

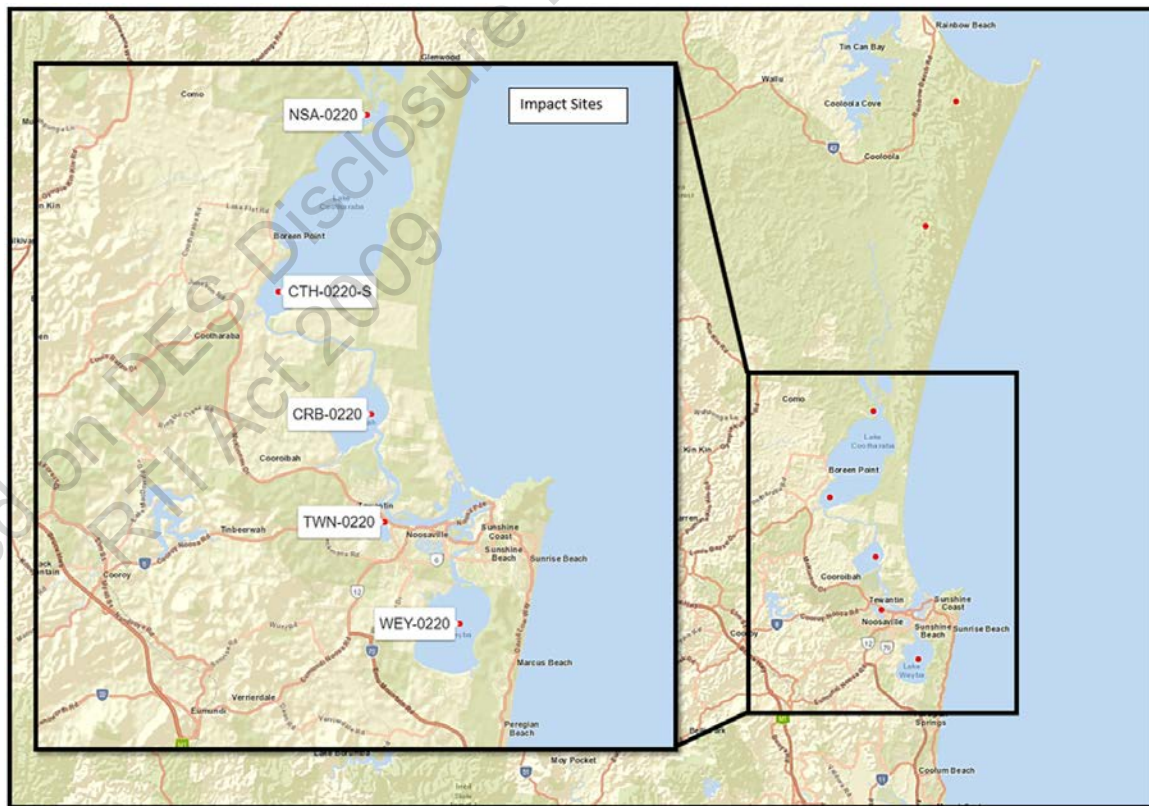


Noosa Catchment Dioxin Survey

Phase One – Sediment Survey

Sampling sites – Potentially impacted forestry

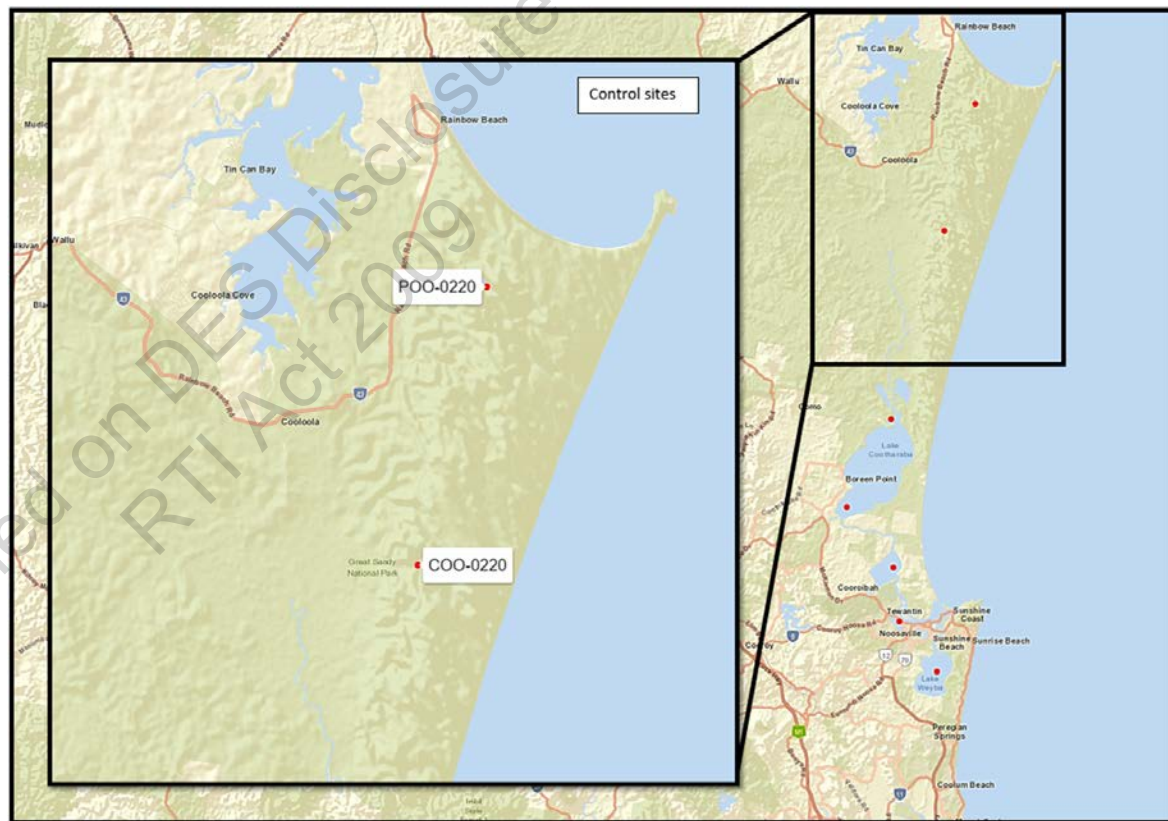
Lake Weyba (WEY-0220)
Lake Cooroibah (CRB -0220)
Lake Cootharaba Nth (NSA-0220)
Lake Cootharaba Sth (CTH-0220-S)



Sampling sites - Control

Lake Poona (POO-0220)

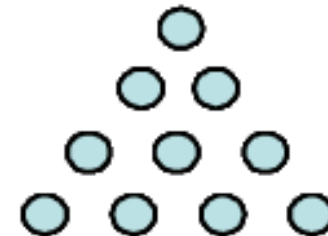
Lake Coolamerra (COO-0220)



Sampling Methodology



- Sampling followed *Dioxins in Aquatic Environments in Australia* (Müller et al. 2004) technical report.
- Ten samples were collected at each site at a 10 cm depth in a triangular formation and composited.
- Samples were analysed by ALS and three duplicates by NMI.



Results

			National Dioxins Survey Industrial Sites			Control Sites		Potentially Impacted Sites				
			Lower Brisbane	Port Jackson	Botany Bay	Lake Poona	Lake Coolamerra	Lake Cootharaba North	Lake Cootharaba South	Lake Cooroibah	Tewantin	Lake Weyba
Dioxins	<i>Dioxins - Individual</i>	Units										
	2378-TCDD	pg/g	0.67	39	2.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7
	12378-PeCDD	pg/g	<0.6	5.9	6.1	<2.4	<2.4	<2.5	7.7	5.7	<2.5	19
	123478-HxCDD	pg/g	1.5	16	14	<2.4	<2.4	<2.5	7.2	5.6	<2.5	20.4
	123678-HxCDD	pg/g	5.2	36	29	<2.4	<2.4	4.4	13.4	11.4	2.6	29
	123789-HxCDD	pg/g	5.4	38	41	2.5	4.7	11.7	34.2	27.6	5.5	66.9
	1234678-HpCDD	pg/g	130	1200	800	83.4	62.7	142	286	270	60.3	321
	OCDD	pg/g	3740	41000	25100	2210	3050	4530	4230	4930	1210	4410
Furans	2378-TCDF	pg/g	1.2	4.8	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	12378-PeCDF	pg/g	<0.5	1.9	2.2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	23478-PeCDF	pg/g	0.84	4.8	32	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123478-HxCDF	pg/g	<1	5.9	<1	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123678-HxCDF	pg/g	1.7	3.5	2.2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	234678-HxCDF	pg/g	0.58	3.7	1.7	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123789-HxCDF	pg/g	0.31	0.5	<0.3	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	1234678-HpCDF	pg/g	14	37	22	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	1234789-HpCDF	pg/g	1.5	5.1	<2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	OCDF	pg/g	61	220	42	<4.9	<4.9	<5.0	<5.0	<4.9	<4.9	<5.0
	Total TEQ WHO 0.5LOD	pg/g	4.9	75	31	4.41	4.66	6.97	18.51	15.54	4.32	38.77

Initially thought it was due to fires.....

In a field study of bushfires, Meyer et al (2004) a low furan to dioxin ratio in air and ash, which is consistent with our results (almost 100% dioxins)

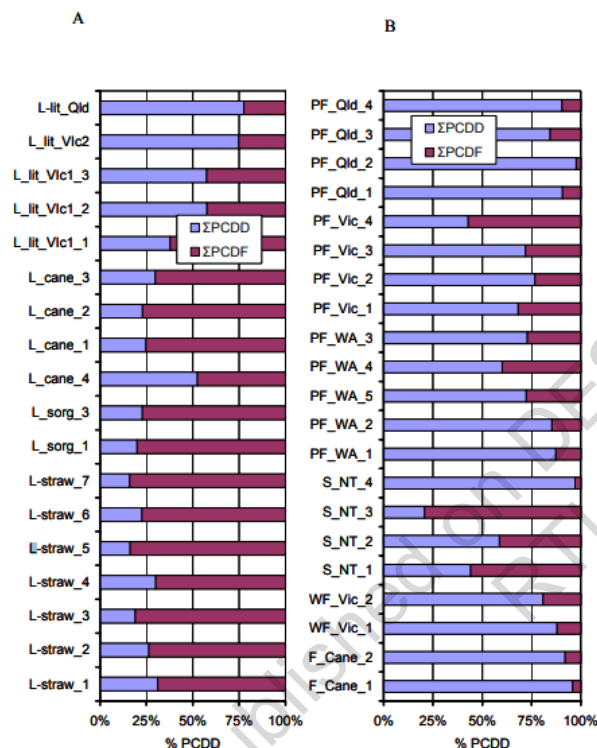


Figure 3.5. The relative contribution of PCDD to total PCDD/PCDF mass.

