Government of **Western Australia**
Department of **Water and Environmental Regulation**

Pollution Response Unit

Action Report

Cleanaway Materials Recovery Facility Fire Hyne Road, South Guildford 25/11/19

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Month 2019

Background

Department of Water and Environmental Regulation – Pollution Response Unit

Under the provisions of the State Emergency Management Plan, the Department of Water and Environmental Regulation (DWER) is required to provide emergency response environmental monitoring for discharges of hazardous materials (HAZMAT) and provide advice on risks to public health and the environment (State Emergency Management Plan).

DWER is on direct-callout readiness for the Department of Fire Emergency Services (DFES) and other emergency services to respond to emergency call outs.

DWER operates a Pollution Response Unit (PRU) that has five full time officers and a Senior Manager. It also has several officers from other areas of DWER who are trained to respond to pollution incidents. The officers are trained by the United States Environmental Protection Agency as 'HAZMAT Specialists' to be able to carry out emergency response air monitoring.

DWER has a range of instruments that provide 'real-time' results in the field for a range of air toxics (gases) and particulates.

The Facility

The Cleanaway Materials Recovery Facility (MRF), which opened in 2017, is located at Lot 62 Hyne Road, South Guildford. The facility is licensed under Schedule 1 of the *Environmental Protection Regulations 1987* as Category 61A (solid waste facility) and 62 (solid waste depot). The facility was designed to accept mixed recyclables and separate them using a mechanical system augmented by human 'pickers'. Part of the process involved baling paper and cardboard, then stockpiling the bales internally prior to transport off site.

Plastic material, including HDPE, plastics bags, and other mixed plastics were pre-sorted, then baled and stored inside the Finished Product Area.

Response

Notification and Deployment

At 09:26 hrs, Monday 25 November 2019, DFES requested DWER's PRU to respond to a 'Fifth Alarm' structure fire at the Cleanaway MRF in South Guildford. Three Pollution Response vehicles and five officers were immediately deployed as a 'Code 3' (highest level of response for DWER PRU) emergency response. Officers arrived on scene approximately 30 minutes after the DFES notification and immediately deployed downwind to conduct air monitoring. A dense grey smoke plume was being emitted when officers arrived (Appendix 1 Photo 1).

Incident Action Plan (IAP)

DWER's Incident Action Plan:

1. Protect public health from emissions and airborne contaminants by monitoring the air downwind to provide advice to DFES, and
2. Protect the environment from discharges of wastewater (firefighting run off) by assessing run off and advising DFES on protective actions.

1) Emergency Response Air Monitoring

PRU officers were deployed in two vehicles downwind to carry out emergency response air monitoring with the immediate priority given to the nearest residential areas west and east of the Swan River located in the suburbs of South Guildford and Bassendean.

At approximately 10:30 hrs, PRU officers conducted air monitoring within the industrial area adjacent to the fire. As a result of the readings, advice was provided to DFES for the evacuation of the immediate industrial area.

At approximately 11:00 hrs, it is understood that the fire spread to the plastic material causing a significant increase in the heat of the fire and the emission of a dense black smoke plume which was later visible from Rottnest Island (Photos 2 and 3).

DFES deployed an 'Air Intelligence' helicopter which provided key observational information, including smoke plume direction and potential ground impact to the DWER Pollution Response Commander. This assisted officers with determining and prioritising air monitoring locations across the surrounding suburbs (Photo 4).

Air monitoring was conducted at additional sensitive receptors which included Hillcrest Primary School, Bassendean Primary School, Guildford Primary School and Eden Hill Primary School. Results and observations were provided to DFES, Department of Education and Department of Health.

Mobile air monitoring continued throughout the day and into the night with the locations changing as the wind changed direction and the plume cooled and dropped to ground level (Photo 5).

Between Tuesday and Saturday, DWER PRU air monitoring was undertaken during day time operations whilst machinery actively removed smouldering waste from the facility for DFES to extinguish.

Air monitoring guidelines, locations and readings for the duration of the fire are provided in Appendix 2, 3 and 4 respectively.

