DDT	mg/L	< 0.005			0.005	Pass	
7.12-Dimethylbenz(a)anthracene	mg/L	< 0.005			0.005	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
a-BHC	mg/L	< 0.005			0.005	Pass	
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Acetophenone	mg/L	< 0.005			0.005	Pass	
Aldrin	mg/L	< 0.005			0.005	Pass	
Aniline	mg/L	< 0.005			0.005	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
b-BHC	mg/L	< 0.005			0.005	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzyl chloride	mg/L	< 0.005			0.005	Pass	
Bis(2-chloroethoxy)methane	mg/L	< 0.005			0.005	Pass	
Bis(2-chloroisopropyl)ether	mg/L	< 0.005			0.005	Pass	
Bis(2-ethylhexyl)phthalate	mg/L	< 0.005			0.005	Pass	
Butyl benzyl phthalate	mg/L	< 0.005			0.005	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
d-BHC	mg/L	< 0.005			0.005	Pass	
Di-n-butyl phthalate	mg/L	< 0.005			0.005	Pass	
Di-n-octyl phthalate	mg/L	< 0.005			0.005	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.j)acridine	mg/L	< 0.005			0.005	Pass	
Dibenzofuran	mg/L	< 0.005			0.005	Pass	
Dieldrin	mg/L	< 0.005			0.005	Pass	
Diethyl phthalate	mg/L	< 0.005			0.005	Pass	
Dimethyl phthalate	mg/L	< 0.005			0.005	Pass	
Dimethylaminoazobenzene	mg/L	< 0.005			0.005	Pass	
Diphenylamine	mg/L	< 0.005			0.005	Pass	
Endosulfan I	mg/L	< 0.005			0.005	Pass	
Endosulfan II	mg/L	< 0.005			0.005	Pass	
Endosulfan sulphate	mg/L	< 0.005			0.005	Pass	
Endrin	mg/L	< 0.005			0.005	Pass	
Endrin aldehyde	mg/L	< 0.005			0.005	Pass	
Endrin ketone	mg/L	< 0.005			0.005	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
g-BHC (Lindane)	mg/L	< 0.005			0.005	Pass	
Heptachlor	mg/L	< 0.005			0.005	Pass	
Heptachlor epoxide	mg/L	< 0.005			0.005	Pass	
Hexachlorobenzene	mg/L	< 0.005			0.005	Pass	
Hexachlorobutadiene	mg/L	< 0.005			0.005	Pass	
Hexachlorocyclopentadiene	mg/L	< 0.005			0.005	Pass	
Hexachloroethane	mg/L	< 0.005			0.005	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Methoxychlor	mg/L	< 0.005			0.005	Pass	
N-Nitrosodibutylamine	mg/L	< 0.005			0.005	Pass	
N-Nitrosodipropylamine	mg/L	< 0.005			0.005	Pass	
N-Nitrosopiperidine	mg/L	< 0.005			0.005	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Nitrobenzene	mg/L	< 0.05			0.05	Pass	
Pentachlorobenzene	mg/L	< 0.005			0.005	Pass	
Pentachloronitrobenzene	mg/L	< 0.005			0.005	Pass	
Pentachlorophenol	mg/L	< 0.01			0.01	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Phenol	mg/L	< 0.003			0.003	Pass	
Pronamide	mg/L	< 0.005			0.005	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Trifluralin	mg/L	< 0.005			0.005	Pass	
Method Blank							
Metals M8 filtered USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury							
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	< 0.001			0.001	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions TRH C6-C36 - MGT 100A							
TRH C6-C9	%	80			70-130	Pass	
TRH C10-C14	%	71			70-130	Pass	
LCS - % Recovery							
BTEX USEPA 8260 - MGT 350A Monocyclic Aromatic Hydrocarbons							
Benzene	%	80			70-130	Pass	
Toluene	%	88			70-130	Pass	
Ethylbenzene	%	83			70-130	Pass	
Total m+p-Xylenes	%	96			70-130	Pass	
Xylenes(ortho.meta and para)	%	90			70-130	Pass	
LCS - % Recovery							
Volatile Organics USEPA 8260 - MGT 350A Volatile Organics by GCMS							
1.1-Dichloroethene	%	76			70-130	Pass	
1.1.1-Trichloroethane	%	78			70-130	Pass	
1.2-Dichloroethane	%	92			70-130	Pass	
Carbon Tetrachloride	%	88			70-130	Pass	
Trichloroethene	%	77			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions * LM-LTM-ORG2010							
TRH C6-C10	%	80			70-130	Pass	
TRH >C10-C16	%	70			70-130	Pass	
LCS - % Recovery							
Semivolatile Organics USEPA 8270 Semivolatile Organics							
1.2.4-Trichlorobenzene	%	76			70-130	Pass	
2-Chlorophenol	%	85			30-130	Pass	
4-Chloro-3-methylphenol	%	76			30-130	Pass	
4-Nitrophenol	%	32			30-130	Pass	
Acenaphthene	%	92			70-130	Pass	
Pentachlorophenol	%	57			30-130	Pass	
Phenol	%	31			30-130	Pass	
Pyrene	%	70			70-130	Pass	
LCS - % Recovery							
Metals M8 filtered USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury							
Arsenic (filtered)	%	100			80-120	Pass	
Cadmium (filtered)	%	101			80-120	Pass	
Chromium (filtered)	%	86			80-120	Pass	
Copper (filtered)	%	91			80-120	Pass	
Lead (filtered)	%	96			80-120	Pass	
Mercury (filtered)	%	108			70-130	Pass	
Nickel (filtered)	%	87			80-120	Pass	
Zinc (filtered)	%	103			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	M11-Oc10585	NCP	%	75			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M11-Oc10585	NCP	%	82			70-130	Pass	
Toluene	M11-Oc10585	NCP	%	78			70-130	Pass	
Ethylbenzene	M11-Oc10585	NCP	%	80			70-130	Pass	
o-Xylene	M11-Oc10585	NCP	%	76			70-130	Pass	
Total m+p-Xylenes	M11-Oc10585	NCP	%	92			70-130	Pass	
Xylenes(ortho.meta and para)	M11-Oc10585	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Volatile Organics				Result 1					
1.1-Dichloroethene	M11-Oc10585	NCP	%	75			70-130	Pass	
1.1.1-Trichloroethane	M11-Oc10585	NCP	%	80			70-130	Pass	
1.2-Dichlorobenzene	M11-Oc10585	NCP	%	97			70-130	Pass	
1.2-Dichloroethane	M11-Oc10585	NCP	%	85			70-130	Pass	
Carbon Tetrachloride	M11-Oc10585	NCP	%	95			70-130	Pass	
Trichloroethene	M11-Oc10585	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *				Result 1					
TRH C6-C10	M11-Oc10585	NCP	%	75			70-130	Pass	
Spike - % Recovery									
Metals M8 filtered				Result 1					
Arsenic (filtered)	M11-Oc10639	CP	%	97			75-125	Pass	
Cadmium (filtered)	M11-Oc10639	CP	%	100			75-125	Pass	
Chromium (filtered)	M11-Oc10639	CP	%	75			75-125	Pass	
Copper (filtered)	M11-Oc10639	CP	%	83			75-125	Pass	
Lead (filtered)	M11-Oc10639	CP	%	90			75-125	Pass	
Mercury (filtered)	M11-Oc10639	CP	%	106			70-130	Pass	
Nickel (filtered)	M11-Oc10639	CP	%	77			75-125	Pass	
Zinc (filtered)	M11-Oc10639	CP	%	86			75-125	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M11-Oc10640	CP	%	73			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *				Result 1					
TRH >C10-C16	M11-Oc10640	CP	%	72			70-130	Pass	
Spike - % Recovery									
Semivolatile Organics				Result 1					
1.2.4-Trichlorobenzene	M11-Oc10641	CP	%	76			70-130	Pass	
1.4-Dichlorobenzene	M11-Oc10641	CP	%	70			70-130	Pass	
2-Chlorophenol	M11-Oc10641	CP	%	77			30-130	Pass	
2.4-Dinitrotoluene	M11-Oc10641	CP	%	72			70-130	Pass	
4-Chloro-3-methylphenol	M11-Oc10641	CP	%	84			30-130	Pass	
4-Nitrophenol	M11-Oc10641	CP	%	32			30-130	Pass	
Acenaphthene	M11-Oc10641	CP	%	78			70-130	Pass	
N-Nitrosodipropylamine	M11-Oc10641	CP	%	75			70-130	Pass	
Pentachlorophenol	M11-Oc10641	CP	%	109			30-130	Pass	
Phenol	M11-Oc10641	CP	%	34			30-130	Pass	
Pyrene	M11-Oc10641	CP	%	89			70-130	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M11-Oc10584	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	M11-Oc10639	CP	mg/L	0.10	0.12	15	30%	Pass	
TRH C15-C28	M11-Oc10639	CP	mg/L	0.6	0.7	19	30%	Pass	
TRH C29-C36	M11-Oc10639	CP	mg/L	0.1	0.2	31	30%	Fail	Q15
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Toluene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
o-Xylene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Total m+p-Xylenes	M11-Oc10584	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Xylenes(ortho.meta and para)	M11-Oc10584	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1-Dichloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1-Dichloroethene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.1-Trichloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.1.2-Tetrachloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.2-Trichloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.2.2-Tetrachloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dibromoethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichlorobenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichloropropane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2.3-Trichloropropane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2.4-Trimethylbenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3-Dichlorobenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3-Dichloropropane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3.5-Trimethylbenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.4-Dichlorobenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
2-Butanone (MEK)	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
2-Propanone (Acetone)	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
4-Chlorotoluene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
4-Methyl-2-pentanone (MIBK)	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Allyl chloride	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromobenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromochloromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromodichloromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromoform	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromomethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Carbon disulfide	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Carbon Tetrachloride	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chlorobenzene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chloroethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chloroform	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chloromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
cis-1.2-Dichloroethene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
cis-1.3-Dichloropropene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibromochloromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibromomethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dichlorodifluoromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iodomethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Isopropyl benzene (Cumene)	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Methylene Chloride	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Styrene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Tetrachloroethene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
trans-1.2-Dichloroethene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
trans-1.3-Dichloropropene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Trichloroethene	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Trichlorofluoromethane	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Vinyl chloride	M11-Oc10584	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - Draft 2010 NEPM Fractions *				Result 1	Result 2	RPD			
Naphthalene	M11-Oc10584	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C6-C10	M11-Oc10584	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C6-C10 less BTEX (F1)	M11-Oc10584	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH >C10-C16	M11-Oc10639	CP	mg/L	0.14	0.16	17	30%	Pass	
TRH >C16-C34	M11-Oc10639	CP	mg/L	0.6	0.7	22	30%	Pass	
TRH >C34-C40	M11-Oc10639	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Semivolatile Organics				Result 1	Result 2	RPD			
2-Methyl-4.6-dinitrophenol	M11-Oc10639	CP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
1-Chloronaphthalene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1-Naphthylamine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2-Dichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2.3-Trichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2.3.4-Tetrachlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2.3.5-Tetrachlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2.4-Trichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.2.4.5-Tetrachlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.3-Dichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.3.5-Trichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
1.4-Dichlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Chloronaphthalene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Chlorophenol	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2-Methylnaphthalene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Methylphenol (o-Cresol)	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2-Naphthylamine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Nitroaniline	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Nitrophenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2-Picoline	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2.3.4.6-Tetrachlorophenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.4-Dichlorophenol	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.4-Dimethylphenol	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.4-Dinitrophenol	M11-Oc10639	CP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
2.4-Dinitrotoluene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2.4.5-Trichlorophenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.4.6-Trichlorophenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.6-Dichlorophenol	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.6-Dinitrotoluene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
3&4-Methylphenol (m&p-Cresol)	M11-Oc10639	CP	mg/L	< 0.006	< 0.006	<1	30%	Pass	
3-Methylcholanthrene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
3.3'-Dichlorobenzidine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4-Aminobiphenyl	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4-Bromophenyl phenyl ether	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4-Chloro-3-methylphenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
4-Chlorophenyl phenyl ether	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4-Nitrophenol	M11-Oc10639	CP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
4.4'-DDD	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4.4'-DDE	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4.4'-DDT	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
7.12-Dimethylbenz(a)anthracene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
a-BHC	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Acenaphthene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acetophenone	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aldrin	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aniline	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Anthracene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
b-BHC	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Benz(a)anthracene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b)fluoranthene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzyl chloride	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Bis(2-chloroethoxy)methane	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Bis(2-chloroisopropyl)ether	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Bis(2-ethylhexyl)phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Butyl benzyl phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Chrysene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
d-BHC	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Di-n-butyl phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Di-n-octyl phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Dibenz(a.h)anthracene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.j)acridine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Dibenzofuran	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Dieldrin	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Diethyl phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Dimethyl phthalate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Dimethylaminoazobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Diphenylamine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endosulfan I	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endosulfan II	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endosulfan sulphate	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endrin	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endrin aldehyde	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Endrin ketone	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Fluoranthene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
g-BHC (Lindane)	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Heptachlor	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Heptachlor epoxide	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Hexachlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Hexachlorobutadiene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Hexachlorocyclopentadiene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Hexachloroethane	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Methoxychlor	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
N-Nitrosodibutylamine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
N-Nitrosodipropylamine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
N-Nitrosopiperidine	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Naphthalene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Nitrobenzene	M11-Oc10639	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Pentachlorobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Pentachloronitrobenzene	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Pentachlorophenol	M11-Oc10639	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Phenanthrene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenol	M11-Oc10639	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Pronamide	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Pyrene	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Trifluralin	M11-Oc10639	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Metals M8 filtered				Result 1	Result 2	RPD			
Arsenic (filtered)	M11-Oc10639	CP	mg/L	0.002	0.002	<1	30%	Pass	
Cadmium (filtered)	M11-Oc10639	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	M11-Oc10639	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	M11-Oc10639	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	M11-Oc10639	CP	mg/L	0.038	0.037	2	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Conductivity	M11-Oc10643	CP	uS/cm	350	350	1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	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

