

Report brief

Darwin International Airport Hydrocarbon Monitoring Data 2000-2016

Prepared for Northern Territory Airports Pty. Ltd.

Dr. Niels C. Munksgaard
Senior Research Fellow

September 2016

Introduction and background:

This brief is a summary of the report “Darwin International Airport Hydrocarbon monitoring data 2000-2016” to Northern Territory Airports Pty. Ltd. by the Environmental Chemistry and Microbiology Unit, Charles Darwin University dated July 2016.

The aim of the report was to review existing monitoring data for hydrocarbons in surface water from Darwin International Airport (DIA) and its surrounds which are located within the Rapid Creek catchment. The data covers the period 2000-2016 and forms part of the airport’s environmental monitoring program.

Rapid Creek is the largest freshwater system in the urban Darwin area and originates in the Marrara swamp area East of Darwin Airport and flows into Darwin Harbour at Rapid Creek Beach. The creek and adjacent park land are mainly used for recreational activities, swimming and harvesting aquatic foods. Figure 1 shows the catchment of upper Rapid Creek including water drainage lines from residential areas, DIA, the RAAF base and Marrara sports ground.

Hydrocarbons are monitored at DIA due to the volumes stored onsite which can be attributed to typical airport operations. Ongoing monitoring is a risk mitigation measure in the management of hazardous substances and dangerous goods stored and used on site. Petroleum products are composed of many different hydrocarbons with varying chemical and physical characteristics and several are included in DIA’s monitoring program.

Monitoring data:

Northern Territory Airports Pty. Ltd. (NTA) provided a database with analytical data for surface water samples collected between 2000 and 2016 by EcOz Environmental Consultants. Collection sites included creek sites and drains along upper Rapid Creek (Figure 1).

The monitoring program includes four standard monitoring rounds per year: in the build-up after the first major rainfall of the season (Sept. - Dec.), in the wet season (Jan. - Mar.), in the late wet season / early dry season (Apr. - May) and in the dry season (July – Aug.). In addition, extra sample collections were undertaken in response to spill incidents.

The following hydrocarbon compounds were analysed and reported: Benzene, Toluene, Ethylbenzene, meta- & para-Xylene, ortho-Xylene, Naphthalene, and the hydrocarbon fractions C6 - C9, C10 - C14, C15 - C28 and C29 - C36.