An interactive map (Map 1) is available at this website:
https://dow.maps.arcgis.com/apps/webappviewer/index.html?id=0ca6d0d296044579a09470b527b5f5c2

2) Firefighting Run-off Water Management

Firefighting run-off water was leaving the site through the Hyne Rd stormwater drainage network (Appendix 5). As a result DWER PRU and the City of Swan commenced an assessment to determine the connectivity and direction of flow path to inform decision making around containment and recovery of impacted firefighting run-off. It was identified that the stormwater drains from the fire entered an open drainage system that eventually led to the Swan River approximately 1 km away. This prompted immediate mitigating action involving a temporary dam (earth bund) being installed by the City of Swan within the open drain (Photo 6).

DWER PRU requested Cleanaway to commence the recovery of firefighting runoff from the stormwater drainage network (Photo 7).

Due to the high volume of water being applied to the fire, DWER had concerns that the dam would eventually overflow as vacuum tankers had approximately a two hour turnaround time (Henderson).

Consequently, DWER PRU then facilitated the approval for Cleanaway to dispose of the firefighting run off water to the Water Corporation's Bridge Street Sewage Pump Station located approximately 1.5 km away.

Despite recovery actions and a change to disposal locations arrangements, at around 9:20pm, PRU officers observed firefighting run off water overflowing from a spoon drain onto Great Eastern Hwy at the rear of 8 Anvil Close, and running down the road into a stormwater drain (Photo 8). A small amount of foam was visible and the odour was consistent with fire water runoff.

On Tuesday 26 November 2019, further preventative measures were undertaken with Department of Biodiversity, Conservation and Attractions (DBCA), River and Estuaries officers installing booms at the stormwater discharge point near the Swan Estuary as well as the entry point into the river (Photo 9). Hay bales were also sourced and positioned within the open stormwater drain as a contingency for the filtration of particulates should the dam be compromised (Photos 10 & 11).

DWER PRU continued to oversee Cleanaway's recovery efforts involving the containment, recovery and disposal of the firefighting run off. Information provided by Cleanaway suggest the recovery efforts continued through to 17 December.

Cleanaway has advised that it has pumped out more than four million litres of water from the drainage system since the fire. It is estimated that around 200,000 litres of firefighting run off water potentially entered the Swan Estuary.

Water sampling

On the 26 November DBCA Rivers and Estuaries Officers collected samples of water flowing from the Hyne Road drain at the opening of the culvert into the Swan Estuary (Sample 1) and within the estuary (Sample 2) 5-10 metres from the discharge point (Map 2). The certificate of analysis for this sampling is located in Appendix 5.

On the 27 November DWER PRU sampled pooled firewater runoff immediately adjacent (upstream) to the blocked drain. The certificate of analysis for this sampling is located in Appendix 6.

DBCA Rivers and Estuaries in consultation with DWER Aquatic Science have prepared a "Statement of environmental impact to the Swan and Canning estuary from the South Guilford Cleanaway facility fire". This statement is located in Appendix 7.

Swab sampling

PRU officers collected swab samples from five houses that were identified to be in the path of the plume as it elevated above the suburb of South Guildford. A background swab was also obtained. Samples were submitted to the Chemistry Centre for analysis for a suite of anolytes including dioxins. The results are expected to be available by late-January.

On the afternoon of Friday 29 November, PRU officers was advised by a resident that some fibrous material had been found in the street. The officer visually assessed it and it appeared to be the remnants of burnt alsynite (fibreglass roofing sheets) that were likely to have originated from the Cleanaway fire. Cleanaway was requested to carry out a clean-up of the area.

List of Maps:

Map 1) Air Monitoring Locations

An interactive map is available at this website:
https://dow.maps.arcgis.com/apps/webappviewer/index.html?id=0ca6d0d296044579a09470b527b5f5c2

Map 2) Cleanaway Fire Drainage Map (Next page)

List of Appendices:

Appendix 1) Photos

Appendix 2) Acute Emergency Guideline Levels

Appendix 3) Department of Health Particulate Guideline

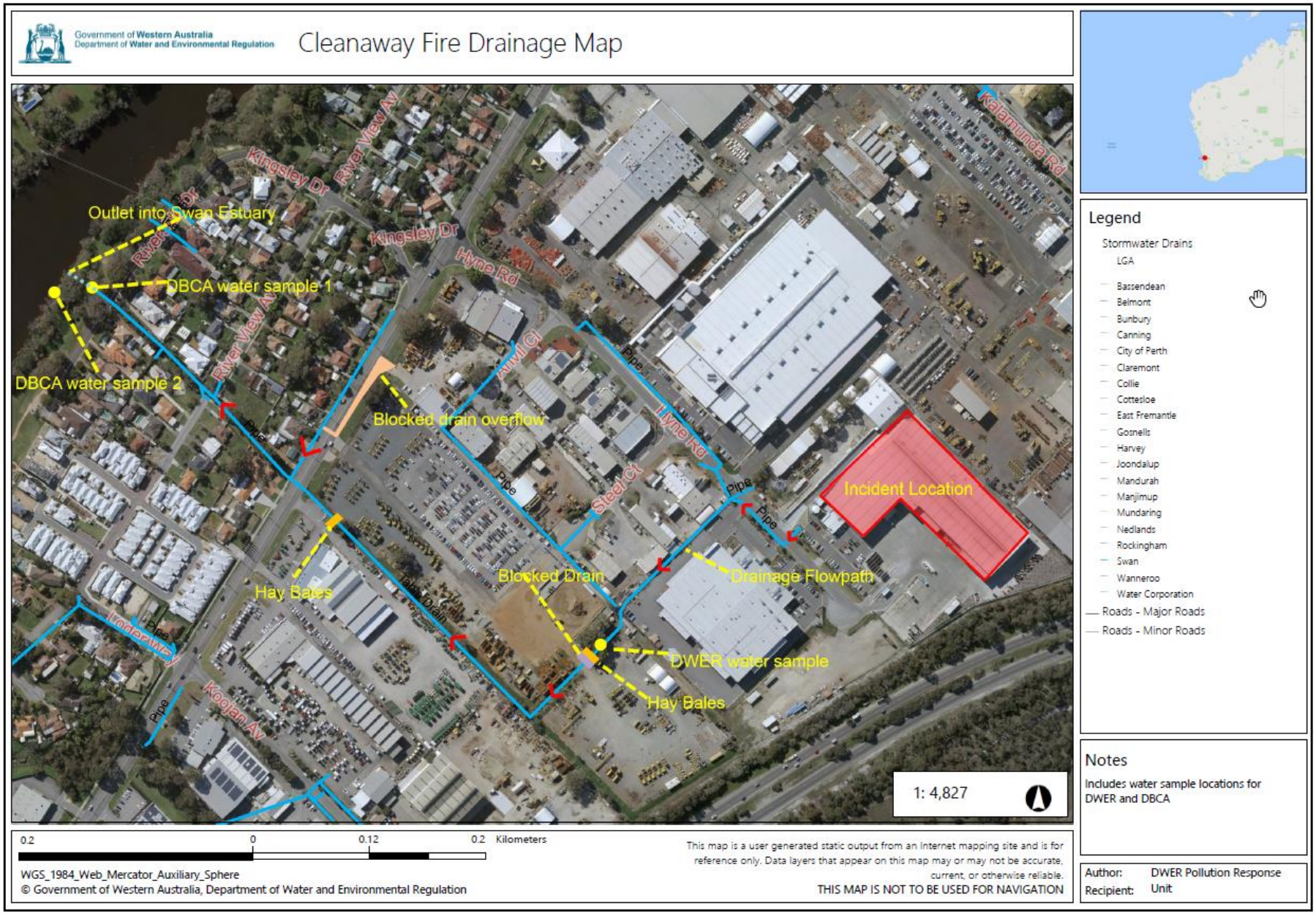
Appendix 4) Air Monitoring Results

Appendix 5) DBCA Water Sample Results

Appendix 6) DWER Water Sample Results

Appendix 7) Fire water run off Impact Statement

End


Government of Western Australia
Department of Water and Environmental Regulation
Cleanaway Fire Drainage Map
Outlet into Swan Estuary
DBCA water sample 1
DBCA water sample 2
Blocked drain overflow
Incident Location
Blocked Drain
Drainage Flowpath
DWER water sample
Hay Bales
Hay Bales
Kingsley Dr
River View Av
Hyne Rd
Steel Ct
Koojan Av
Kalamunda Rd
Pipe
1: 4,827
Legend
Stormwater Drains
LGA
Bassendean
Belmont
Bunbury
Canning
City of Perth
Claremont
Collie
Cottesloe
East Fremantle
Gosnells
Harvey
Joondalup
Mandurah
Manjimup
Mundaring
Nedlands
Rockingham
Swan
Wanneroo
Water Corporation
Roads - Major Roads
Roads - Minor Roads
Notes
Includes water sample locations for DWER and DBCA
0.2 0 0.12 0.2 Kilometers
WGS_1984_Web_Mercator_Auxiliary_Sphere
© Government of Western Australia, Department of Water and Environmental Regulation
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION
Author: DWER Pollution Response
Recipient: Unit

Appendix 1: **Photos**

Photo 1 – Cleanaway fire during paper/cardboard impacts.