A. Laboratory fire samples
B. Field samples.

• <https://www.environment.gov.au/system/files/pages/626f9956-95df-4a7b-8fed-6728c18f626a/files/report-1b.pdf>

FILE E

Release

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Noosa Catchment Dioxin Survey

Phase Two – Biota Sampling

Human Health Assessment

Site and sample type	Fat (%)	TEQ (pg/g)	Sample
Weyba mullet	4.1	1.7	Composite Sample (5 fillets)
Cootharaba mullet	8.6	1.3	Composite Sample (4 fillets)
Cooroiba Oysters	ND	1.7	Composite Sample (7 fillets)
Weyba Oysters	ND	3.2	Composite Sample (9 fillets)
Cootharaba Mud Crab	0.6	0.36	Composite Sample (flesh of two crabs)

ND – Not determined as not enough sample to do lipid extraction

TEQ (pg/g) stands for toxic equivalents (to normalise for different toxicities associated with different dioxins/furans).

Calculations

- NHMRC (2002) established Tolerable Monthly Intake (TMI) guideline value (GV) for dioxins of 70 pg TEQ/month.
- By taking in account background exposures, FSANZ estimated limit for dioxins and fish and seafood for human consumption was 6 pg TEQ/g (FSANZ 2007), based on a single serve of fish from the contaminated area per week.

National Health and Medical Research Council (2002) 'Dioxins : Recommendation for Tolerable Monthly Intake for Australians', (October). Available at:

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FSANZ. (2007). *Dioxins in Seafood from Sydney Harbour A Revised Assessment of the Public Health and Safety Risk. Technical Series Report No: 32. Food Standards Australia and New Zealand. Canberra*

Equations

$$\text{Intake (dioxin)} = \frac{\text{Conc} \times (\text{portion size} * \text{frequency})}{\text{Body weight}} \quad \text{Equation 1}$$

Where

Intake is intake of dioxin in pg TEQ/kg

Conc is the concentration of dioxin in fish

Portion size is the weight in g of fish consumed in a meal

Frequency is the number of meals consumed per month

Body weight is the default body weight for a child or adult in kg.

$$HQ = \frac{\text{Intake}}{\text{Guideline}}$$

Equation 2

Where

HQ is the hazard quotient

Intake is the intake of dioxin from Equation 1

Results

Parameter	Units	1 meal per week	2 meals per week	3 meals per week	Oysters (all)	Oysters (Weyba)
Concentration	pg/g	1.70	1.70	1.70	2.50	3.20
Portion size (fish)	g/meal	150.00	150.00	150.00	100.00	200.00
Frequency	meals/month	4.00	8.00	12.00	4.00	4.00
Ingestion Rate (fish)	g/week	600.00	1200.00	1800.00	400.00	800.00
body weight	kg	70	70	70	70	70
Intake (dioxin)	pg/kg bw month	1.46E+01	2.91E+01	4.37E+01	1.43E+01	3.66E+01
GV (NHMRC)	pg/g bw month	70	70	70	70	70
HQ		0.21	0.42	0.62	0.20	0.52

QH advice for mercury in fish – would be protective to dioxins

People should be advised to follow the recommendation to limit the consumption of fish 2 to 3 serves per week of 75 g of most fish for children up to 6 years, and 2 to 3 serves of 150 g for the rest of the population..... It should be noted that this advice includes all fish consumed, including wild caught, store bought, farmed and tinned fish..... In general, consumers should source seafood from multiple locations.

Dioxins in biota compared to previous results from Moreton Bay

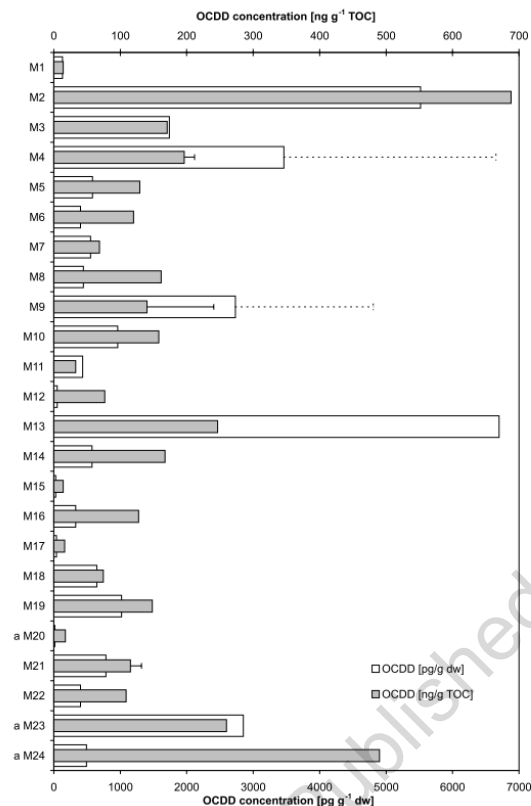
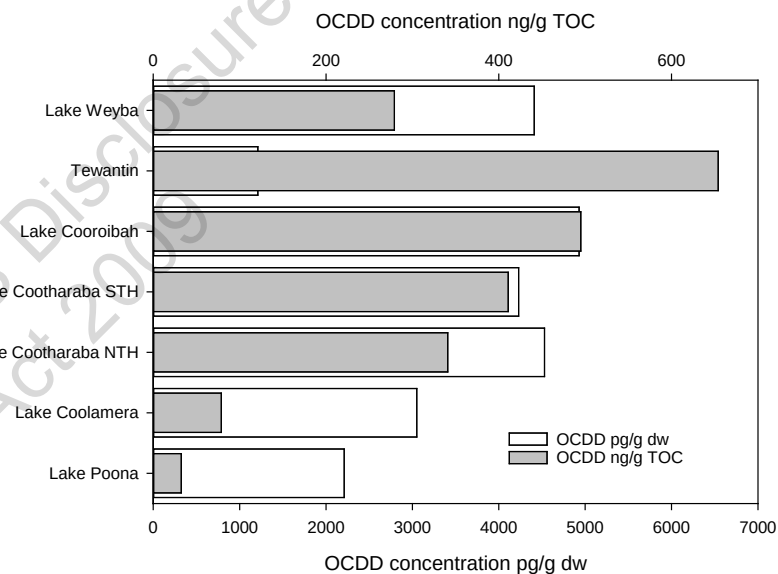
	n	TCDD (pg/g lipid) median (range)	Total dioxins (pg/g lipid) median (range)
Pacific Oyster	1	1200	3800
Pearl Oyster	1	2600	4300
Pipi	4	6300 (6000-12000)	37000 ^a
Cooroiba Oysters ^b	1	3913	57739
Weyba Oysters ^b	1	3008	44513
Mullet	4	88 (14-150)	170 (99-240)
Weyba Mullet	1	134	439
Cootharaba Mullet	1	221	342
Mudcrab	2	7200 (3700-11000)	12000 ^a
Cootharaba Mudcrab	1	65	1363

^a Only one sample was analysed for Total Dioxins

^b Lipid weight used was average of pacific oyster and pearl oyster

Matthews, V., Päpke, O. and Gaus, C. (2008) 'PCDD/Fs and PCBs in seafood species from Moreton Bay, Queensland, Australia', Marine Pollution Bulletin, 57(6-12), pp. 392-402.

Comparison of sediment results to previous studies

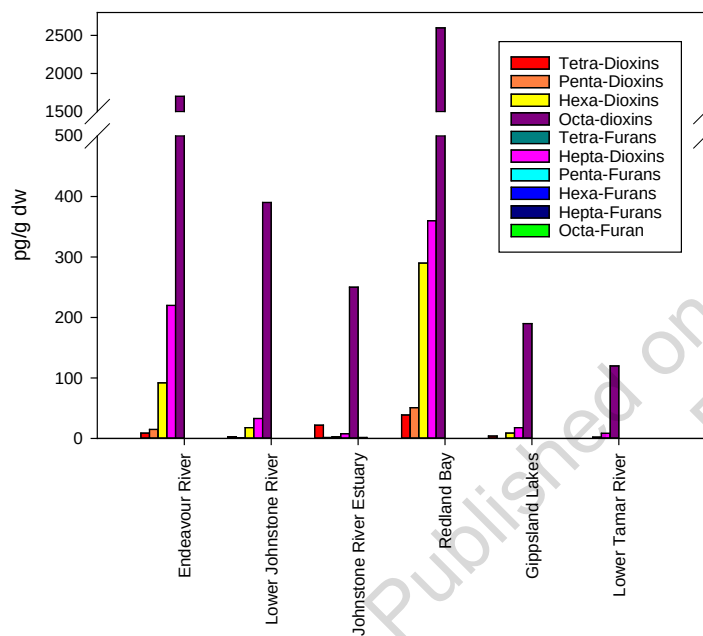


Marine sediments in QLD

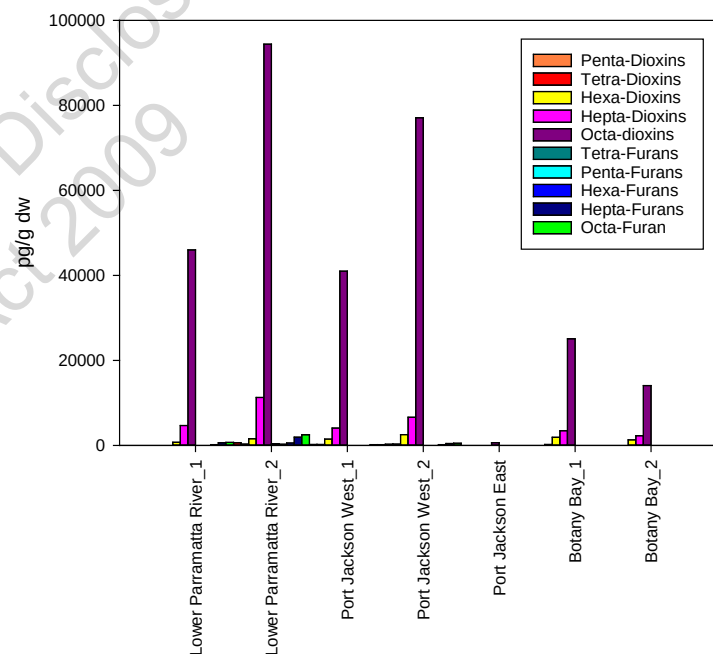
Gaus et al. / Chemosphere 43 (2001) 549-558