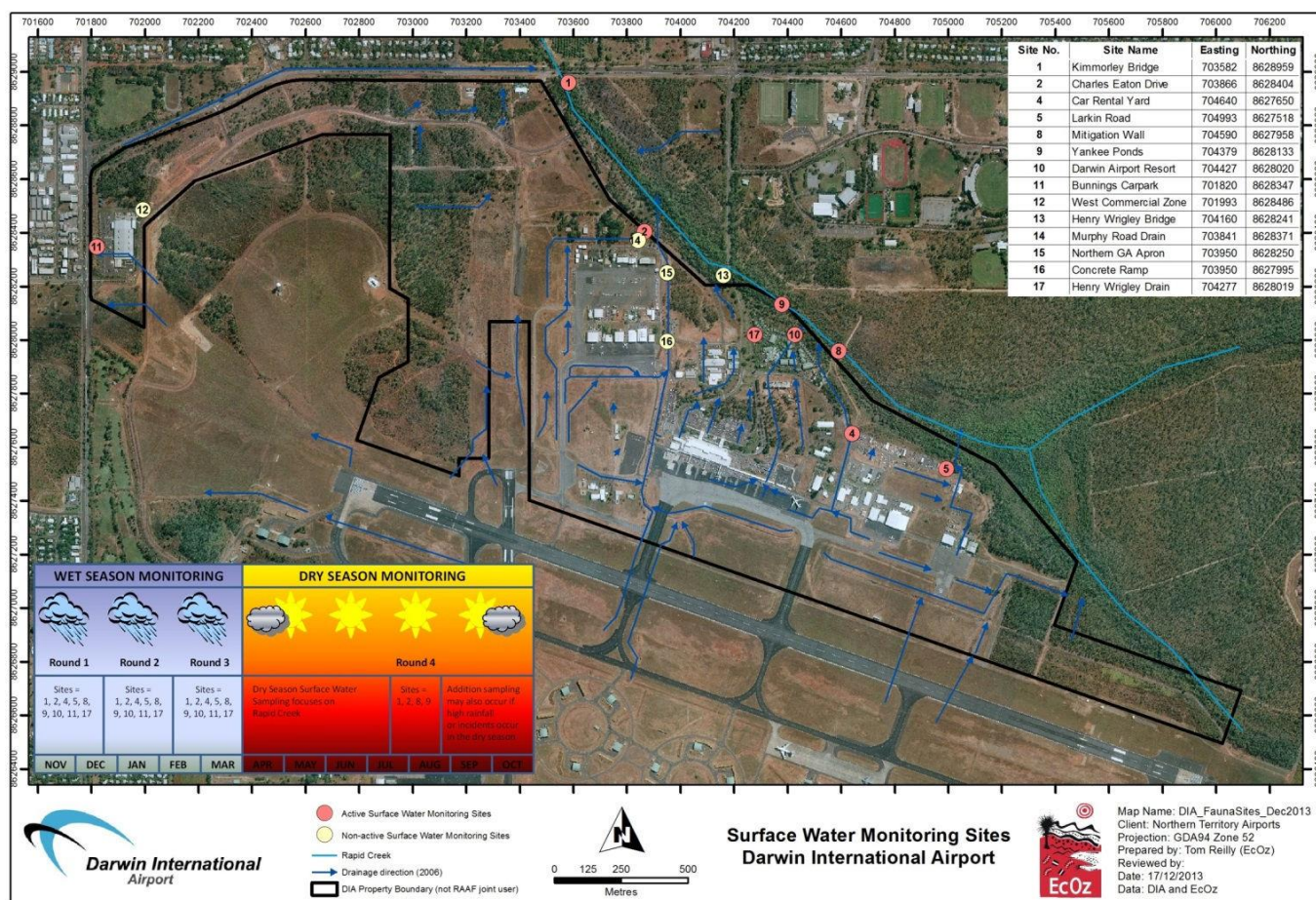


Figure 1. Darwin International Airport surface water monitoring scheme (EcOz Environmental Consultants). Active sampling sites are indicated by numbered red circles.

Report findings and conclusions:

Statistical summaries of all monitoring data for each monitoring site are compared to 'Airports Limits 1997, Freshwater' in Tables 1-3. These environmental limits were established by the Airports Environment Protection Regulations 1997 (Schedule 2) and apply to airports on Commonwealth land. Water quality guideline levels defined by the Australian and New Zealand Environment and Conservation Council (ANZECC) and which apply to the Rapid Creek ecosystem waters outside airport land are also shown in Tables 1-3.

The majority (73%) of the reviewed monitoring data were reported as less than the Limit of Reporting (LOR) values. All LOR values were below the 'Airports Limits' as well as the 'ANZECC guideline levels'.

The statistical data show that the median values for all hydrocarbon parameters measured in the monitoring program were at the LOR (the values shown in Table 1 are half the LOR for the purpose of statistical processing).

The 95-percentile values for the dataset (Table 2) show that the 'Airports Limits' for hydrocarbon fractions C15-C28 were breached at site 4 (Car Rental Yard).

The maximum values for the dataset (Table 3) show that the 'Airports Limits' for all four hydrocarbon fractions were breached at site 4 (Car Rental Yard) and hydrocarbon fractions C15-C28 and C29-C36 at site 5 (Larkin Road).

The breaches of the 'Airport Limits' at site 4 (Car Rental Yard) occurred on 27/9/2000, 13/12/2000, 7/9/2001 and 13/5/2004. At site 5 (Larkin Road) the breaches occurred on 17/1/2001 and 13/5/2004.

Figure 2 shows a graphical representation of the median, 95-percentile and maximum values for the four hydrocarbon fractions for which breaches of the 'Airports Limits' were recorded.

The maximum recorded values for aromatic hydrocarbons (Benzene, Toluene, Ethylbenzene, meta- & para-Xylene, ortho-Xylene and Naphthalene) at all of Darwin International Airport's monitoring sites from 2000-2016 were substantially below both the 'Airports Limits' and the ANZECC ecosystem guideline levels.