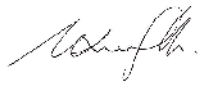
Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the "<C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap GCMS) analysis.
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be indentical. 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 haved passed all QAQC acceptance criteria, and are entirely technically valid.
N03	The method has been audited and technically assessed by NATA. NATA accreditation is pending.
Q15	The RPD reported passes mgt-LabMark's Acceptance Criteria as stipulated in SOP 05. Refer to Glossary Page of this report for further details

Authorised By

Natalie Krasselt	Client Services

NATA Signatories:

Carroll Lee	Senior Analyst-Volatile (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)
Mary Makarios	Senior Analyst-Metal (VIC)
Orlando Scalzo	Senior Analyst-Organic (VIC)



Michael Wright

National Technical Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Uncertainty data is available on request

Appendix G

NRETAS Reporting Guidelines

Northern Territory Government

DEPARTMENT OF
NATURAL RESOURCES, ENVIRONMENT, THE ARTS AND SPORT

WORKING

Guidelines for Consultants Reporting on Environmental Issues

In the Northern Territory of Australia July 2010

Date of Issue	Document ID	Amendments Made	Endorsed	Signature/Date
Version 1	EOGD-001-01	New document	Michael Wells A/Director Environment and Heritage	29/9/10

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File Reference: EN2010/0036
Last Reviewed: 29 September 2010

Preface

These guidelines have been largely adopted from the NSW Environment Protection Authority (EPA) *Guidelines for Consultants Reporting on Contaminated Sites* September 2000. The purpose of these guidelines is to assist consultants, site auditors, council and shire staff, along with other interested parties, in reporting on investigations, monitoring and remediation of land and water on licensed activities and contaminated sites.

NRETAS will periodically review and update these guidance notes where necessary, and any comments are more than welcome.