Dioxin signature in QLD and Australia

Urban/rural



Industrial



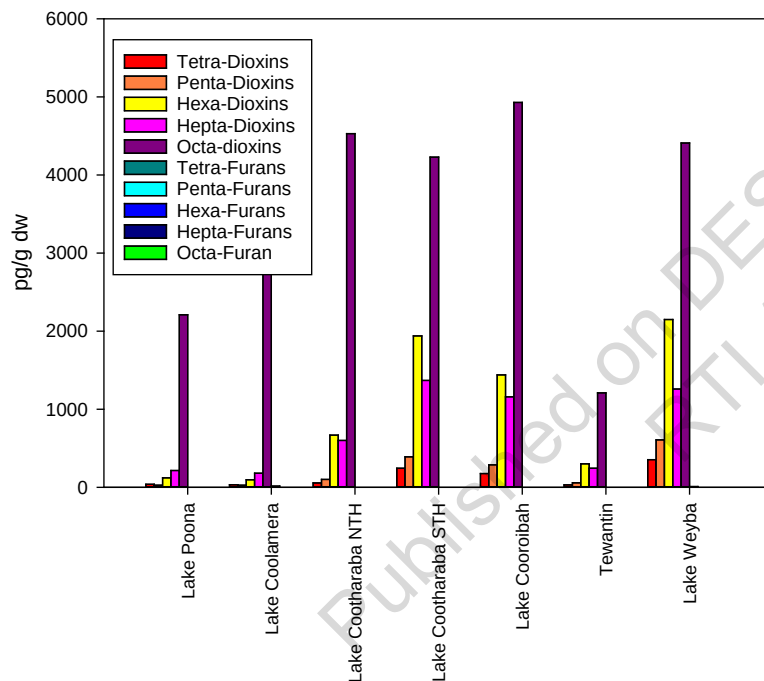
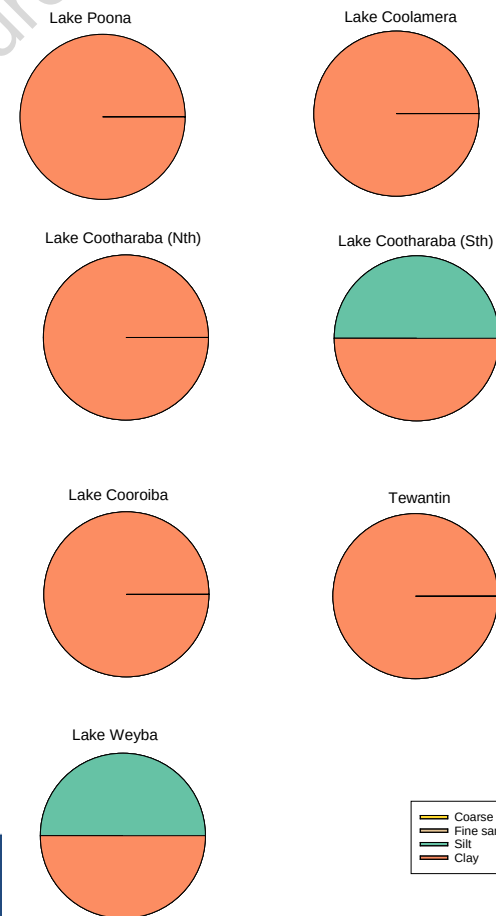
Theories on sources

- Secondary kaolinitic clays have a particular signature (US, Germany, UK).
- Described as 'a natural formation pattern'
- HxCDD-congeners the 1,2,3,7,8,9-HxCDD dominated, followed by the 1,2,3,6,7,8-HxCDD.

Hexa congeners	Units	Lake Poona	Lake Coolamerra	Lake Cootharaba NTH	Lake Cootharaba STH	Lake Cooroibah	Tewantin	Lake Weyba
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Schmitz et al. (2011) Environ. Sci. Technol. 45, 461–467

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- PCDF contents were low to undetectable.



Other theories

- Pentachlorophenol and other pesticides cause the contamination pattern in QLD (precursors to dioxin formation).
- Recent forest fires do not cause this dominant pattern

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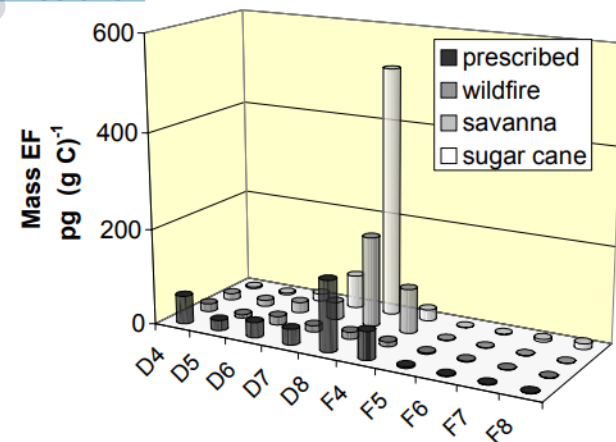


Figure 1. Mass emission factors (EF) for PCDD/PCDF homologue groups for each class of fire. D4=TCDD; D5=PeCDD; D6= HxCDD; D7=HpCDD; D8= OCDD; F4= TCDF; F5=PeCDF; F6= HxCDF; F7=HpCDF; F8= OCDF.

Dioxin Survey Noosa River

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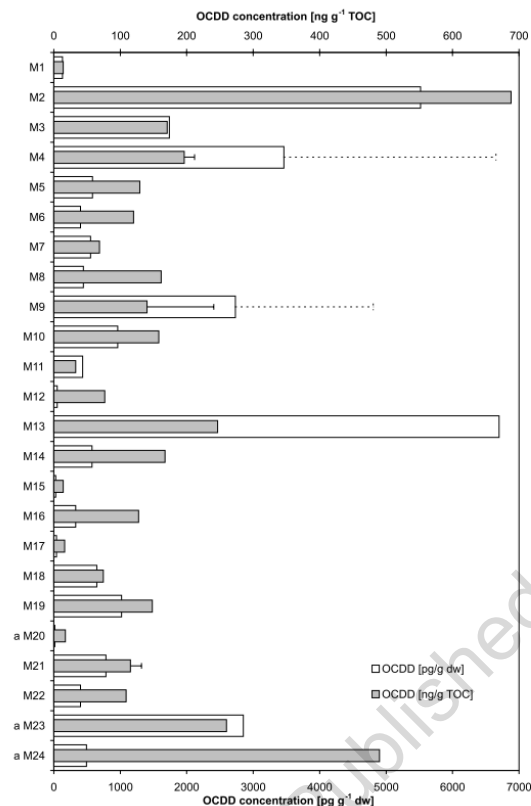
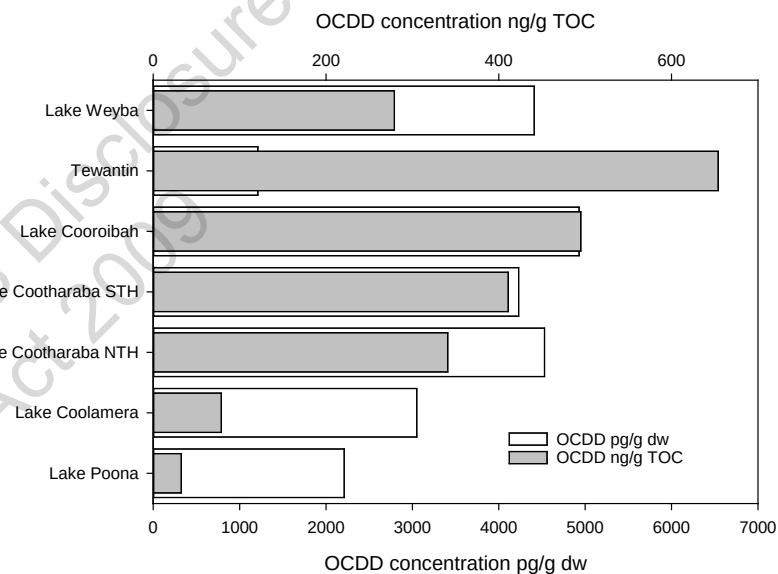
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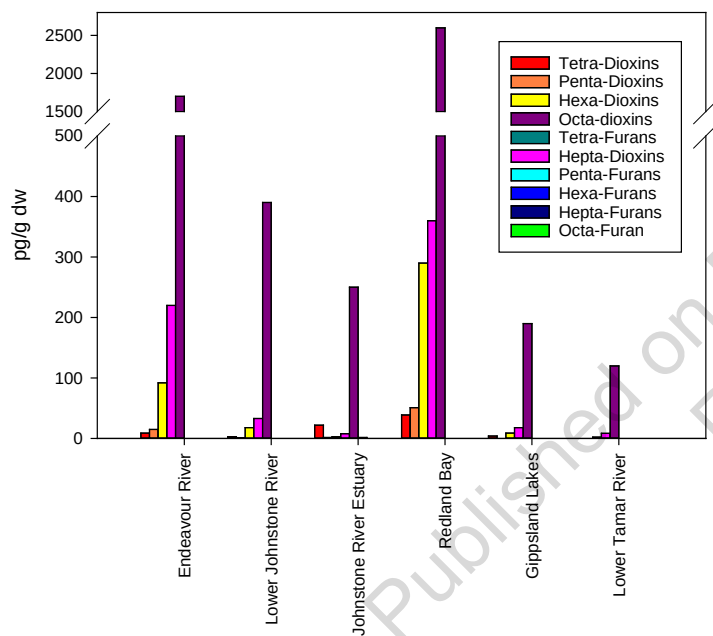