There have been no breaches of the 'Airports Limits' or ANZECC ecosystem guideline levels for any of the hydrocarbons monitored since 2004. Based on the monitoring data, no toxic impacts from hydrocarbons are expected to have occurred at the monitoring sites in the past 12 years.

Table 1: Median of values recorded 2000-2016

Half LOR inserted

Analyte:	Site 1	Site 2	Site 4	Site 5	Site 8	Site 9	Site 10	Site 11	Site 17	Airports Limits 1997, Freshwater	ANZECC 2000 levels 95% protection
	Benzene (n=235)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	300
Toluene (n=235)	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	300	180*
Ethylbenzene (n=235)	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	140	80*
meta- & para-Xylene (n=223)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	(200)**
ortho-Xylene (n=222)	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	ND	350
Naphthalene (n=147)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	ND	16
C6 - C9 Fraction (n=346)	10	10	10	10	10	10	10	10	10	150	ND
C10 - C14 Fraction (n=347)	25	25	25	25	25	25	25	25	25	600	ND
C15 - C28 Fraction (n=347)	50	50	50	50	50	50	50	50	50	600	ND
C29 - C36 Fraction (n=309)	25	25	25	25	25	25	25	25	25	600	ND

Table 2: 95%'ile of values recorded 2000-2016

Half LOR inserted

Analyte:	Site 1	Site 2	Site 4	Site 5	Site 8	Site 9	Site 10	Site 11	Site 17	Airports Limits 1997, Freshwater	ANZECC 2000 levels 95% protection
	Benzene (n=235)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	300
Toluene (n=235)	1.0	1.0	1.0	1.2	1.0	1.0	4.0	1.2	1.8	300	180*
Ethylbenzene (n=235)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	140	80*
meta- & para-Xylene (n=223)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	(200)**
ortho-Xylene (n=222)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	350
Naphthalene (n=147)	5.0	9.8	7.0	5.0	5.5	5.0	5.0	8.0	3.9	ND	16
C6 - C9 Fraction (n=346)	10	10	20	10	10	10	10	10	10	150	ND
C10 - C14 Fraction (n=347)	25	28	542	45	25	25	25	25	25	600	ND
C15 - C28 Fraction (n=347)	50	179	1111	475	50	63	50	156	210	600	ND
C29 - C36 Fraction (n=309)	50	50	358	93	50	50	50	58	295	600	ND

Table 3. Maximum value recorded 2000-2016

Half LOR inserted

Analyte:	Site 1	Site 2	Site 4	Site 5	Site 8	Site 9	Site 10	Site 11	Site 17	Airports Limits 1997, Freshwater	ANZECC 2000 levels 95% protection
	Benzene (n=235)	0.5	0.5	0.5	0.5	0.5	1.0	0.5	0.5	0.5	300
Toluene (n=235)	2.5	2.5	2.5	2.5	2.5	2.5	4.0	2.5	2.5	300	180*
Ethylbenzene (n=235)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	140	80*
meta- & para-Xylene (n=223)	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	(200)**
ortho-Xylene (n=222)	4.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	350
Naphthalene (n=147)	10.0	10.0	10.0	5.0	10.0	5.0	5.0	10.0	5.0	ND	16
C6 - C9 Fraction (n=346)	20	10	1200	10	10	10	10	10	10	150	ND
C10 - C14 Fraction (n=347)	80	150	2200	181	25	25	25	25	25	600	ND
C15 - C28 Fraction (n=347)	225	560	3000	4000	100	130	140	300	370	600	ND
C29 - C36 Fraction (n=309)	81	60	4600	23000	130	100	120	130	540	600	ND

ND: Not defined; *: Low reliability (Table 8.3.14); **: para-Xylene only (no value for meta- and para-xylene combined)

Tables 1-3: Median, 95-percentile and maximum values for hydrocarbon data from Darwin International Airport's monitoring program 2000-2016. Breaches of the 'Airport Limits 1997, Freshwater' are highlighted in yellow.