Photo 2 - Cleanaway Fire when impact to plastics commenced.

Photo 3 – Smoke plume from Rottnest Island, WA.

Photo 4 – DWER officers' air monitoring during the early stages of the fire.

Photo 5 – DWER officers conducting air monitoring on the evening of 25 November

Photo 6 – Drainage culvert blocked by City of Swan.

Photo 7 - Foam observed inside City of Swan stormwater system.

Photo 8 – Wastewater flooding on Great Eastern Highway, South Guildford.

Photo 9 – Booms installed at the Swan River drainage outlet.

Photo 10 – DWER officer installing hay bales in the open drainage.

Photo 11 – Installed hay bales near to Great Eastern Highway, South Guildford.

Appendix 2 **Acute Emergency Guideline Levels**

1.1.1.1.1 What are AEGLs?

AEGLs estimate the concentrations at which most people—including sensitive individuals such as old, sick, or very young people—will begin to experience health effects if they are exposed to a hazardous chemical for a specific length of time (duration). For a given exposure duration, a chemical may have up to three AEGL values, each of which corresponds to a specific tier of health effects. The three AEGL tiers are defined as follows:

- **AEGL-3** is the airborne concentration, expressed as parts per million (ppm) or milligrams per cubic meter (mg/m^3), of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
- **AEGL-2** is the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- **AEGL-1** is the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

All three tiers (AEGL-1, AEGL-2, and AEGL-3) are developed for five exposure periods: 10 minutes, 30 minutes, 60 minutes, 4 hours, and 8 hours. Table 1 below shows how the chlorine AEGL values vary with exposure duration.

Final AEGLs for chlorine (in parts per million, ppm)

	10 minutes	**30 minutes**	**60 minutes**	**4 hours**	**8 hours**
AEGL-1	0.50	0.50	0.50	0.50	0.50
AEGL-2	2.8	2.8	2.0	1.0	0.71
AEGL-3	50	28	20	10	7.1

Typically, the AEGL values will be different for each exposure duration (such as the AEGL-3 values in the table above). This is because the physical effects are typically related to dose (that is, concentration over exposure duration). However, in some cases, the AEGL values will be the same for all durations. This situation usually occurs at the AEGL-1 level (as in the table above), because it is a threshold for non-disabling effects; some effects (for example, whether people will be able to smell the chemical) depend only on concentration—not on the length of time people are exposed.

Appendix 3 **Department of Health Particulate Guideline**

Alert Level	PM_{10} µg/m³ ≤ 4 hour average	Visibility km	Information & Recommended Actions for: • **Environmental Health Response Team** • **Incident Response Teams – DEC/DFES** • **Officers responding to Media enquiries** (Generic Media Statements attached)	Recommended Health Advisory (PTO)
1	50-75	> 16	**Information:** Be aware that any increase in particulate matter (PM) above background affects highly susceptible groups such as those with more severe respiratory or cardio-vascular disease. People with asthma are in this group. **Action:** If smoke is forecast, be prepared to provide information and Health Advice as required.	1
2	76 - 150	10 - 16	**Information:** As concentrations increase, there is an increased chance that people with mild to moderate respiratory or cardiovascular disease may be affected. **Action:** If smoke haze is expected to be prolonged (>4 hrs), evaluate and be prepared to issue public Health Advisory if necessary.	2
3	151 – 300	5 - 10	**Information:** There is an increased risk of respiratory/irritant symptoms among the general community. Strenuous physical activity like sports or work outside may cause even very healthy people to experience symptoms. **Action:** If smoke haze is expected to persist (>4 hrs) be prepared to issue public Health Advisory and consider:- • Alerting schools and day care centres to move children into areas with central filtered air conditioning (some newer buildings may be more protective than older 'leakier' ones) • Limit or cancel public scheduled outdoor activities, based on event, anticipated crowd numbers, and travel considerations.	3
4	301 – 500	1 - 5	**Information:** Everyone is at risk of respiratory/irritant symptoms and irritation. As PM concentrations increase so does the risk of premature mortality in people with respiratory and cardiac disease. **Action:** Issue public Health Advisory. If smoke haze is expected to persist (>4 hrs) consider : • Advising people at risk to leave the area if safe to do so or take frequent clean-air breaks. • Alerting schools and day care centres to move children into areas with central filtered air conditioning (some newer buildings may be more protective than older 'leakier' ones) • Cancelling scheduled public outdoor activities.	**4**
5	> 500	<1	**Information:** Everyone is at risk of respiratory/irritant symptoms and irritation. There is a big increase in the risk of premature mortality in people with respiratory and cardiac disease. Most healthy people will experience some level of discomfort. **Action:** Issue public Health Advisory. If smoke haze is expected to persist (>4 hrs): • Advise people at risk to leave the area if safe to do so. • Consider the need to evacuate people at high risk that require assistance. • Consider closing schools and day care centres – although new schools may be more protective than older homes. • Cancel all scheduled public outdoor activities.	5