Inquiries or comments can be directed to:

Environmental Operations
Environment, Heritage and Arts Division
Department of Natural Resources, Environment, The Arts and Sport
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Limitations

These notes apply only to consultants reporting on the investigations, monitoring and remediation of land and water on licensed activities and contaminated sites. Note however that they do not provide detailed guidance on contaminated site assessment and management.

Disclaimer

The Department of Natural Resources, Environment, The Arts and Sport (NRETAS) has prepared this document in good faith, exercising all due care and attention, but no representation or warranty, express or implied, is made as to the relevance, completeness or fitness for purpose of this document in respect of any particular user' s circumstances. Users of this document should satisfy themselves concerning its application to their situation and, where necessary, seek expert advice.

Contents

1. INTRODUCTION

The purpose of these guidelines is to ensure that reports prepared by consultants on the investigation, monitoring and remediation of land and water contain sufficient and appropriate information to enable efficient review by regulators, Site Auditors and other interested parties to assist in appropriate regulatory decisions. .

Other reporting requirements may apply in certain cases. For sites subject to planning processes such as rezoning application, development application and/or building approval, the Department of Lands and Planning should be consulted.

2. INVESTIGATION STAGES

Key aspects of any report on the investigation, monitoring and remediation of licensed activities and contaminated sites can be broadly classified into the following stages:

- preliminary site investigation
- detailed site investigation
- remedial action
- validation and
- monitoring.

Consultants' reports normally address these stages. Reports may be presented separately or combined in various ways. However, each report must stand alone, and contain sufficient information to be readily understood. Where relevant information has been included in previous reports, that are readily available and easily accessible, a summary of that information should suffice in subsequent reports.

The reporting requirements of each stage are discussed in the following sections and a checklist summary is included in Section 3.

2.1. Preliminary site investigation

The preliminary site investigation report should:

- provide a detailed site history and needs to identify all past and present potential polluting activities
- identify potential pollutant types
- discuss the activity and/or site condition and provide a site capability statement
- provide a preliminary assessment of the impacts of the pollutant on the receiving environment
- provide a conceptual hydrogeological model; and
- assess the need for further investigations.
-

An appraisal of the site history is fundamental to the assessment and may be used to assess potential polluting activities and assist in developing a way forward. It is

important to review and assess all relevant information about the site, including information obtained during a site inspection.

2.2. Detailed site investigation

The detailed site investigation report should give comprehensive information on:

- issues raised in the preliminary investigation
- the type, extent and level of pollutant

and assess:

- pollutant dispersal in surface water, groundwater, sediment and soil. An assessment of pollutant dispersal in dust and air may also be required in some assessments
- the potential effects of pollutants on public health, the environment and building structures
- off-site impacts on soil, waters, sediment and biota
- the adequacy and completeness of all information available to be used in making decisions on further investigation, remediation and monitoring.

Where it is preferred that site-specific clean-up levels be developed by applying risk assessment methods, the consultant **must contact NRETAS** to discuss appropriate procedures.

If the results of the detailed site investigation indicate that pollutants on a licensed activity or contaminated site poses unacceptable risks to the environment and or human health then a remedial action plan needs to be prepared and implemented.

2.3. Remedial action plan (RAP)

The RAP should:

- set remediation goals that ensure the area of the activity or contaminated site will be suitable for the proposed use and will pose no unacceptable risk to human health or to the environment
- document in detail all procedures and plans to be implemented to reduce risks to acceptable levels for the proposed site use

- establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner
- identify and include proof of the necessary approvals and licences required by regulatory authorities.

Once remedial work is complete, a report should be prepared detailing the site work conducted and regulatory decisions made.

2.4. Validation

If detailed information has been included in a previous report a summary of previous investigations and monitoring may be adequate. However, when reporting on a licensed activity it is reiterated that all reports must stand alone and must contain sufficient information to allow decision making. This means that a summary is not always sufficient.

Where remedial action has been carried out, the site must be 'validated' to ensure that the objectives stated in the RAP have been achieved. A report detailing the results of the site validation is required.

The extent of validation required will depend on:

- the degree of pollutant originally present
- the type of remediation processes that have been carried out
- the proposed land use.

Validation must confirm statistically that the remediated site complies with the clean-up criteria set for the site. For guidance, see the NSW EPA's *Contaminated Sites Sampling Design Guidelines*. Where applicable, the US EPA's *Methods for Evaluating the Attainment of Cleanup Standards* (1989) can also be used.

The validation report must assess the results of the post-remediation testing against the clean-up criteria stated in the RAP. Where targets have not been achieved, reasons must be stated and additional site work proposed to achieve the original RAP objectives.

The validation report should also include information confirming that all NRETAS and other regulatory authorities' licence conditions and approvals have been met. In

particular, documentary evidence is needed to confirm that any disposal of soil off-site is done in accordance with the RAP.

2.5. Monitoring

Where a monitoring program is needed, the monitoring report should detail the proposed monitoring strategy, parameters to be monitored, monitoring locations, frequency of monitoring, and reporting requirements. The monitoring report must include sufficient information on the location of the site, site history and surrounding environment (including geology and hydrogeology) field and laboratory sampling and analysis plans, quality control and assurance to enable robust regulatory decision making. It is reiterated that all reports must stand alone and must contain sufficient information to allow decision making. This means that a summary is not always sufficient and will not be marked by the letter S in the tables following.

3. REPORTING REQUIREMENTS

The following checklist has been prepared to help achieve a uniform approach to reporting on licensed activities and contaminated sites and ensure that environmental issues have been addressed to the satisfaction of NRETAS.

Where a consultant chooses to deviate from the requirements in this checklist, clear reasons should be given and any significant deviations listed.

3.1. How to use the checklist

Use the checklist on the following pages in conjunction with the objectives stated in the investigation stages (2.1-2.5).

The first column lists report headings to be included and subjects to be covered under each heading. The other columns refer to the principal reporting stages of contaminated site studies:

- preliminary site investigation report
- detailed site investigation report
- remedial action plan
- validation; and
- monitoring.

A tick in these columns indicates that the corresponding heading should be included in the report.

'(S)' denotes that a summary may be adequate if detailed information has been included in a previous report.

'(N)' denotes that the section should be included only if no further site investigation is to be undertaken.

'N/A' denotes that the report heading is not applicable and may be omitted provided that those aspects have been addressed elsewhere or justification provided for the omission

3.2. Checklist

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Executive Summary	☑	☑	☑	☑	☑
o Background o Objectives of investigation o Scope of work o Summary of sampling results in tabulated format containing minimum, maximum, arithmetic average and 95% upper confidence limit on arithmetic average for each analyte (**where appropriate**) o Summary of conclusions and recommendations.					
Scope of Work	☑	☑	☑	☑	☑
o A clear statement of the scope of work					
Site Identification	☑	☑	☑	☑	☑
o Property name, street number, street name and suburb o Land title details e.g Mine lease northern references, Lot number, Land Titles Office plans, Tenure type Parcel and Unit references o Geographic coordinates related to a nearby cadastral corner of a recognised reference mark o Locality map o Current site plan with scale bar, showing north, local water drainage and other local environmentally significant features.					

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Site History	☑	☑ (S)	☑ (S)	☑ (S)	☑
o Zoning – previous, present and proposed o Land use – previous, present and proposed o Summary of rezoning, relevant development and building approval records o Chronological list of site uses, indicating information gaps and unoccupied periods o Review of aerial photographs o Site photographs (with date and location indicated on site maps) o Inventory of chemicals and wastes associated with site use and their on—site storage location o Possible pollutant sources and potential off-site effects o Site layout plans showing present and past industrial processes o Sewer and service plans o Description of manufacturing processes o Details and locations of current and former underground and aboveground storage tanks o Product spill and loss history o Discharges to land, water and air o Disposal locations o Relevant complaint history o Local site knowledge of residents and staff – both present and former o Summary of local literature about the site, including newspaper articles; o Details of buildings and related permits, licenses, approvals and trade waste agreements o Historical use of adjacent land o Local usage of ground/surface waters, and location of bores/pumps o Integrity assessment (assessment of the accuracy of information).					