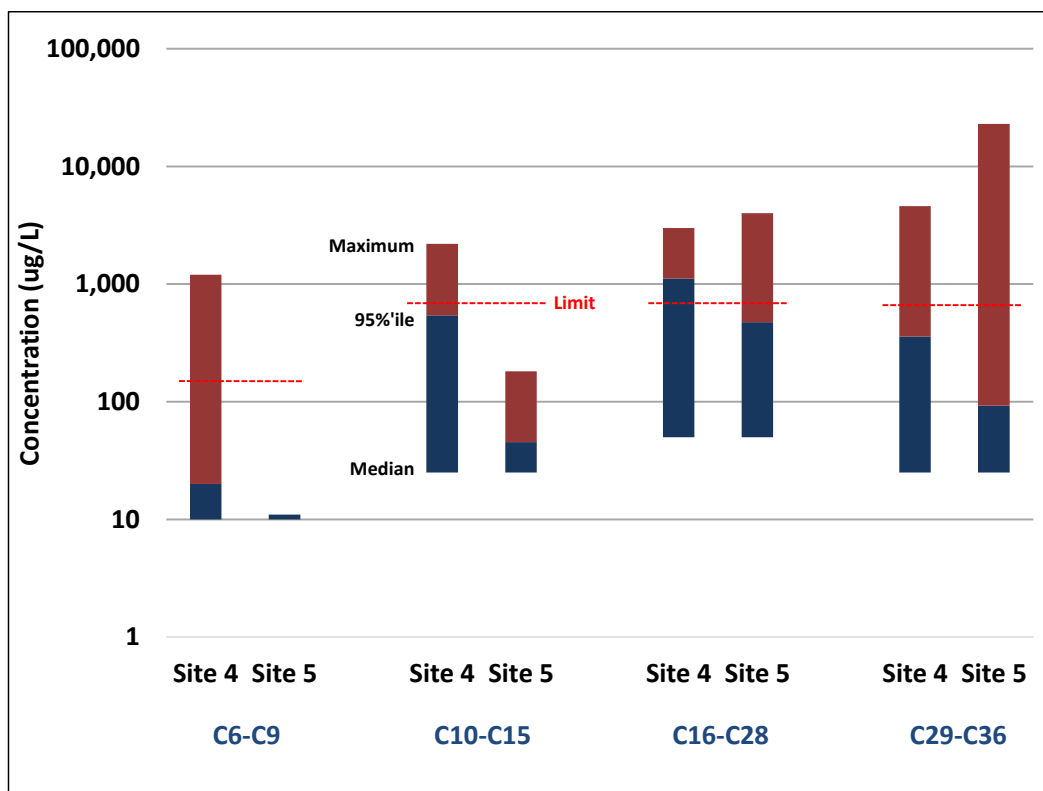


Figure 2. Median (base of blue column), 95-percentile (top of blue column) and maximum (top of red column) concentrations of hydrocarbon fractions C1-C9, C10-C15, C16-C28 and C29-C36 at site 4 and 5 compared to 'Airports Limits 1997 Freshwater' (broken red lines). Note the logarithmic concentration scale in µg/L (micrograms per litre).

Reference List:

Airports Environment Protection Regulations, Schedule 2 (1997):
http://www.austlii.edu.au/au/legis/cth/consol_reg/apr1997501/sch2.html

ANZECC (2000): Australian and New Zealand Guidelines for Fresh and Marine Water Quality Vol. 1. Australian and New Zealand Environment and Conservation Council. Canberra, Australia.

Abbreviations and explanations:

95-percentile value: The value where 95% of recorded values in a dataset are lower and 5% are higher

ANZECC guideline: Australian and New Zealand Guidelines for Fresh and Marine Water Quality Vol. 1. Australian and New Zealand Environment and Conservation Council.

DIA: Darwin International Airport

Hydrocarbon fraction: The fractions C6 - C9, C10 - C14, C15 - C28 and C29 - C36 refer to the number of carbon atoms in the hydrocarbon chain. It is a measure of the length of the length of the chain and the size and weight of the hydrocarbon molecule

LOR: Limit of Reporting, the minimum concentration of a compound that can reliably be detected

Maximum value: The highest value recorded in a dataset

Median value: The value where half (50%) of recorded values in a dataset are lower and half are higher

NTA: Northern Territory Airports Pty. Ltd.

RAAF: Royal Australian Air Force