Appendix 4: **Air Monitoring Results**

					Field Air Monitoring Readings		Smoke Observations		Odour		Air Monitoring Guideline	
Monitoring Event	Date	Time	Zone	Location	Air toxics(ppm)	Particulates (µg/m³)	Colour	Ground smoke density	Intensity	Description	DOH PM10 Guideline Alert Level	AEGL
1	25/11/2019	10:13	Residential	Riverside Drive South Guildford	Non detect	TSP = 78 PM10 = 69	White	Light Haze	1	General Smoke	2	0
2	25/11/2019	10:15	Residential	Highland Street Bassendean	Non detect	TSP = 17 PM10 = 10	White	None	None	No Odour	0	0
3	25/11/2019	10:20	Residential	Great Eastern Highway South Guildford	Non detect	TSP = 330 PM10 = 329	White	Light Haze	1	General Smoke	4	0
4	25/11/2019	10:30	Residential	Loder Way South Guildford	Non detect	TSP = 195 PM10 = 193	Light Grey	Light Haze	1	General Smoke	3	0
5	25/11/2019	10:40	Industrial	Hyne Road South Guildford	CO = 35 HCN = 4	TSP = 8150 PM10 = 8150	Light Grey	Thick	APR	N/A	5	1
6	25/11/2019	10:50	Industrial	Anvil Close South Guildford	VOC = 0.1 HCN = 1 CH3SH	TSP = 1170 PM10 = 1170	Dark Grey	Medium	APR	N/A	5	1

					= 0.1 SO2 = 0.5							
7	25/11/2019	11:05	Industrial	Koojan Avenue South Guildford	Non detect	TSP = 7 PM10 4	Black	None	None	No Odour	0	0
8	25/11/2019	11:25	Residential	Beverley Terrace South Guildford	Non detect	TSP = 2 PM10 = 2	Dark Grey	None	None	No Odour	0	0
9	25/11/2019	11:26	School	Bassendean Primary School - 70 West Road Bassendean	Non detect	TSP = 2 PM10 = 2	Dark Grey	None	None	No Odour	0	0
10	25/11/2019	11:50	Residential	Riverside Drive South Guildford	Non detect	TSP = 5 PM10 = 3	Dark Grey	None	2	Slight Plastic Odour	0	0
11	25/11/2019	11:50	Residential	Bassendean Road Bayswater	VOC = 0.1 CH3SH = 0.1	TSP = 49 PM10 = 48	Dark Grey	None	None	No Odour	0	0
12	25/11/2019	11:57	Residential	Riverside Drive South Guildford	Non detect	TSP = 58 PM10 = 54	Dark Grey	None	2	Slight Plastic Odour	1	0
13	25/11/2019	12:20	School	Hillcrest Primary School - 2 Bay View Street Bayswater	VOC = 0.1	TSP = 51 PM10 = 49	Grey	None	1	General Smoke	0	0
14	25/11/2019	13:05	School	Bassendean Primary School - 70 West Road Bassendean	Non detect	TSP = 7 PM10 = 4	Grey	None	None	No Odour	0	0