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Site Condition and Surrounding Environment	☑	☑ (S)	☑ (S)	☑ (S)	☑
o Topography o Condition at site boundary such as type and condition of fencing, soil stability and erosion o Visible signs of pollution such as discolouration or staining of soil, bare soil patches – both on-site, and off-site adjacent to site boundary o Visible signs of plant stress o Presence of drums, wastes and fill materials o Odours o Condition of buildings and roads o Quality of surface water o Flood potential o Details of any relevant local sensitive environments eg. Rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna.					
Geology and Hydrogeology	Include readily available information	☑	☑ (S)	☑ (S)	☑
o Soil stratigraphy using recognised classification methods eg. Australian Standard 1726, Unified Soil Classification Table o Location and extent of imported and locally derived soil o Site borehole logs or test pit logs showing stratigraphy o Detailed description of the location, design and construction of on-site wells o Description and location of springs and wells in the vicinity o Depth to groundwater table o Direction and rate of groundwater flow o Direction of surface water run-off o Background water quality o Preferential water courses o Summary of local meteorology. o Assessment on storm surge impacts from inundation and wave motion.					

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Sampling and Analysis Plan and Sampling Methodology	Include readily available information	☑	N/A	☑	☑
o Sampling, analysis and data quality objectives (DQOs) o Rationale for the selection of: o Sampling pattern o Sampling density including an estimated size of the residual hot spots that may remain undetected o Sampling location including locations shown on a site map o Sampling depths o Samples for analysis and samples not analysed o Analytical methods o Analytes for samples o Detailed description of the sampling methods including: o Sample containers and type of seal used o Sampling devices and equipment eg. Auger type o Equipment decontamination procedures o Sample handling procedures o Sample preservation methods and reference to recognised protocols eg. APHA or US EPA SW 846 o Detailed description of field screening protocols.					
Field Quality Assurance and Quality Control (QA/QC)	☑ (N)	☑	N/A	☑	☑
o Details of sampling team o Decontamination procedures carried out between sampling events.					

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Field Quality Assurance and Quality Control (QA/QC) (continued)	☑ (N)	☑	N/A	☑	☑
o Logs for each sample collected – including time, location, initials of sampler, duplicate locations, duplicate type, chemical analyses to be performed, site observations and weather conditions o Chain of custody fully identifying, for each sample, the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method, departure time from the site and dispatch courier(s) o Sample splitting techniques o Statement of duplicate frequency o Field blank results o Background sample results o Rinsate sample results o Laboratory prepared trip spike results for volatile analytes o Trip blank results o Field instrument calibrations (when used).					
Laboratory QA/QC	☑ (N)	☑	N/A	☑	☑
o A copy of signed chain of custody forms acknowledging receipt date and time, and identity of samples included in shipments o Record of holding times and a comparison with method specifications o Analytical methods used o Laboratory accreditation for analytical methods used					

- Laboratory performance in inter-laboratory trials for the analytical methods used, where available
- Description of surrogates and spikes used
- Per cent recoveries of spike and surrogates
- Instrument detection limit;

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Laboratory QA/QC (continued)	☑ (N)	☑	N/A	☑	☑
- Method detection limits - Matrix or practical quantification limits - Standard solution results - Reference sample results - Reference check sample results - Daily check sample results - Laboratory duplicate results - Laboratory blank results - Laboratory standards charts.					
QA/QC Data Evaluation	☑ (N)	☑	N/A	☑	☑

- Evaluation of al QA/QC information listed above against the state DQOs, including a discussion of:
  - Documentation completeness
  - Data completeness
  - Data compatibility (see next point)
  - Data representativeness
  - Precision and accuracy for both sampling and analysis for each analyte in each environmental matrix informing data users of the reliability, unreliability, or qualitative value of the data
- Data comparability checks, which should include e.g. Bias assessment which may arise from various sources, including:
  - Collection and analysis of samples by different personnel					

- Use of different methodologies
- Collection and analysis by the same personnel using the same methods but at different times
- Spatial and temporal changes (because of the environmental dynamics)
- Relative per cent difference for intra and inter laboratory duplicates.

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Basis for assessment criteria	☑	☑	☑	☑	☑
o Table listings for all selected assessment criteria and references o Rational for and appropriateness of the selection criteria o Assumptions, uncertainties and limitations of criteria.					
Results	☑	☑	☑	☑	☑

o Summary of all results for all **environmental media** (surface waters, groundwaters, sediments, soil and air) in a table that :
  o shows all essential details such as sample numbers, sampling features (e.g. depth, points);
  o shows assessment criteria
  o highlights all results exceeding the assessment criteria.
o Site plan showing all sample locations, sample identification numbers and sampling features (e.g. depths in soil and sediment; extent in groundwater plumes);
o Site plan showing the extent of pollutant exceeding selected assessment criteria all media (with consideration of the sampling features e.g. depth in soil and sediment, extent of groundwater plumes).					

Pollutant Characterisation	☑	☑	☑	☑	☑

- Assessment of type and of all environmental pollutants in all media
- Assessment of extent of all pollutants include off-site extent
- Assessment of chemical degradation products
- Assessment of possible exposure routes and exposed populations (human and ecological).

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Remedial Action Plan (RAP)	N/A	N/A	☑	☑ S	☑

- Remediation gaols
- Discussion of extent of remedial action required
- Discussion of relevant possible remedial options and how risks can be reduced
- Rational for the selection of recommended remedial options
- Proposed testing to validate the site after remedial actions undertaken
- Contingency plans if the selected remedial strategy fails
- Interim site management plans (prior to commencing remedial actions) including e.g. fencing, warning signs, stormwater diversions and management
- Site management plans (operational phase)
    - Site stormwater management plans
    - Soil management plans
    - Noise control plans
    - Dust control plans
    - Odour control plans
    - Leachate control
    - Occupational health and safety plans
- Remedial action schedule

- Hours of operation
- Contingency plans to responds to site incidents to mitigate potential effects on surrounding environment and community
- Identification of regulatory compliance requirements such as licences and approvals
- Names and phone numbers of appropriate personnel to contracting remediation
- Community relations plans where applicable
- Staged progress reporting where appropriate
- Long terms site management plans.

Report Sections and Information to be Included	Preliminary Site Investigation	Detailed Site Investigation	RAP	Validation	Monitoring
Validation	N/A	N/A	N/A	☑	☑

o Rational and justification for the validation strategy including:
  o Clean up criteria and statistically based decision- making methodology
  o Validation sampling and analysis plan
o Details of statistical analysis of validation results and evaluation against the clean-up criteria
o Verification of compliance with regulatory requirements set by e.g. NRETAS Worksafe, Department of Health and Families (Environmental Health Branch), Department of Land and Planning and local and Shire Councils.					

Monitoring	☑ S	☑S	☑S	☑	☑
o Monitoring requirements, including monitoring parameters and frequency o Results of monitoring analyses including all relevant QA/QC reporting requirements stated in previous sections o Ongoing site/equipments maintenance e.g. containment cap integrity maintenance, leachate control o Details of parties responsible for maintenance and monitoring programmes.					
Conclusions and recommendations	☑	☑	☑	☑	☑
o Brief summary of findings					

- Assumptions used in reaching the conclusion
- Extent of uncertainties in the results
- Where remedial action has been taken a list summarising the actions and physical changes to the site
- Where relevant a clear statement that the consultant considers that there is a potential for off site migration and the main issues that need to be considered to address the off-site issues
- Where relevant a clear statement from the consultant that the subject site is suitable for the proposed use
- A statement detailing all the limitations and constraints on the use of the site (where applicable)
- Recommendations for further work.

4. REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC)

- ANZECC / National Health & Medical Research Council (NHMRC) (January 1992). *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.*

- ANZECC (April 1994). Financial Liability for Contaminated Site Remediation: A Position Paper.