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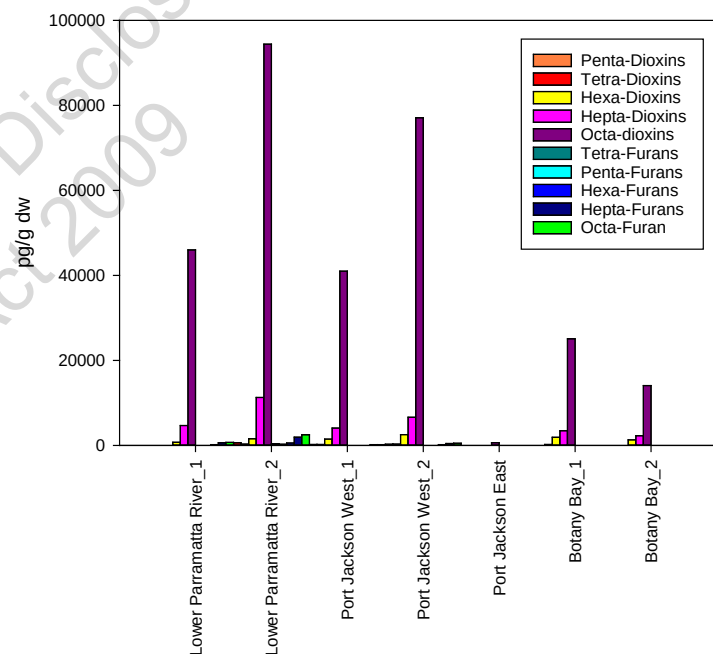
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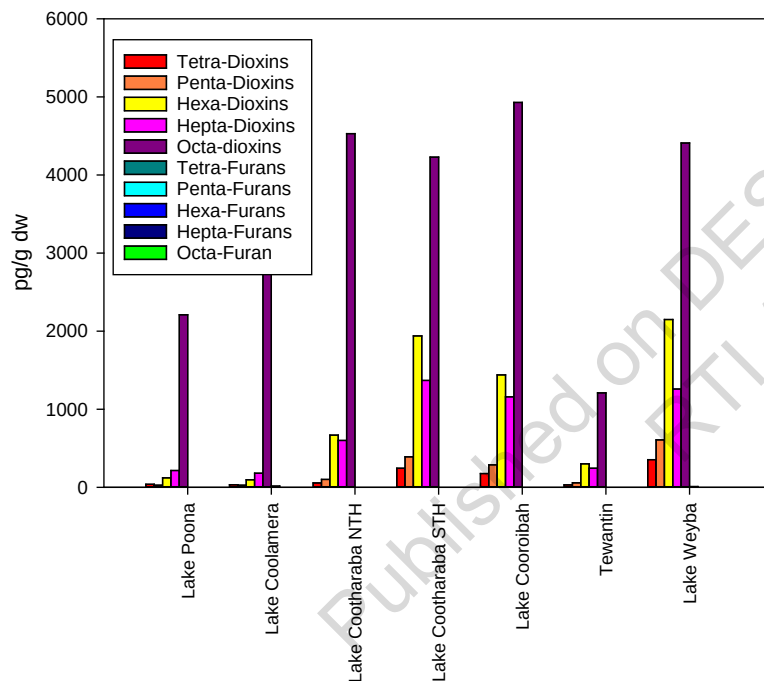
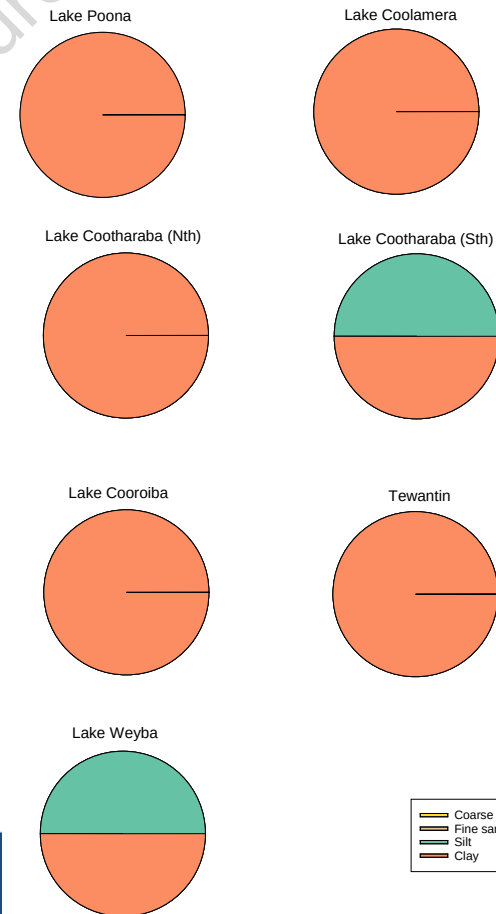
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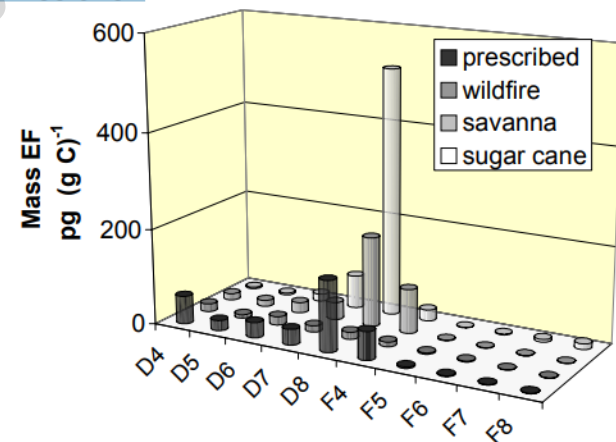


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Dioxin Assessment
Noosa River Catchment

Prepared by: Environmental Monitoring and Assessment Sciences, Department of Environment and Science

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December 2020

Executive Summary

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1 Introduction

Dioxins are ubiquitous persistent organic pollutants (POPs). The term 'dioxins' is often used as short hand to refer to the family of related compounds polychlorinated dibenzo para dioxins (PCDDs or dioxins) and polychlorinated dibenzofurans (PCDFs or furans). Dioxins are formed by combustion process (e.g. bushfires, sugar cane burns and motor vehicle emissions) as well as being a bi-products of manufacturing (such as the production of pesticides) (REF), and have also been found as natural component in clays (REF). Dioxins are predominantly insoluble in water (Ref), and are generally associated with sediments and accumulate in the fatty tissue of biota (ref). More than 90 per cent of human exposure is through food, mainly meat and dairy products, fish and shellfish (WHO).

Concerns have been raised by members of the Noosa community that historical usage of the pesticide 2,4-D in the forestry industry has contaminated the Noosa Catchment with 2,3,7,8- tetrachlorodibenzo para dioxin (TCDD). TCDD is considered to be the most toxic of the dioxin family (REF). In response to these concerns the Queensland Government undertook a water, sediment and biota survey in the Noosa River area in order to assess whether dioxin contamination is present in the area.

2 Site Selection

Five sites downstream of historic forestry in the Noosa Catchment were chosen for sediment sampling (Figure One):

- Two sites in Lake Cootharaba (Lake Cootharaba North, Lake Cootharaba South)
- One site in Lake Cooloomirah
- One site at Doonella Lake (Tewantin)
- One site at Lake Weyba.

Two additional control sites in the Coolool National Park (Figure Two) were also selected. Lakes were chosen as they are likely to be sinks for sediments.



Figure Two: Control sites in the Cooloolo National Park

3 Sampling Methodology

3.1 Sediment

Sediment sampling occurred in February 2020. Sediments were collected in the same manner as outlined in the National Dioxin Program's *Dioxins in Aquatic Environments in Australia* (Mueller et al. 2004). Ten samples were collected at each site using a standardised coring device comprised of an aluminium tube (15cm length, 2.8cm diameter) attached to the corer. The ten samples were collected in a triangular formation and were approximately 25m apart. After collection the samples were composited. At three sites samples were split into three, with blind duplicates sent to the main analytical laboratory (Australian Laboratory Services) and triplicates sent to a secondary laboratory (National Measurement Institute) as part of quality control measures. Both these laboratories are National Association of Testing Authorities (NATA) accredited for dioxin analysis in sediment. As well as dioxins, particle size distribution and total organic carbon analysis were undertaken on each sample at the Chemistry Centre, Department of Environment and Science. **Only primary sample results were analysed for this report, however all results are presented in Appendix X.**

3.2 Biota

Biota were collected between in June 2020 and were filleted and composited prior to sending to NMI for analysis. Mullet, oyster and Mud crab were collected at a number of sites (Table 1). Edible portions of fish fillets were prepared for analysis, with scales removed but skin retained. Lipid concentrations were measured in all samples other than oysters, as there was not enough sample to undertake dioxin and lipid analysis.

Table 1: Species, location and composite numbers biota collected during the June 2020 biota survey for Human Health related Risk Assessment

Species	Location	Composite numbers
Mullet	Lake Weyba	Five fillets
Mullet	Lake Cootharaba	Four fillets
Oyster	Lake Cooroibah	Seven oysters
Oyster	Lake Weyba	Nine oysters
Mud crab	Lake Cootharaba	Flesh of two crabs

3.3 Water

Water samples were collected between the 17 and 19 November 2020 at Lake Weyba, Lake Cooroibah and Lake Cootharaba. Water was collected directly into the bottles provided by the laboratory and were delivered to the laboratory on 20 December 2020. The analytical laboratory for the water samples was ALS.

4 Results and Discussion

4.1 Water

4.2 Sediment

TCDD was not detected at five of the sites surveyed, but was found at around the limit of reporting at Lake Cootharaba - North (duplicates were <0.05 and 0.7 pg/g dw) and at in Lake Weyba (duplicates were 2.7 and 4.4 pg/g dw) (See Appendix One for all results). The overall concentrations of dioxins were higher in the areas downstream of old forestry Lake Cootharaba (north and south), Lake Cooroibah and Lake Weyba than at Lake Poona and Lake Coolamara (control sites) and Tewantin. There is no history of forestry or agriculture around Lake Weyba. Dioxin

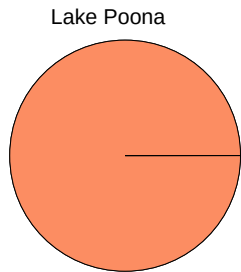
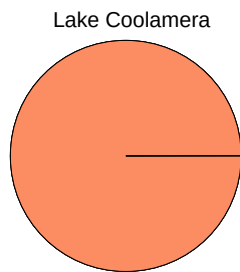
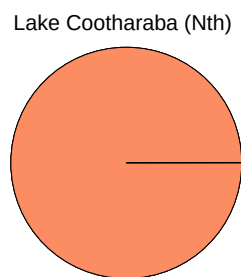
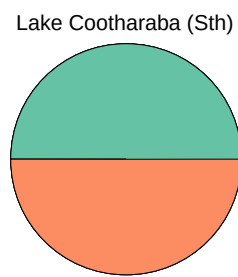
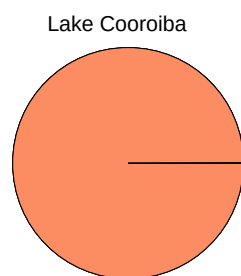
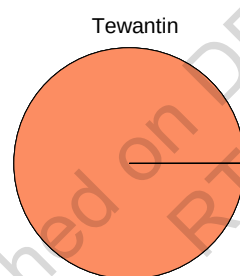
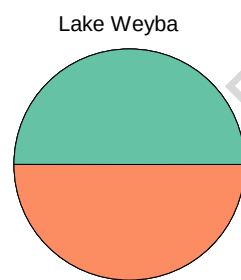
Dioxins are typically associated with organic matter (Technical report 11), and are **thought to** strongly bind to organic matter. However, no significant correlation was found between total organic matter in the sediment and dioxin concentration (as measured by total TEQ). **A strong and significant correlation was found between clay content and TEQ (Figure X).**

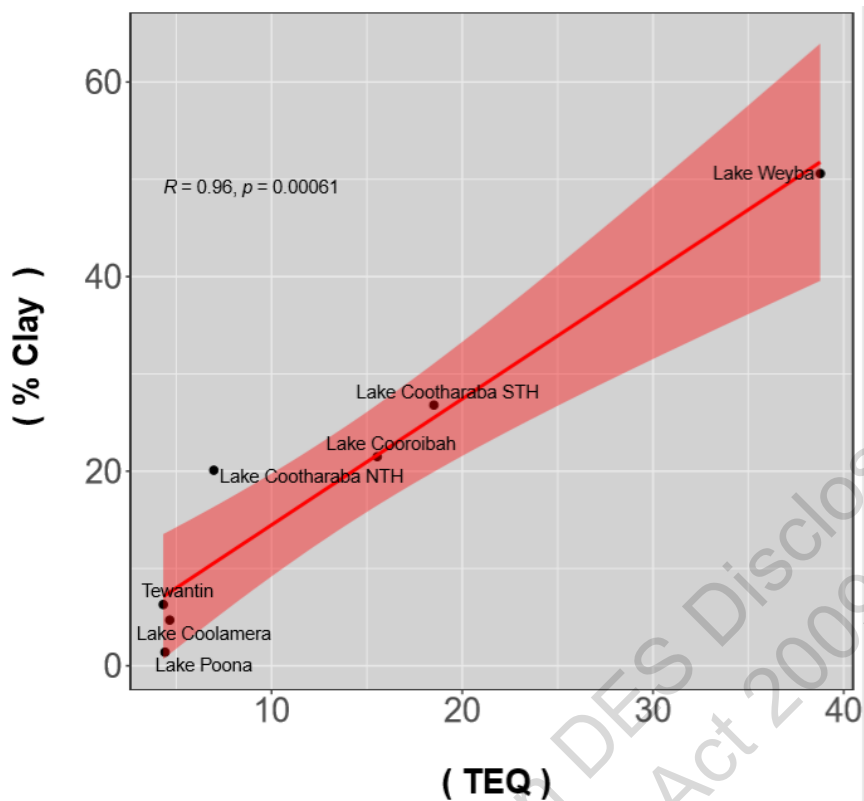
Commented [VS1]: This not usually found?