15	25/11/2019	13:25	School	Guildford Primary School - 125 Helena Street Guildford	Non detect	TSP = 4 PM10 = 2	Grey	None	None	No Odour	0	0
16	25/11/2019	14:00	School	Eden Hill Primary School - 83a Ivanhoe Street Eden Hill	Non detect	TSP = 5 PM10 = 3	Grey	None	None	No Odour	0	0
17	25/11/2019	14:00	Residential	Riverside Drive South Guildford	Cl2 = 0.1 HCN = 0.5 H2S = 0.9 CH3SH = 0.2 NO2 = 0.12	TSP = 29 PM10 = 16	Grey	None	None	No Odour	0	0
18	25/11/2019	14:20	Residential	Waterhall Shops, Waterhall Road South Guildford	Non detect	TSP = 54 PM10 = 50	Grey	None	1	General Smoke	1	0
19	25/11/2019	14:30	Residential	Queen Road South Guildford	Cl2 = 0.1 HCN = 0.5 NO2 = 0.2	TSP = 429 PM10 = 418	Grey	Light Haze	3	Woodsmoke	4	0
20	25/11/2019	14:35	Residential	Impey Lane South Guildford	Non detect	TSP = 334 PM10 = 331	Grey	Light Haze	1	General Smoke	4	0

21	25/11/2019	14:40	Residential	Queens Road South Guildford	Non detect	TSP = 411 PM10 = 388	Grey	Light Haze	2	Woodsmoke	4	0
22	25/11/2019	15:25	Industrial	Kalamunda Road South Guildford	Non detect	TSP = 415 PM10 = 412	Grey	Light Haze	1	General Smoke	4	0
23	25/11/2019	15:40	Industrial	Kalamunda Road South Guildford	Non detect	TSP = 511 PM10 = 508	Grey	Light Haze	APR	N/A	5	0
24	25/11/2019	15:57	Industrial	Kalamunda Road South Guildford	Non detect	TSP = 368 PM10 = 365	Grey	Light Haze	APR	N/A	4	0
25	25/11/2019	17:05	Industrial	Kalamunda Road South Guildford	HCN = 1	TSP = 695 PM10 = 683	Grey	Medium	APR	N/A	5	0
26	25/11/2019	17:30	Residential	Kidman Avenue South Guildford	Non detect	TSP = 1120 PM10 = 1110	Grey	Medium	APR	N/A	5	0
27	25/11/2019	17:40	Residential	Kidman Avenue South Guildford	Non detect	TSP = 1020 PM10 = 1010	Grey	Medium	APR	N/A	5	0
28	25/11/2019	18:28	Residential	Kidman Avenue South Guildford	Non detect	TSP = 1030 PM10 = 1020	Grey	Medium	APR	N/A	5	0

29	25/11/2019	18:41	Residential	Queens Road South Guildford	Non detect	TSP = 436 PM10 = 430	Grey	Medium	APR	N/A	4	0
30	25/11/2019	19:23	Residential	Kidman Avenue South Guildford	VOC = 1 HCN = 1 NO2 = 0.2	TSP = 999 PM10 = 990	Grey	Medium	APR	N/A	5	0
31	25/11/2019	19:47	Residential	West Parade South Guildford	VOC = 0.4 Cl2 = 0.2 HCN = 1.5 NO2 = 0.2	TSP = 387 PM10 = 384	Grey	Thick	APR	N/A	4	0
32	25/11/2019	20:20	Residential	Kidman Avenue South Guildford	NO2 = 0.14	TSP = 380 PM10 = 367	Grey	Light Haze	APR	N/A	4	0
33	25/11/2019	20:40	Residential	Kidman Avenue South Guildford	Non detect	TSP = 234 PM10 = 231	White	Light Haze	APR	N/A	3	0
34	25/11/2019	21:18	Industrial	Kalamunda Road South Guildford	VOC = 1.4 CO = 5 HCN = 0.5	TSP = 2420 PM10 = 2410	White	Thick	APR	N/A	5	0

35	25/11/2019	21:33	Residential	Kalamunda Road South Guildford	VOC = 1.2 HCN = 0.5 PH3 = 0.1	TSP = 1430 PM10 = 1430	White	Thick	APR	N/A	5	0
36	26/11/2019	9:55	Industrial	Westrac - 17 Hyne Road South Guildford	VOC = 1 HCN = 0.5	TSP = 157 PM10 = 154	White	Light	APR	N/A	2	0
37	26/11/2019	10:05	Industrial	Westrac - 17 Hyne Road South Guildford	Non detect	TSP = 6 PM10 = 6	White	None	1	General Smoke	0	0
Disclaimer: Locations 38-40 were removed as readings were taken inside a commercial building.												
41	26/11/2019	11:20	Industrial	Hyne Road South Guildford	VOC = 0.2 HCN 0.5 CH3SH = 0.1	TSP = 92 PM10 = 48	White	None	2	General Smoke	0	0
42	27/11/2019	12:40	Industrial	Westrac Dispatch Door #14 - 17 Hyne Road South Guildford	VOC = 0.4	TSP = 43 PM10 = 40	None	None	1	General Smoke	0	0
43	27/11/2019	12:52	Industrial	Westrac Dispatch Door #9 - 17 Hyne Road South Guildford	VOC = 0.4	TSP = 34 PM10 = 32	None	None	1	General Smoke	0	0
44	27/11/2019	13:05	Industrial	Westrac Dispatch Door #5 - 17 Hyne	HCN = 0.5	TSP = 139	None	None	1	General Smoke	2	0