- National Water Quality Management Strategy Guideline Documents http://www.mincos.gov.au/publications/national_water_quality_management_strategy including:

    - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (revised 2000)
    - Australian Drinking Water Guidelines (NHMRC/ARMCANZ) (2004) www.nhmrc.gov.au/files_nhmrc/file/publications
    - Australian Guidelines for Water Quality Monitoring & Reporting (2000)

- ARMCANZ / ANZECC (September 1995). *Guidelines for Groundwater Protection in Australia.*

National Environment Protection Council (NEPC)

Assessment of Site Contamination - Dec 1999

- Schedule B(1): Investigation Levels for Soil and Groundwater - Dec 1999
- Schedule B(2): Data Collection, Sample Design and Reporting of Data - Dec 1999
- Schedule B(3): Laboratory Analysis of Potentially Contaminated Soils - Dec 1999
- Schedule B(4): Health Risk Assessment Methodology - Dec 1999
- Schedule B(5): Ecological Risk Assessment - Dec 1999
- Schedule B(6): Risk Based Assessment of Groundwater Contamination - Dec 1999
- Schedule B(7a): Health-Based Investigation Levels - Dec 1999
- Schedule B(7b): Exposure Scenarios and Exposure Settings - Dec 1999
- Schedule B(8): Community Consultation and Risk Communication - Dec 1999
- Schedule B(9): Protection of Health & the Environment During the Assessment of Site Contamination – Dec 1999

- Report of the Review of the Assessment of Site Contamination NEPM - Sep 2006

- Discussion Paper: Review of the Assessment of Site Contamination NEPM - Apr 2006

- Summary and response document: Review of the Assessment of Site Contamination NEPM Issues Paper - Apr 2006

Department of Natural Resources, Environment, the Arts and Sport (NRETAS)

- *Guidelines for siting, design and management of solid waste disposal facilities in the Northern Territory*
- *Guide to Waste Discharge Licensing*
- *Waste Discharge Licensing Policy Position in the Northern Territory*

Along with any other documentation as published from time to time by NRETAS.

While this guide has been largely based on New South Wales Environment Protection Authority (EPA) *Guidelines for Consultants Reporting on Contaminated Sites* September 2000, other information from other States and Territory may also be useful (please refer to jurisdictional websites).

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Appendix D

Risk Assessment Tools

Table C1 Descriptions used to classify the likelihood and consequence measure of impact

Descriptor	Definition
Likelihood	
Almost certain	Is expected to occur in most circumstances, or is of a continuous nature, or likelihood is unknown.
Likely	Will probably occur.
Possible	Could occur.
Unlikely	Could occur, but not expected to occur.
Rare	Occurs only in exceptional circumstances.
Consequence	
Catastrophic	Health – death or widespread health effects, or toxic release off-site with detrimental effect. Environmental – extreme permanent changes to the natural environment (not able to be practically or significantly rehabilitated or alleviated). Social – major public outrage. Financial – huge financial loss (greater than A$500 million). Or the consequences are unknown.
Major	Health – extensive injuries. Environmental – substantial and significant changes to the natural environment or only partially able to be rehabilitated or alleviated. Social – will attract public concern in wider community. Financial – major financial loss (A$100 to A$500 million). Or changes will be substantial if cumulative effects are considered.
Moderate	Health – medical treatment required. Environment- significant local changes, but can be rehabilitated or alleviated with difficulty at significant cost and with outside assistance. Social – will attract concern of adjoining community. Financial – high financial loss (A$10 to A$100 million).
Minor	Health – first aid treatment required. Environmental – on-site release immediately contained very local consequence with no significant long-term changes or may be simply rehabilitated. Social – not of significant concern to wider community. Financial – medium financial loss (A$1 to A$10 million).
Insignificant	Health – no injuries. Environmental – negligible environmental impact. Social – unlikely to be noticed by public. Financial – low financial loss (less than A$1 million).

Table C2 Qualitative risk analysis matrix

		Severity of consequence				
		Catastrophic	***Major***	***Moderate***	***Minor***	***Insignificant***
Likelihood of consequence	***Almost certain***	Extreme	Extreme	Extreme	High	High
	Likely	Extreme	Extreme	High	High	Moderate
	Possible	Extreme	Extreme	High	Moderate	Low
	Unlikely	Extreme	High	Moderate	Low	Low
	Rare	High	High	Moderate	Low	Low

Appendix E

Communication and Consultation Plan

CLIENTS | PEOPLE | PERFORMANCE

Darwin Turf Club

Fannie Bay Racecourse

Consultation and Communications Plan for the Application of Used Oil

May 2012

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Appendices

1. Introduction

1.1 Overview

Darwin Turf Club (DTC) operates Fannie Bay Racecourse, situated approximately four kilometres north of Darwin central business district (CBD). The site is approximately 47 hectares and the main site entrance, Buntine Drive, is accessed off Dick Ward Drive.

Refined used oil is applied to the racecourse twice a year; at the end of April and September by Waste Solutions (Contractor) and is subsequently tilled into the track. To maintain the track rotovation occurs twice a week and tilling occurs daily after morning training sessions.

The used oil is of high viscosity and is applied to the sand on the track to maintain cohesion between the sand particles. The relatively high viscosity reduces potential erosion of the sand due to the local climate, which produces monsoonal rain in the wet season.

Neighbouring residential properties to the south and east have historically registered complaints about odours emanating from the track. Concerns have been raised over the impact of oil application to the track on the soils and local groundwater.

A letter from the Northern Territory Department of Natural Resources Environment the Arts and Sport (NRETAS) dated 27 April 2011, specifies the needs for a Consultation and Communication Plan: *'A consultation and communication plan about the activities which includes a strategy for communicating with members of the public who are likely to have a real interest in or be affected by the activity'.*

1.2 Method

Preparation of this Consultation and Communication Plan entailed:

- Collecting and reviewing relevant information such as;
  - researching past media reports to identify messages conveyed to stakeholders via the media and the level of interest in site activity and matters relating to application of used oil at the Racecourse.
  - identifying issues and concerns raised by previous stakeholders and those likely to be raised.
- Identifying key stakeholders that may be affected by application of used oil at the Racecourse;
- Specifying the method and manner in which DTC will communicate with the identified stakeholders about the proposed application of used oil; and
- Detailing protocols for communicating with stakeholders.

1.3 Scope and Objectives

The objective of this Consultation and Communication Plan is to: outline the procedure and process of communicating with stakeholders who may have a “real interest” in the activity of used oil application at the Racecourse. Stakeholder categories are discussed in section 3.

Some key principles of community engagement and risk communication are incorporated in the development of the Plan which includes objectives to:

- Clearly communicate the key messages developed;
- Reduce potential for public outrage associated with risk perception of used oil application and odour through provision of consultation;
- Ensure the community and stakeholders are aware of and understand the protocol of the Consultation and Communication Plan; and
- Ensure consistent messages are conveyed to all stakeholders.

2. Responsibilities

The Chief Operating Officer is responsible for implementing this Consultation and Communications Plan, ensuring relevant external and internal bodies are notified of the proposed biannual application of used oil prior to each event. The Project and Operations Manager will coordinate internal company requirements for implementation, responsibilities are further detailed in Table 1.

It is intended that this document is reviewed and updated where necessary on a regular basis prior to the commencement of each application event. In particular, stakeholder groups and contact details shall be updated.

Table 1 Communication Responsibilities

Personnel	Responsibility
Chief Operating Officer	Monitor overall performance
	Ensure regulatory compliance (external)
Project and Operations Manager	Ensure compliance with this Plan (internal)
	Update and maintain the Plan when necessary
	Maintain the Complaints Register in consultation with the Manager of the Used Oil Application Environmental Management Plan
	Ensure continuous improvement

All DTC employees have a general environmental duty to prevent environmental harm, or, where environmental harm is observed, to report all incidents with the potential to cause environmental harm, with incidents reported to NRETAS. An Environmental Management Plan (EMP) has been prepared for the application of used oil at the Racecourse. Potential environmental impacts such as odour emissions are addressed in the EMP. Responsibilities such as a requirement to notify respective managers of environmental incidents are included in the EMP.

Employees and contractors are not permitted to communicate with any members of the print, electronic or broadcast media about any aspect of the used oil application. Team members should be cautious of any request for information, as media representatives may not identify themselves as such. If approached by a media representative employees and contractors should refer them to the Chief Operating Officer (section 3.3).