As the results in the national park sites were lower than those measured, a biota sampling program was initiated in order to assess the risk to human health from the consumption of seafood caught in the lakes.

Dioxins	Lake Poona	Lake Coolamara	Lake Cootharaba NTH	Lake Cootharaba NTH Duplicate	Lake Cootharaba STH	Lake Cootharaba STH Duplicate	Lake Cooroibah	Doonella Lake	Lake Weyba	Lake Weyba Duplicate
2378-TCDD	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	2.7	4.4
12378-PeCDD	<2.4	<2.4	<2.5	3.6	7.7	6.4	5.7	<2.5	19	44.6
123478-HxCDD	<2.4	<2.4	<2.5	3.9	7.2	5.9	5.6	<2.5	20.4	34.7
123678-HxCDD	<2.4	<2.4	4.4	5.5	13.4	11.4	11.4	2.6	29	44.2
123789-HxCDD	2.5	4.7	11.7	14.6	34.2	28.2	27.6	5.5	66.9	114
1234678-HpCDD	83.4	62.7	142	188	286	285	270	60.3	321	589
OCDD	2210	3050	4530	6080	4230	3640	4930	1210	4410	6410
2378-TCDF	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12378-PeCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
23478-PeCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
123478-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
123678-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
234678-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
123789-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
1234678-HpCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
1234789-HpCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
OCDF	<4.9	<4.9	<5.0	<5.0	<5.0	<5.0	<4.9	<4.9	<5.0	<5.0
Total TEQ ^A	1.75	2.01	4.39	10.44	17.31	14.86	14.43	1.77	37.81	76.06

^AWHO excluding LOD data (pg/g)





4.3 Biota

4.3.1 Dioxins and furan concentrations

The concentrations of TCDD and total dioxins normalised to lipid concentration (Table X). Overall, the concentrations of TCDD and total dioxins in oysters from Lake Cooroibah were in the same order of magnitude as that measured in Lake Weyba, and the concentrations of TCDD and total dioxins in mullet were the same order of magnitude in Lake Cootharaba and Lake Weyba.

	TCDD (pg/g lipid)	Total dioxins (pg/g lipid)
Cooroiba Oysters ^a	3913	57739
Weyba Oysters ^a	3008	44513
Weyba Mullet	134	439
Cootharaba Mullet	221	342
Cootharaba Mudcrab	65	1363

^a Lipid weight used was average of pacific oyster and pearl oyster as reported in Gauss 20??,

4.3.2 Assessment of the risk of consumption of biota from the Noosa area for Human Health

Queensland Health assessed the risk of consumption of biota collected from Lake Cootharaba, Lake Weyba and Lake Corroibah. The detailed assessment is presented in [Appendix A](#). In summary they found that:

Consumption of fish from the Noosa area sampled by DES is unlikely to result in an unacceptable risk to public health. Recreational fishers consuming relatively significant amounts over extended seasons may approach the recommended Tolerable Monthly Intake TMI. Seasonal consumption patterns, lifetime patterns of activity, and locality changes mitigate against the possibility of exceeding the dioxin tolerable intake guideline value.

This assessment has not considered the risks associated with commercial fishing. As the concentration in fish is below the FSANZ limit of 6 pg TEQ/g, the risk is not expected to be a concern.

5 Conclusions

Based on this study, the risks posed to human health by the dioxins measured in the Noosa River Lakes is considered to be low. Although the source of the dioxins is unknown at present, they are unlikely to be associated with pesticides or industrial activities due to the low concentrations of TCDD and furans present in the samples. Unusually, there is a high correlation between clay content and dioxins concentration in the area. Work is on-going to identify the source of the dioxins in the Noosa River area.

Dioxin Assessment
Noosa River Catchment

Prepared by: Environmental Monitoring and Assessment Sciences, Department of Environment and Science

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December 2020

Executive Summary

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1 Introduction

Dioxins are ubiquitous persistent organic pollutants (POPs). The term 'dioxins' is often used as short hand to refer to the family of related compounds polychlorinated dibenzo para dioxins (PCDDs or dioxins) and polychlorinated dibenzofurans (PCDFs or furans). Dioxins are formed by combustion process (e.g. bushfires, sugar cane burns and motor vehicle emissions) as well as being a bi-products of manufacturing (such as the production of pesticides) (REF), and have also been found as natural component in clays (REF). Dioxins are predominantly insoluble in water (Ref), and are generally associated with sediments and accumulate in the fatty tissue of biota (ref). More than 90 per cent of human exposure is through food, mainly meat and dairy products, fish and shellfish (WHO).

Concerns have been raised by members of the Noosa community that historical usage of the pesticide 2,4-D in the forestry industry has contaminated the Noosa Catchment with 2,3,7,8- tetrachlorodibenzo para dioxin (TCDD). TCDD is considered to be the most toxic of the dioxin family (REF). In response to these concerns the Queensland Government undertook a water, sediment and biota survey in the Noosa River area in order to assess whether dioxin contamination is present in the area.

2 Site Selection

Five sites downstream of historic forestry in the Noosa Catchment were chosen for sediment sampling (Figure One) :

- Two sites in Lake Cootharaba (Lake Cootharaba North, Lake Cootharaba South)
- One site in Lake Cooloomirah
- One site at Doonella Lake (Tewantin)
- One site at Lake Weyba.

Two additional control sites in the Coolool National Park (Figure Two) were also selected. Lakes were chosen as they are likely to be sinks for sediments.



Figure One: Sites in the Noosa River Catchment downstream of historical forestry.



Figure Two: Control sites in the Cooloolo National Park

3 Sampling Methodology

3.1 Sediment

Sediment sampling occurred in February 2020. Sediments were collected in the same manner as outlined in the National Dioxin Program's *Dioxins in Aquatic Environments in Australia* (Mueller et al. 2004). Ten samples were collected at each site using a standardised coring device comprised of an aluminium tube (15cm length, 2.8cm diameter) attached to the corer. The ten samples were collected in a triangular formation and were approximately 25m apart. After collection the samples were composited. At three sites samples were split into three, with blind duplicates sent to the main analytical laboratory (Australian Laboratory Services) and triplicates sent to a secondary laboratory (National Measurement Institute) as part of quality control measures. Both these laboratories are National Association of Testing Authorities (NATA) accredited for dioxin analysis in sediment. As well as dioxins, particle size distribution and total organic carbon analysis were undertaken on each sample at the Chemistry Centre, Department of Environment and Science. **Only primary sample results were analysed for this report, however all results are presented in Appendix X.**

3.2 Biota

Biota were collected between in June 2020 and were filleted and composited prior to sending to NMI for analysis. Mullet, oyster and Mud crab were collected at a number of sites (Table 1). Edible portions of fish fillets were prepared for analysis, with scales removed but skin retained. Lipid concentrations were measured in all samples other than oysters, as there was not enough sample to undertake dioxin and lipid analysis.

Table 1: Species, location and composite numbers biota collected during the June 2020 biota survey for Human Health related Risk Assessment

Species	Location	Composite numbers
Mullet	Lake Weyba	Five fillets
Mullet	Lake Cootharaba	Four fillets
Oyster	Lake Cooroibah	Seven oysters
Oyster	Lake Weyba	Nine oysters
Mud crab	Lake Cootharaba	Flesh of two crabs

3.3 Water

Water samples were collected between the 17 and 19 November 2020 at Lake Weyba, Lake Cooroibah and Lake Cootharaba. Water was collected directly into the bottles provided by the laboratory and were delivered to the laboratory on 20 December 2020. The analytical laboratory for the water samples was ALS.

4 Results and Discussion

4.1 Water

4.2 Sediment

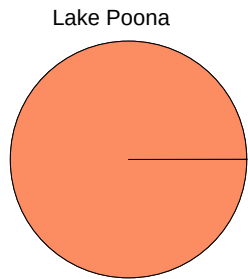
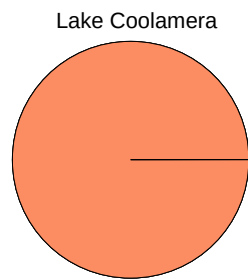
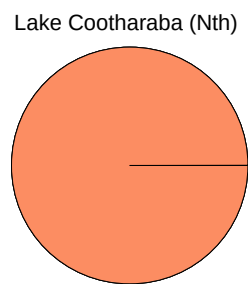
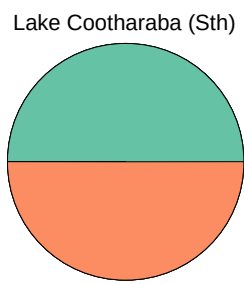
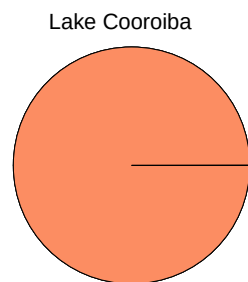
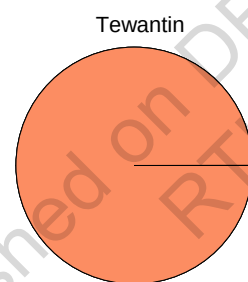
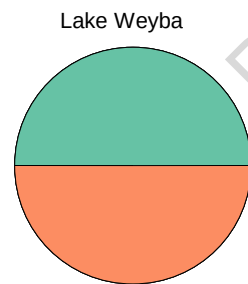
TCDD was not detected at five of the sites surveyed, but was found at around the limit of reporting at Lake Cootharaba - North (duplicates were <0.05 and 0.7 pg/g dw) and at in Lake Weyba (duplicates were 2.7 and 4.4 pg/g dw) (See Appendix One for all results). The overall concentrations of dioxins were higher in the areas downstream of old forestry Lake Cootharaba (north and south), Lake Cooroibah and Lake Weyba than at Lake Poona and Lake Coolamerra (control sites) and Tewantin. There is no history of forestry or agriculture around Lake Weyba. Dioxin