				Road South Guildford		PM10 = 135						
45	27/11/2019	13:44	Industrial	Westrac Dispatch Door #9 - 17 Hyne Road South Guildford	VOC = 0.3	TSP = 36 PM10 = 33	None	None	1	General Smoke	0	0
46	28/11/2019	9:55	Industrial	Westrac Dispatch Door #5 - 17 Hyne Road South Guildford	VOC = 0.5 HCN = 0.5	TSP = 61 PM10 = 59	White	Light	2	Wood Smoke	1	0
47	28/11/2019	10:05	Industrial	Westrac Dispatch Door #5 - 17 Hyne Road South Guildford	Non detect	TSP = 84 PM10 = 82	White	Light	1	Wood Smoke	2	0
48	28/11/2019	10:20	Residential	Kingsley Street South Guildford	VOC = 0.1 CH3SH = 0.1 PH3 = 0.1	TSP = 7 PM10 = 5	White	None	None	No Odour	0	0
49	28/11/2019	10:35	Residential	Kinglsey Street South Guildford	VOC = 0.1 CH3SH = 0.1 PH3 = 0.1	TSP = 10 PM10 = 8	None	None	1	Slight Wood Smoke	0	0
50	28/11/2019	13:25	Industrial	Westrac Dispatch Door #5 - 17 Hyne Road South Guildford	VOC = 0.5 NO2 = 0.2	TSP = 43 PM10 = 41	White	Light	2	Wood Smoke	0	0

51	28/11/2019	13:35	Residential	Kingsley Street South Guildford	VOC = 0.1 HCN = 0.5 CH3SH 0.1 NO2 = 0.1 PH3 = 0.1	TSP = 12 PM10 = 9	None	None	None	No Odour	0	0
52	29/11/2019	15:02	Residential	Kidman Avenue South Guildford	VOC = 0.1 HCN = 0.5 CH3SH = 0.2 PH3 = 0.1	TSP = 25 PM10 = 23	None	None	2	Burnt Paper	0	0
53	28/11/2019	15:20	Residential	Kidman Avenue South Guildford	VOC = 0.1 HCN = 0.5	TSP = 7 PM10 = 5	None	None	None	No Odour	0	0
54	29/11/2019	11:30	Residential	Riverside Drive South Guildford	VOC = 0.1 HCN = 0.5	TSP = 20 PM10 = 15	None	None	1	Slight waste odour	0	0
55	29/11/2019	11:42	Residential	Riverside Drive South Guildford	VOC = 0.1 HCN = 0.5 CH3SH = 0.1	TSP = 16 PM10 = 12	None	None	1	Slight smoke	0	0

56	29/11/2019	11:58	Residential	Kinglsey Street South Guildford	VOC = 0.2 CH3SH = 0.1 PH3 = 0.1	TSP = 6 PM10 = 3	None	None	None	No odour	0	0
57	29/11/2019	12:25	Industrial	Westrac Dispatch Door #5 - 17 Hyne Road South Guildford	VOC = 0.6 Cl2 = 0.1 HCN = 1.0 CH3SH = 0.1 PH3 = 0.1	TSP = 224 PM10 = 221	White	Light	3	Burning Paper	3	0
58	29/11/2019	12:35	Industrial	Westrac Dispatch Door #5 - 17 Hyne Road South Guildford	VOC = 0.6 Cl2 = 0.1 HCN = 0.5	TSP = 185 PM10 = 183	White	Light	3	Burning Paper	3	0
59	29/11/2019	16:32	Residential	River View Avenue South Guildford	VOC = 0.2 Cl2 = 0.1 HCN = 1.0 NO2 = 0.1	TSP = 6 PM10 = 4	White	None	1	Burning Paper	0	0
60	29/11/2019	16:45	Residential	River View Avenue South Guildford	VOC = 0.2 Cl2 = 0.1	TSP = 12 PM10 = 10	White	None	2	Burning Paper	0	0