3. Procedure

3.1 Overview

This section provides a framework of processes and protocols to guide consultation and communication activities for application of used oil activities.

3.2 Notification

3.2.1 Regulatory Authorities

NRETAS regulate the *Waste Management and Pollution Control Act* and staff the NT Pollution Hotline. DTC will notify NRETAS of planned application of used oil at the Racecourse approximately two weeks in advance of application. A summary of stakeholder engagement is provided in Table 2.

3.2.2 Nearby land occupiers

In accordance with existing DTC communication protocols, DTC will notify nearby land occupiers of planned used oil application activities planned for April and September each year (Table 2). A DTC employee will provide written notification (in person if the land occupier is home, otherwise letter box drop in the occupier's absence) of impending application of used oil at the Fannie Bay Racecourse. Approximately 170 occupiers of adjacent residential properties are notified of the proposed activity. A map of the approximate extent of land occupiers adjacent to the course that would be notified is provided in Appendix A. An example of written notification is provided in Appendix B.

3.2.3 Broader Community

A notice regarding the used oil application will be provided on the DTC webpage approximately two weeks prior to each application event.

Table 2 Summary of stakeholder engagement prior to each use oil application activity

Stakeholder	Action	Contact details
Government Bodies and Regulatory Authorities		
Department of Natural Resources, Environment, the Arts and Sport (NRETAS)	Contact Senior Environmental Officer by telephone to advise of planned used oil application two weeks prior to occurrence. Brief and keep informed of situation on regular basis (case by case basis as agreed with NRETAS).	Nigel Green, Senior Environmental Officer Telephone: 08 8924 4050. Email: Nigel.Green@nt.gov.au or environmentops.nretas@nt.gov.au
Adjacent Land Occupiers (refer to Appendix A)		
Residences closest to the Turf track (approximately the first 5 houses in each street closest to the Turf Club boundary) ◗ Douglas Street ◗ Wells Street ◗ Playford Street ◗ Edwards Street ◗ Freer Street ◗ Cooper Street ◗ Clancy Street ◗ Bleeser Street ◗ Brown Street ◗ Brogan Street ◗ Parsons Street	Provide written notification (in person if the land occupier is home, or letter box drop in the occupier's absence) of the planned application of used oil at the Racecourse at a minimum two weeks prior to application. Provide contact details to the land occupier in the event they wish to speak to a representative of DTC or register a complaint.	N/A
Broader Community and Stakeholders with a "Real Interest"		
Darwin Turf Club Members	Provide written notification in the DTC Members Newsletter of the upcoming planned application of used oil at the track.	DTC Members Database

General Public	Provide written notification on the DTC webpage of the upcoming planned activity, approximately two weeks prior to application. Provide contact details in the event the public wish to speak to a representative of DTC or register a complaint.	N/A (posted on DTC website http://www.darwinturfclub.org.au/)

3.3 Contact Person

Contact details of the DTC Chief Operating Officer will be provided to stakeholders in the event they seek additional information:

Keith Stacy
DTC Chief Operating Officer
Ph: (08) 8923 4222
Mobile: 0417892468
Fax: (08) 8923 4233
E-Mail: kstacy@darwinturfclub.org.au

3.4 Register of Complaints

A register of complaints will be maintained in accordance with the EMP.

Appendix A

Surrounding Land Occupiers Notified

N

LEGEND

APPROXIMATE EXTENT OF WRITTEN NOTIFICATION TO RESIDENTS

SITE LAYOUT PLAN

NTS

GHD

DARWIN TURF CLUB INCORPORATED
CONSULTATION & COMMUNICATIONS PLAN

SURROUNDING LAND OCCUPIERS NOTIFIED

Job Number	43-21851
Revision	A
Date	MAY 2011

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: 22 May 2012 - 4:23 PM Plotted by: Ron Fernandez Cad File No: G:\43\21851\CADD\Drawings\CONSULTATION AND COMMUNICATIONS PLAN.dwg

Appendix B

Example of Written Notification to Nearby Residents

DARWIN TURF CLUB

Dick Ward Drive, Fannie Bay NT
GPO Box 589 Darwin NT 0801
Ph: 08 8923 4222
Fax: 08 8923 4233
Email: pneck@darwinturfclub.org.au

28th March 2012

Dear Neighbour

Track Maintenance Procedure

As you are aware, the Darwin Turf Club undertakes a track upgrade twice yearly in order to ensure that the cambers are correctly laid and the track is returned to its optimum for the ensuing six months of racing. The pre-Cup Carnival 'grading only' upgrade, will take place during the week commencing Monday 2nd April 2012 and will only take approximately 2-3 working days to complete.

This upgrade will involve one grader trimming and folding the track in order to loosen the material that provides the cushion for our racing. The applying of an oil-based substance which has been filtered and had the light fractions of hydrocarbon removed will not take place until Friday 27th April 2012. This product is used to bind the sand together and create a firm and stable surface. Additional to this, processes have been undertaken to reduce/remove any odour.

The DTC has developed an 'Environmental Management Plan' to ensure the track upgrade undertaken does not cause any harm to the environment or to the health of our neighbours.

We have had continuing meetings and dialogue with the Department of Natural Resources, Environment, The Arts and Sport, in particular, the Environmental Operations Department. They have been most helpful and the Darwin Turf Club are following their direction.

We thank you for your understanding in this matter.

Regards,

Philip Neck
Chief Executive/ Darwin Turf Club

GHD

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		Name	Signature	Name	Signature	Date
00	K.Fitzpatrick	A.Koscielski A. Smit		A. Smit		22/05/12

Appendix F

Environmental Management Inspection Checklist

Internal Environmental Management Inspection

Date of Inspection / / Time of Inspection am/pm

Item	Issue	Yes	No	N/A	Comments/ Remedial Actions
1	**General**				
	Is the EMP readily available for use?				
	Are all personnel on site inducted, aware of their environmental responsibilities and relevant provisions of the CEMP				
	Are required staff trained, and licensed or approved by relevant agencies, for necessary environmental management tasks?				
	Is the incident reporting system in place and working?				
	Is the emergency response plan readily available and are the personnel trained?				
	Are records kept of communication and consultation?				
	Are the Environmental Complaints, Non-Conformance and Corrective Action Register maintained and up-to-date?				
2	**Hazardous Materials**				
	Are MSDSs available for all hazardous chemicals held on site?				
	Is there procedure for handling and storing hazardous waste on site, and is it being followed and checked?				
	Are adequate spill kits and emergency response/ safety equipment available for dealing with hazardous/ dangerous materials incidents?				

Internal Environmental Management Inspection

Date of Inspection / / Time of Inspection am/pm

	Is there a procedure for disposing of hazardous waste by a licensed contractor in place for the site and is it being followed and adequate records kept?				
3	**Noise and Vibration**				
	Has a noise and Vibration Management Plan been prepared and is it being implemented?				
	Are the designated work hours being observed?				
	Are activities that generate excessive noise being managed to minimise their impacts?				
	Are noisy activities/ equipment functioning properly?				
	Are any noise complaints being addressed promptly?				
4	**Waste**				
	Has a Waste Management Plan been prepared and is it being implemented?				
	Are appropriate waste handling and storage practices being implemented to reduce the safety and environmental hazards from wastes and to encourage re-use/ recycling?				
	Is the site clean and tidy?				
	Is waste being collected by a licensed contractor on a regular basis?				
	Are appropriate waste generation, recycling and disposal records kept?				
5	**Water Quality, Stormwater and Erosion**				
	Have erosions and sediment control measures being installed and are they being maintained?				
	Is there any obvious hydrocarbon staining in or adjacent to drainage lines?				

Appendix G

EMP Acknowledgement Form

EMP Acknowledgement Form

I acknowledge that I have read and understand this EMP and will comply with processes detailed.

Name	Role	Signature	Date

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01	A Koscielski	Andre Smit		Andre Smit		25/05/12

APPENDIX C
SITE PHOTOGRAPHS

Photograph	Description
	Photo 1 – Truck arriving at site, 27 April 2021.
	Photo 2 – First truck apply waste oil mixture to the race track straight.