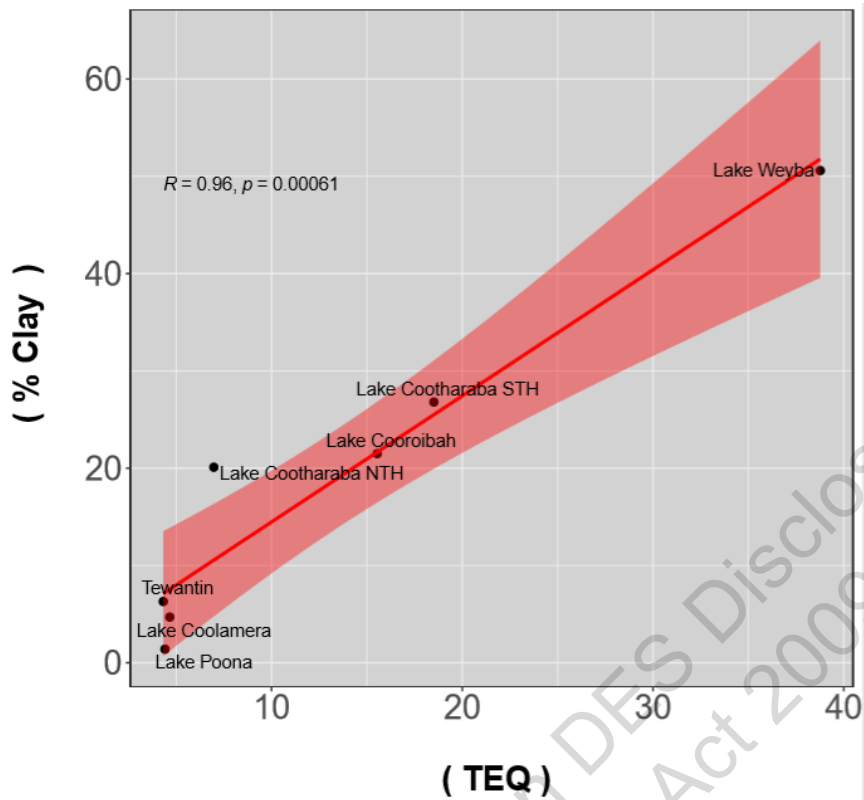
Dioxins are typically associated with organic matter (Technical report 11), and are **thought to** strongly bind to organic matter. However, no significant correlation was found between total organic matter in the sediment and dioxin concentration (as measured by total TEQ). **A strong** and significant correlation was found between clay content and TEQ (Figure X).

Commented [VS1]: This not usually found?

As the results in the national park sites were lower than those measured, a biota sampling program was initiated in order to assess the risk to human health from the consumption of seafood caught in the lakes.

	This study						
	Lake Poona	Lake Coolamara	Lake Cootharaba NTH	Lake Cootharaba STH	Lake Cooroiabah	Doonella Lake	Lake Weyba
Dioxins							
2378-TCDD	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7
12378-PeCDD	<2.4	<2.4	<2.5	7.7	5.7	<2.5	19
123478-HxCDD	<2.4	<2.4	<2.5	7.2	5.6	<2.5	20.4
123678-HxCDD	<2.4	<2.4	4.4	13.4	11.4	2.6	29
123789-HxCDD	2.5	4.7	11.7	34.2	27.6	5.5	66.9
1234678-HpCDD	83.4	62.7	142	286	270	60.3	321
OCDD	2210	3050	4530	4230	4930	1210	4410
2378-TCDF	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12378-PeCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
23478-PeCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
123478-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
123678-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
234678-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
123789-HxCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
1234678-HpCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
1234789-HpCDF	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
OCDF	<4.9	<4.9	<5.0	<5.0	<4.9	<4.9	<5.0
Total TEQ WHO excluding LOD (pg/g)	1.75	2.01	4.39	17.31	14.43	1.77	37.81





4.3 Biota

4.3.1 Dioxins and furan concentrations

The concentrations of TCDD and total dioxins normalised to lipid concentration (Table X). Overall, the concentrations of TCDD and total dioxins in oysters from Lake Cooroibah were in the same order of magnitude as that measured in Lake Weyba, and the concentrations of TCDD and total dioxins in mullet were the same order of magnitude in Lake Cootharaba and Lake Weyba.

	TCDD (pg/g lipid)	Total dioxins (pg/g lipid)
Cooroiba Oysters ^a	3913	57739
Weyba Oysters ^a	3008	44513
Weyba Mullet	134	439
Cootharaba Mullet	221	342
Cootharaba Mudcrab	65	1363

^a Lipid weight used was average of pacific oyster and pearl oyster as reported in Gauss 20??,

4.3.2 Assessment of the risk of consumption of biota from the Noosa area for Human Health

Queensland Health compared the biota results assessed the biota data and the detailed assessment is presented in [Appendix A](#). In summary they found that:

Consumption of fish from the Noosa area sampled by DES is unlikely to result in an unacceptable risk to public health. Recreational fishers consuming relatively significant amounts over extended seasons may approach the recommended Tolerable Monthly Intake TMI. Seasonal consumption patterns, lifetime patterns of activity, and locality changes mitigate against the possibility of exceeding the dioxin tolerable intake guideline value.

This assessment has not considered the risks associated with commercial fishing. As the concentration in fish is below the FSANZ limit of 6 pg TEQ/g, the risk is not expected to be a concern.

5 Conclusions

Based on this study, the risks posed to human health by the dioxins measured in the Noosa River Lakes is considered to be low. Although the source of the dioxins is unknown at present, they are unlikely to be associated with pesticides or industrial activities due to the low concentrations of TCDD and furans present in the samples. Unusually, there is a high correlation between clay content and dioxins concentration in the area. Work is on-going to identify the source of the dioxins in the Noosa River area.

Preliminary Results Stage One Dioxin Survey in Noosa Area

Water Quality and Investigations

Suzanne Vardy

Introduction

This document outlines the Stage One proposal for sampling the dioxin TCDD in the Noosa River. There have been concerns raised by members of the Noosa community that historical usage of the pesticide 2,4-D and 2,4,5-T in the forestry industry in the Noosa catchment has contaminated the river with TCDD. There is some evidence that TCDD is a contaminant in 2,4-D and is a known contaminant in 2,4,5-T. TCDD cannot be analysed on its own, and so a standard suite of dioxins and furans will be analysed.

Dioxins and furans are persistent organic pollutants (POPs) and are ubiquitous. They are formed by combustion process (e.g. bushfires, sugar cane burns and motor vehicle emissions) as well as being bi-products of manufacturing (such as the production of pesticides). Dioxins are insoluble in water, and so will be found in sediments and biota in the aquatic environment. The National Dioxin Survey found the presence of dioxins in every sediment sample that was tested (Müller et al. 2004).

As there are no guidelines for TCDD in sediments, the best way to assess the results from this survey is to compare the dioxin results to those reported in the National Dioxin Program's *Dioxins in Aquatic Environments in Australia* (Müller et al. 2004). Therefore, the sampling design and methodology outlined in Müller et al. (2004) will be followed.

Noosa council have been using methoprene for many years to control mosquitos, and the use of this chemical is also potentially of concern. Methoprene breaks down rapidly, is only sparingly soluble in water and is likely to bind to sediments. Therefore, the analysis of methoprene in sediments is also going to be undertaken during this survey.

Sampling Sites

Five sites downstream of historic forestry in the Noosa River were chosen (Figure One) for sediment sampling. Two additional control sites in the Cooloola National Park (Figure Two) were also selected. Lakes were chosen as these are likely to be sinks for contaminated sediments.

Sampling Strategy

Sampling was the same as that carried out 'Dioxins in Aquatic Environments in Australia' (Müller et al. 2004) technical report. Ten samples were collected at each site using standardised aluminium tubes (15 cm length, 2.8 cm diameter) attached to a sediment coring device. This method ensures the collection of sediment from a shallow profile (10 cm depth) of surface sediment. The samples were composited prior to sending them to the laboratory. The ten samples were collected in a triangular formation and will be approximately 25 m apart. At three sites samples were split and sent as blind duplicates to the main analytical laboratory, and a further split sample was sent to a second laboratory. As well as dioxins, methoprene, particle size distribution (PSD), and total organic carbon samples were collected for analysis. At the time of writing, PSD and TOC results were outstanding.

References

Müller J, Muller R, Goudkamp K, Shaw M, Mortimer M, Haynes D, Paxman C, Hyne R, McTaggart A, Burniston D, Symons R & Moore M 2004, *Dioxins in Aquatic Environments in Australia*, National Dioxins Program Technical Report No. 6, Australian Government Department of the Environment and Heritage, Canberra.



Figure One: Sites in the Noosa River Catchment downstream of historical forestry.

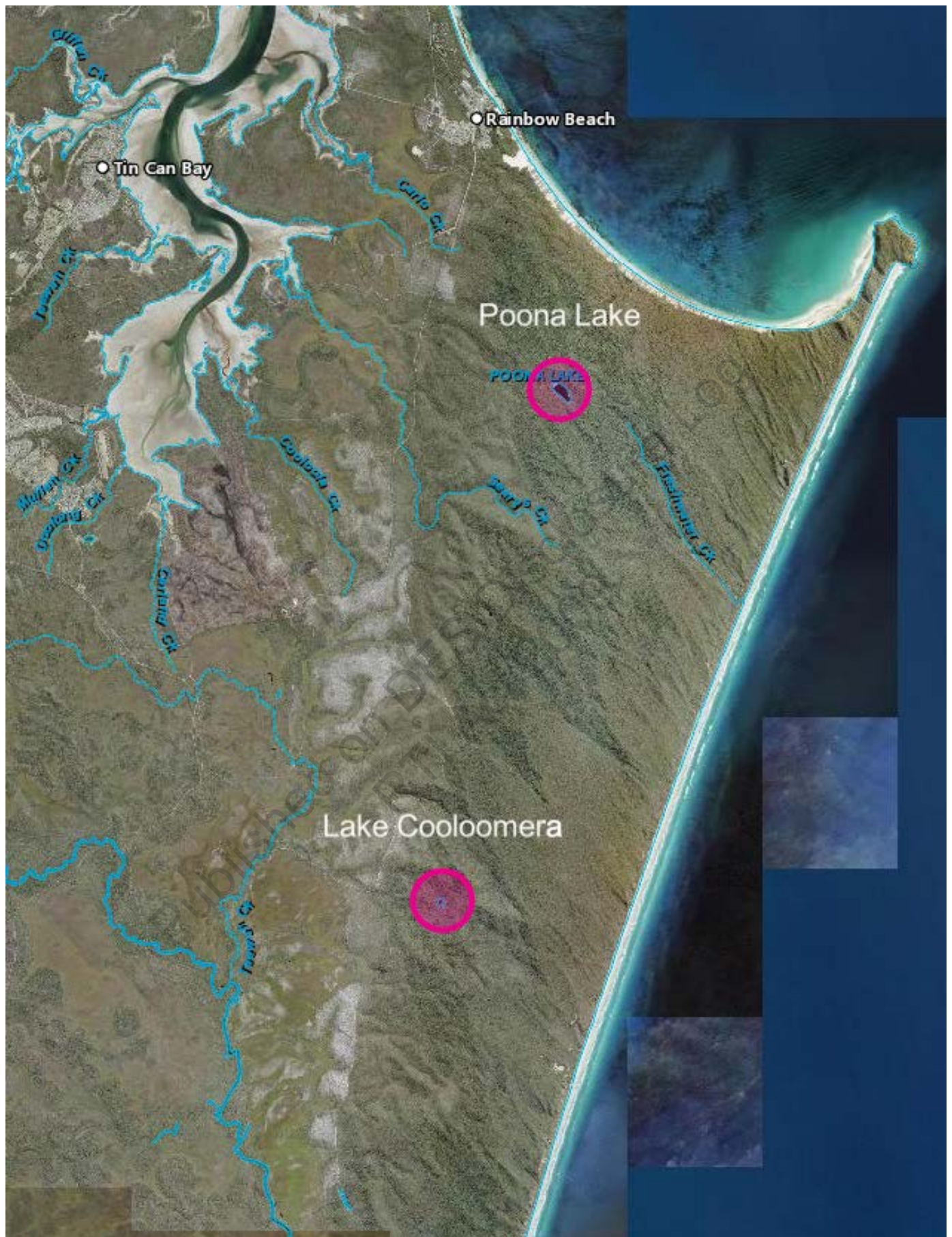


Figure Two: Control sites in the Cooloolo National Park

Table One: Budget summary

	No. Samples	Cost per sample	Total cost
Analysis			
Dioxin Analysis Laboratory One	10	850	8500
Dioxin Analysis Laboratory Two	3	1521	4563
PSD Analysis	10	36	360
TOC Analysis	10	21	210
s-methoprene Laboratory One	10	40	400
s-methoprene Laboratory Two	1	200	200
Accommodation (three nights, two people)			
Travel allowance			800
Hotels			1200
Grand total			\$16, 233

Agreement

Title	Position	Signature	Date
Liz Young	Director, Sustainable Environment		
Christian Witte	Director, EMAS		

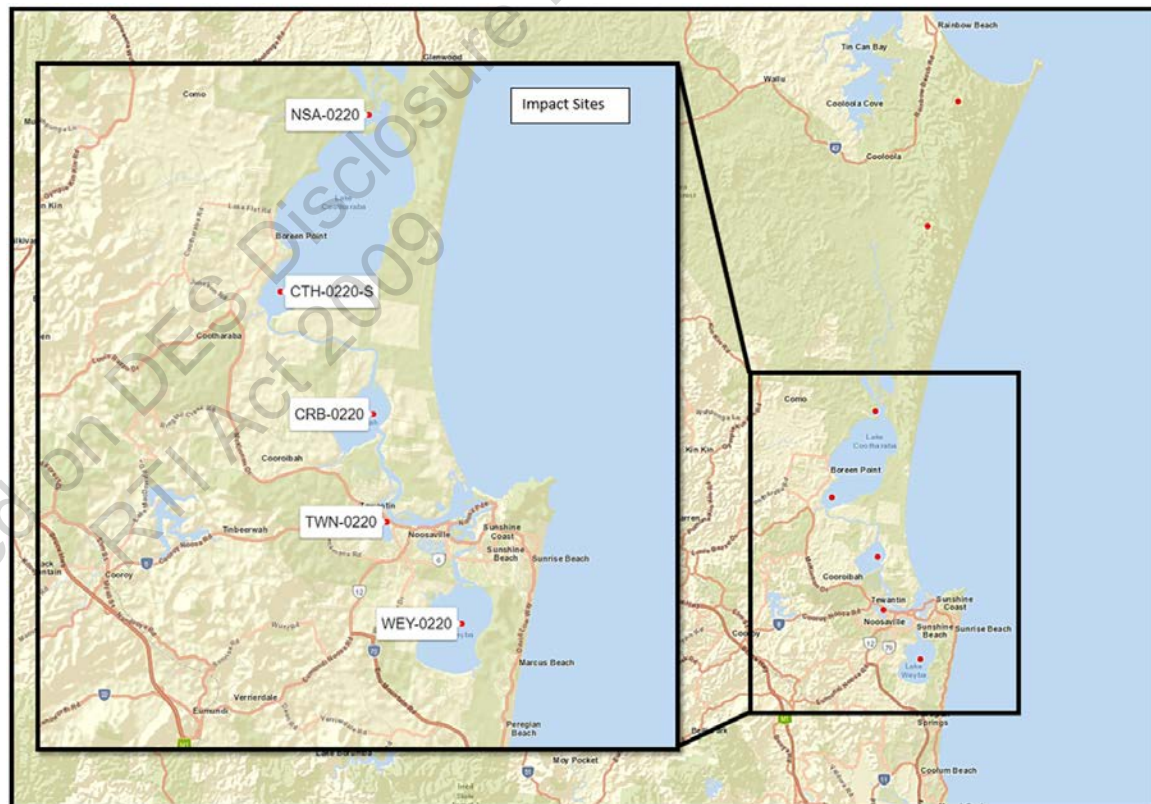


Noosa Catchment Sediment Survey

Dioxins – February 2020

Sampling sites – Potentially impacted forestry

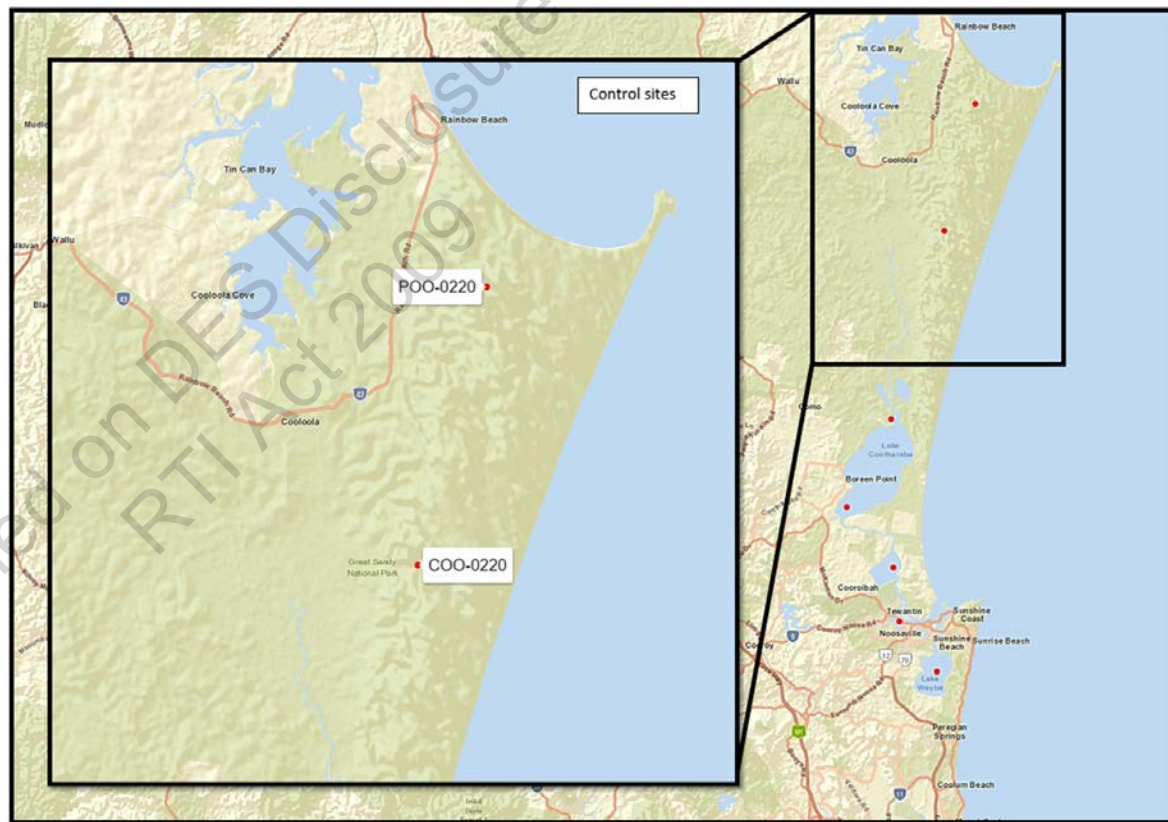
Lake Weyba (WEY-0220)
Lake Cooroibah (CRB -0220)
Lake Cootharaba Nth (NSA-0220)
Lake Cootharaba Sth (CTH-0220-S)



Sampling sites - Control

Lake Poona (POO-0220)

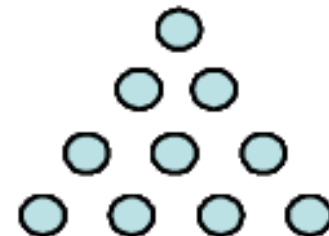
Lake Coolamerra (COO-0220)



Sampling Methodology



- Sampling followed *Dioxins in Aquatic Environments in Australia* (Müller et al. 2004) technical report.
- Ten samples were collected at each site at a 10 cm depth in a triangular formation and composited.
- Samples were analysed by ALS and three duplicates by NMI.



Results

			National Dioxins Survey Industrial Sites			Control Sites		Potentially Impacted Sites				
	<i>Dioxins - Individual</i>	Units	Lower Brisbane	Port Jackson	Botany Bay	Lake Poona	Lake Coolamerra	Lake Cootharaba North	Lake Cootharaba South	Lake Cooroibah	Tewantin	Lake Weyba
Dioxins	2378-TCDD	pg/g	0.67	39	2.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7
	12378-PeCDD	pg/g	<0.6	5.9	6.1	<2.4	<2.4	<2.5	7.7	5.7	<2.5	19
	123478-HxCDD	pg/g	1.5	16	14	<2.4	<2.4	<2.5	7.2	5.6	<2.5	20.4
	123678-HxCDD	pg/g	5.2	36	29	<2.4	<2.4	4.4	13.4	11.4	2.6	29
	123789-HxCDD	pg/g	5.4	38	41	2.5	4.7	11.7	34.2	27.6	5.5	66.9
	1234678-HpCDD	pg/g	130	1200	800	83.4	62.7	142	286	270	60.3	321
	OCDD	pg/g	3740	41000	25100	2210	3050	4530	4230	4930	1210	4410
Furans	2378-TCDF	pg/g	1.2	4.8	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	12378-PeCDF	pg/g	<0.5	1.9	2.2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	23478-PeCDF	pg/g	0.84	4.8	32	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123478-HxCDF	pg/g	<1	5.9	<1	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123678-HxCDF	pg/g	1.7	3.5	2.2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	234678-HxCDF	pg/g	0.58	3.7	1.7	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	123789-HxCDF	pg/g	0.31	0.5	<0.3	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	1234678-HpCDF	pg/g	14	37	22	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	1234789-HpCDF	pg/g	1.5	5.1	<2	<2.4	<2.4	<2.5	<2.5	<2.5	<2.5	<2.5
	OCDF	pg/g	61	220	42	<4.9	<4.9	<5.0	<5.0	<4.9	<4.9	<5.0
	Total TEQ WHO 0.5LOD	pg/g	4.9	75	31	4.41	4.66	6.97	18.51	15.54	4.32	38.77

Why we think its from fire.....