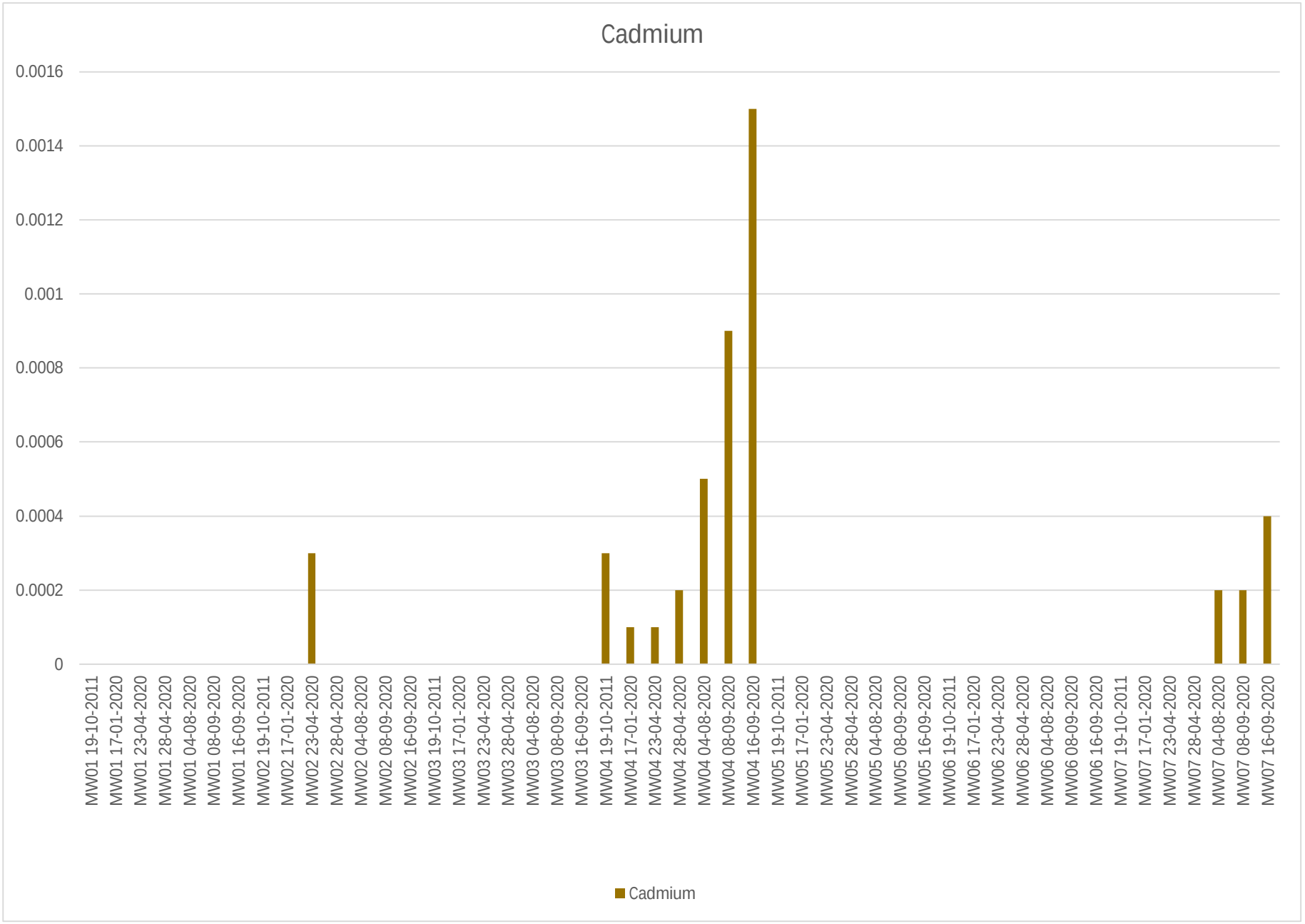
Photograph	Description
	Photo 3 – Mobile Odour suppressant unit

Photograph	Description
	Photo 4 – two trucks applying waste oil mixture to main race track.
	Photo 5 – two trucks applying waste oil mixture to main race track.

Photograph	Description
	Photo 6 – air quality monitoring station

Photograph	Description
	Photo 7 – stormwater drain in the north east corner of the site.