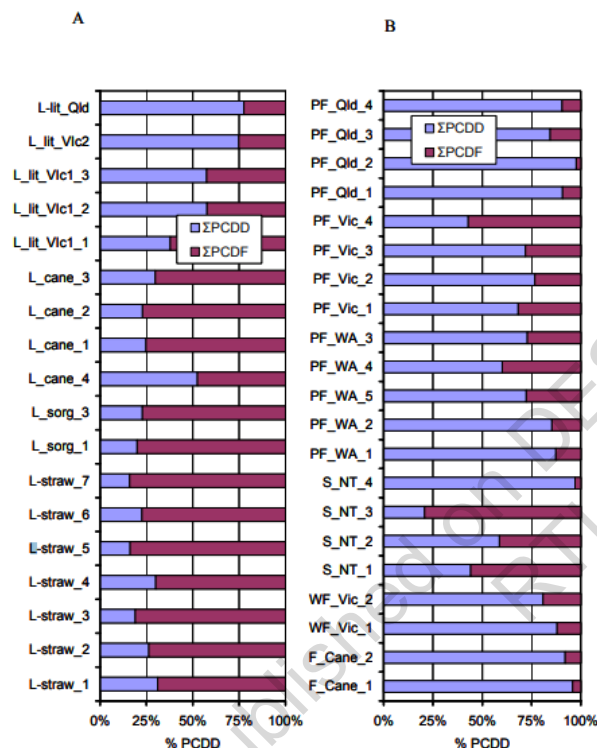


Figure 3.5. The relative contribution of PCDD to total PCDD/PCDF mass.

A. Laboratory fire samples
B. Field samples.

In a field study of bushfires, Meyer et al (2004) a low furan to dioxin ratio in air and ash, which is consistent with our results (almost 100% dioxins)

Dioxins emissions from bushfires in Australia (2004)

Technical report No. 1

Dr Carl Meyer, Dr Tom Beer and Dr Jochen Müller

Department of the Environment and Heritage, May 2004

• <https://www.environment.gov.au/system/files/pages/626f9956-95df-4a7b-8fed-6728c18f626a/files/report-1b.pdf>

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Release



Biota Survey to follow up

- Mullet, oysters, mudcrab in Lake Weyba, Lake Cootharabah, and Lake Cooroibah.
- Last week of May.
- Results will be back five or six weeks after this (COVID 19 slowing laboratories down).





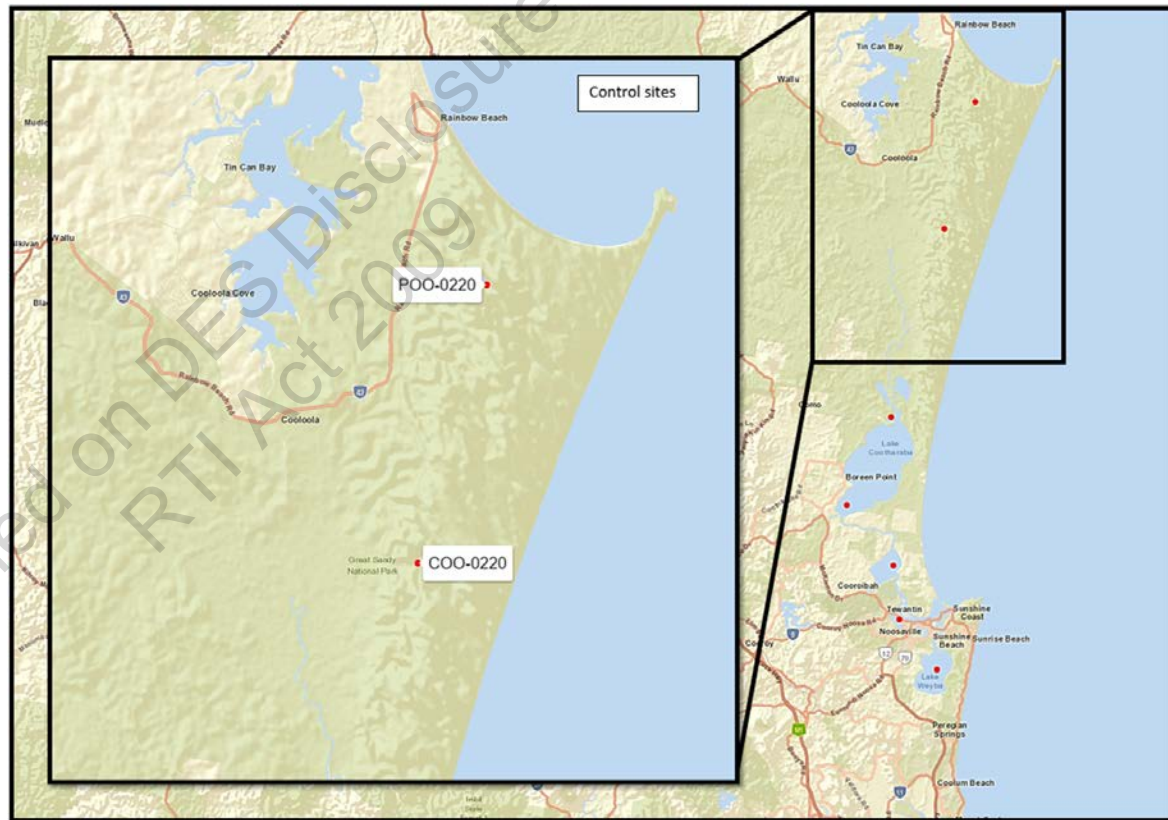
Noosa River Sediment Survey

Dioxins – February 2020

Sampling sites - Control

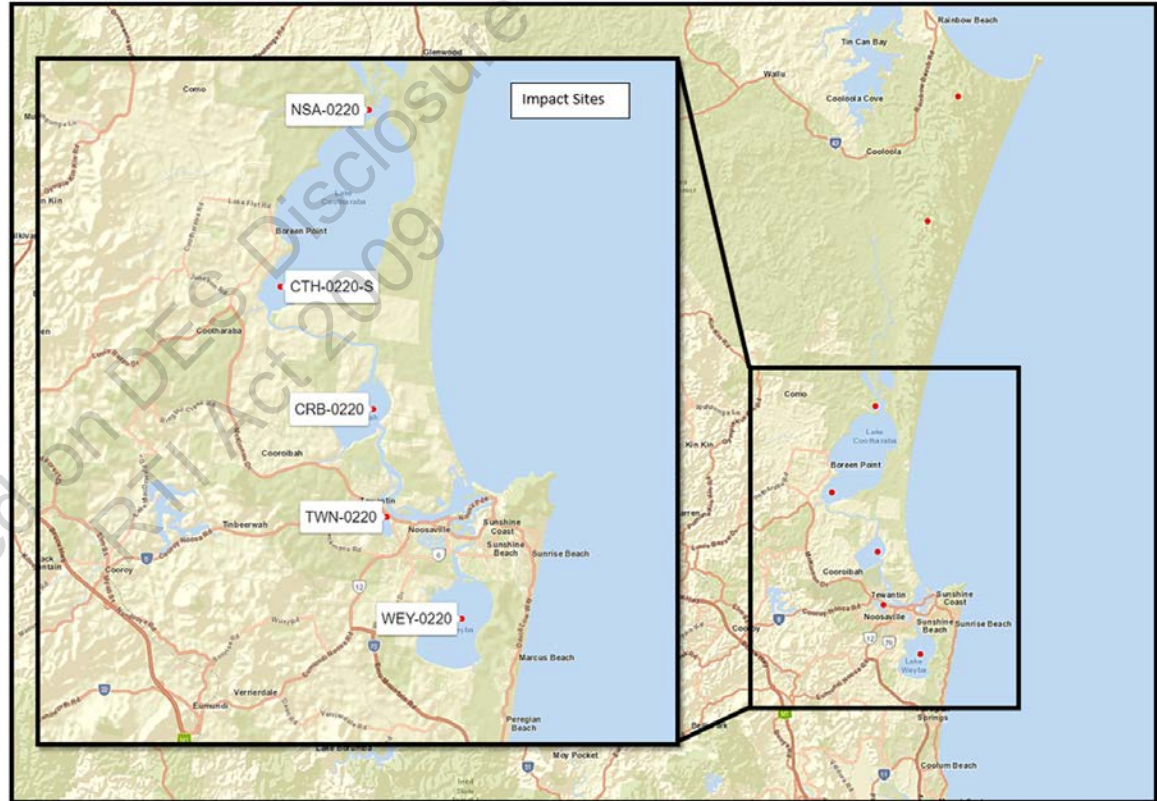
Lake Poona (POO-0220)

Lake Coolamerra (COO-0220)



Sampling sites – Potentially impacted forestry

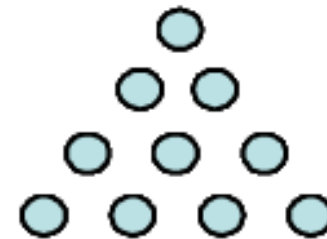
Lake Weyba (WEY-0220)
Lake Cooroibah (CRB -0220)
Lake Cootharaba Nth (NSA-0220)
Lake Cootharaba Sth (CTH-0220-S)



Sampling Methodology



- Sampling followed *Dioxins in Aquatic Environments in Australia* (Müller et al. 2004) technical report.
- Ten samples were collected at each site at a 10 cm depth in a triangular formation and composited.
- Samples were analysed by ALS and three duplicates by NMI.



Results

			National Dioxins Survey Industrial Sites			Control Sites		Potentially Impacted Sites				
	<i>Dioxins - Individual</i>	Units	Lower Brisbane	Port Jackson	Botany Bay	Lake Poona	Lake Coolamerra	Lake Cootharaba North	Lake Cootharaba South	Lake Cooroibah	Tewantin	Lake Weyba
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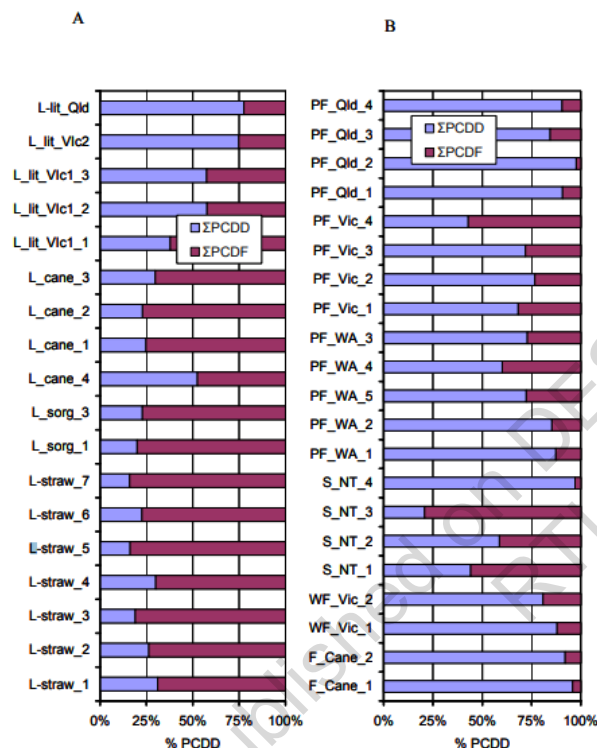


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A. Laboratory fire samples

B. Field samples.

Meyer et al (2004) found in a field study of bushfires there was a low furan to dioxin ratio in air and ash, what we have found

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