APPENDIX D
GROUNDWATER QUALITY TREND ASSESSMENT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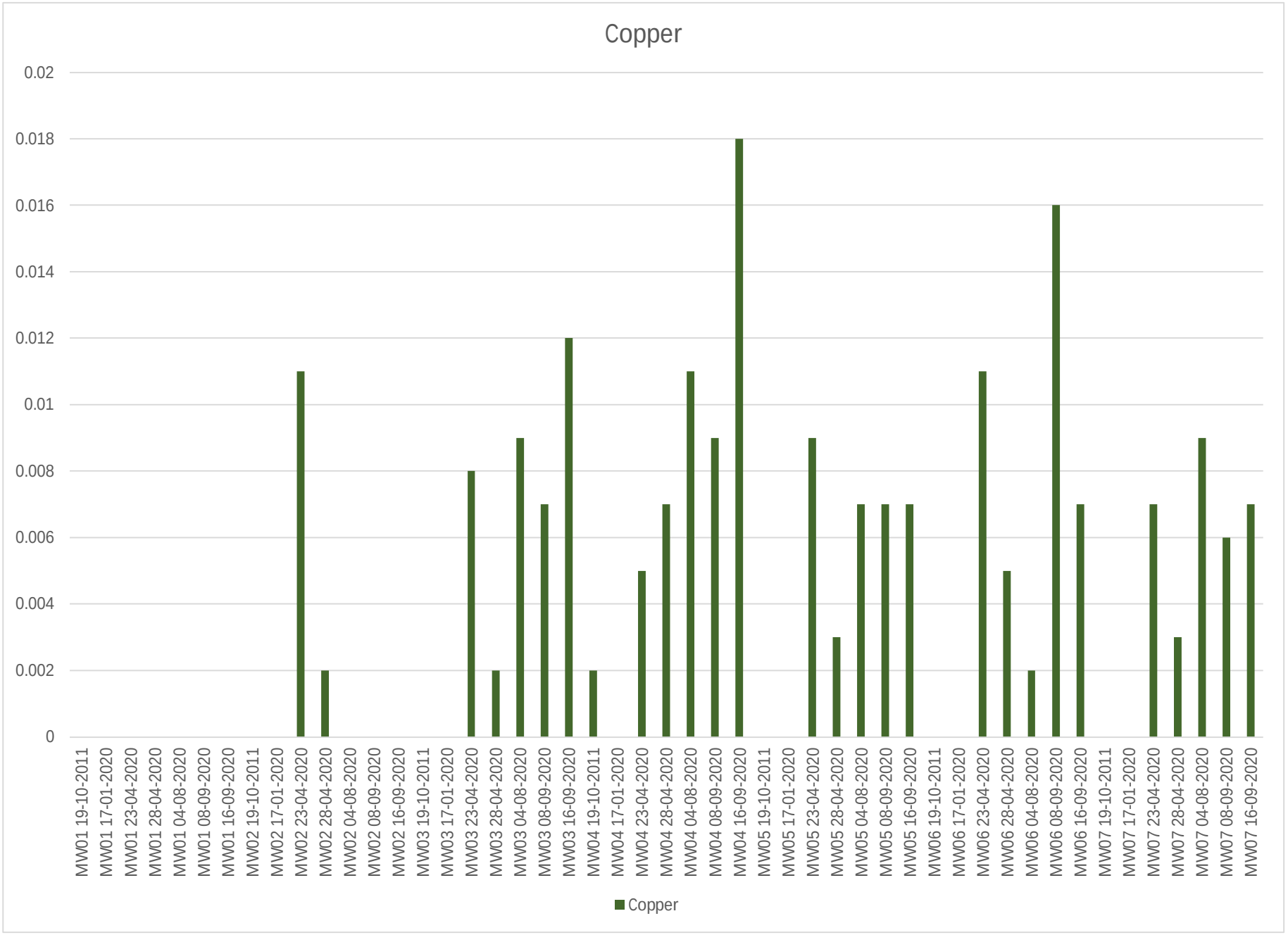
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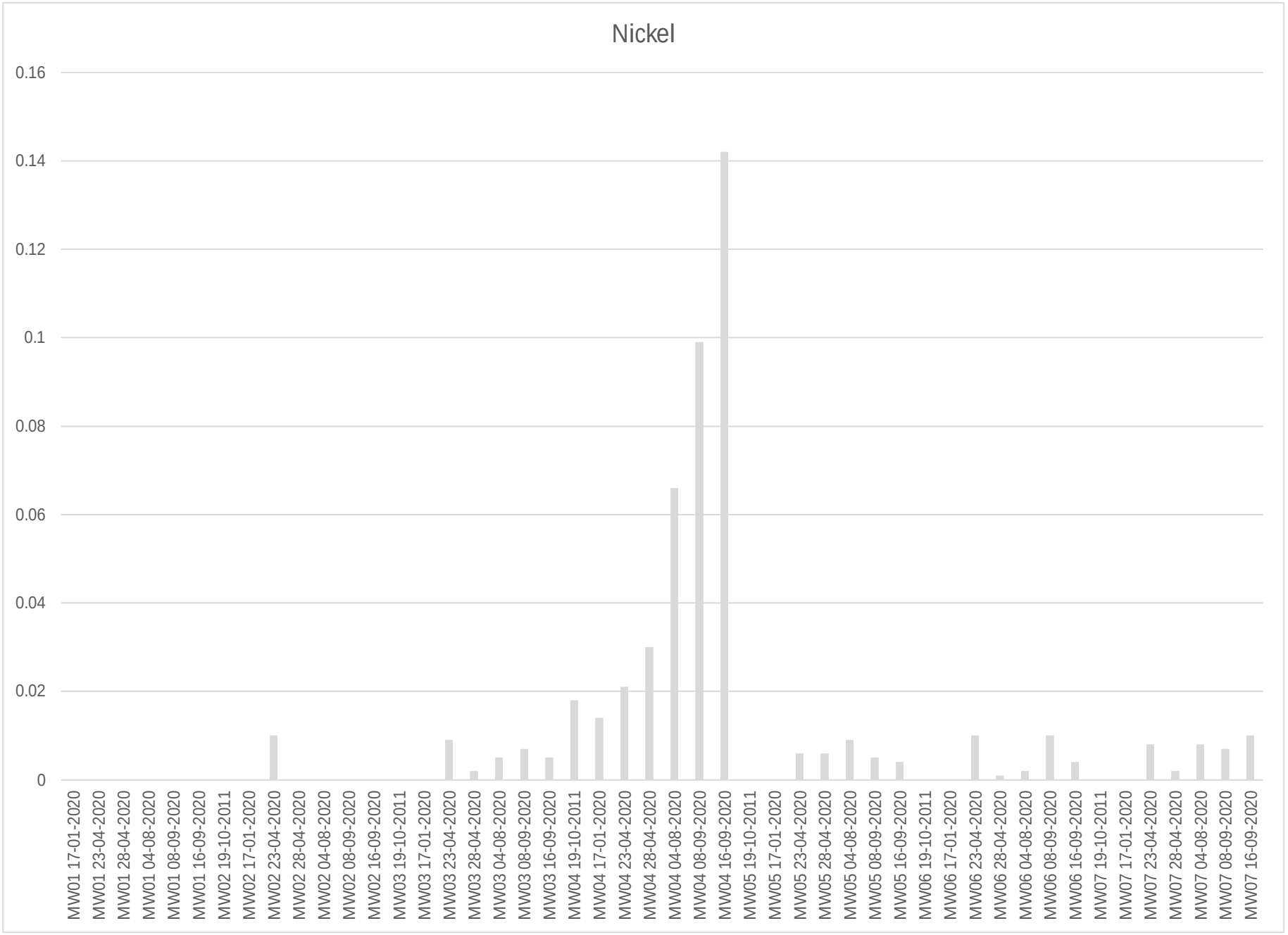
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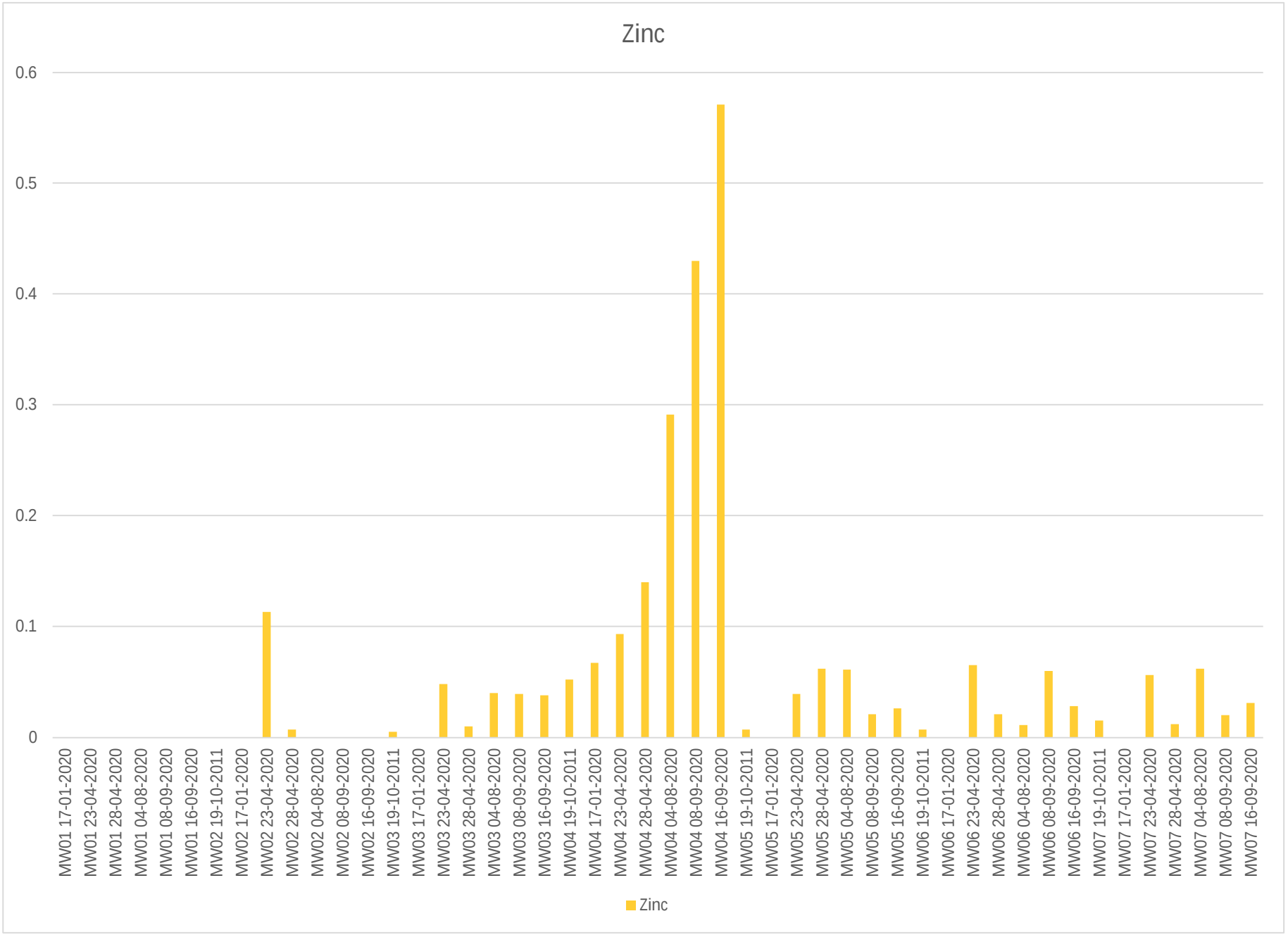
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