					HCN = 1.5 NO2 = 0.1							
61	30/11/2019	8:52	Residential	Kingsley Drive South Guildford	VOC = 0.1 HCN = 0.5 PH3 = 0.1	TSP = 21 PM10 = 18	White	None	2	Burning Paper	0	0
62	30/11/2019	9:04	Residential	Kingsley Drive South Guildford	VOC = 0.1 HCN = 0.5 CH3SH = 0.1	TSP = 15 PM10 = 12	White	None	3	Burning Paper	0	0
63	30/11/2019	9:25	Industrial	Westrac Dispatch Door #13 - 17 Hyne Road South Guildford	VOC = 0.2	TSP = 186 PM10 = 180	White	Light Haze	APR	N/A	3	0
64	30/11/2019	9:36	Industrial	Westrac Dispatch Door #11 - 17 Hyne Road South Guildford	VOC = 0.3 CH3SH = 0.1	TSP = 159 PM10 = 156	White	Light Haze	APR	N/A	3	0
Tally										**Alert Level**	**PM Alert Tally**	**AEGL Alert Tally**
64										0	32	62
										1	3	2
										2	4	0
										3	6	0
										4	9	

										5	10	
										Total	64	64

Appendix 5 – DBCA Water Analysis Results

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025 testing, Accreditation No. 8

ChemCentre
Residues Laboratory
Report of Examination

Chem Centre
EXPERT SOLUTIONS

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Purchase Order: None
ChemCentre Reference: 19S2274 R2

Dept of Biodiversity, Conservation & Attractions
17 Dick Perry Avenue
Technology Park Western Precinct
KENSINGTON WA 6151

Attention: Richard Tunnicliffe

Report on: 2 samples received on 26/11/2019

LAB ID	Material	Client ID and Description
19S2274 / 001	water	Hynes Road Drain
19S2274 / 002	water	Drain Outflow

LAB ID				001	002
Client ID				Hynes Road Drain	Drain Outflow
Sampled				26/11/2019	26/11/2019
Analyte	Method	LOR	Unit		
6:2 FtS (Fluorotelomer Sulfonate)	ORG095W	0.05	ug/L	<0.05	<0.05
8:2 FtS (Fluorotelomer Sulfonate)	ORG095W	0.05	ug/L	<0.05	<0.05
Nitrogen, ammonia	iNPSi1SFAA	0.01	mg/L	1.0	
Biochemical Oxygen Demand	iBOD1WR	5	mg/L	460	
Nitrogen, nitrite	iNPSi1SFAA	0.01	mg/L	0.15	
* Nitrogen, organic - Filterable	iNPCALC2	0.025	mg/L	7.2	
Nitrogen, total kjeldahl	iNPCALC1	0.025	mg/L	9.6	
Phosphorus, sol. reactive	iNPSi1SFAA	0.005	mg/L	0.027	
PFBS (Perfluorobutane sulfonate)	ORG095W	0.05	ug/L	<0.05	<0.05
PFBA (Perfluorobutanoic acid)	ORG095W	0.1	ug/L	<0.10	<0.10
PFHpA (Perfluoroheptanoic acid)	ORG095W	0.05	ug/L	<0.05	<0.05
PFHxA (Perfluorohexanoic acid)	ORG095W	0.05	ug/L	<0.05	<0.05
PFPeA (Perfluoropentanoic acid)	ORG095W	0.05	ug/L	<0.05	<0.05
Nitrogen, total	iNPT1SFAA	0.025	mg/L	10	
Nitrogen, nitrate + nitrite	iNPSi1SFAA	0.01	mg/L	0.44	
Total PFHxS	ORG095W	0.05	ug/L	<0.05	<0.05
Total PFOS	ORG095W	0.05	ug/L	<0.05	<0.05
Total PFOA	ORG095W	0.05	ug/L	<0.05	<0.05
Phosphorus, total	iNPT1SFAA	0.005	mg/L	0.53	
Nitrogen, total soluble	iNPT1SFAA	0.025	mg/L	8.7	
TRH >C10-C16	ORG007W	25	ug/L	9800	3100

LAB ID				001	002
Client ID				Hynes Road Drain	Drain Outflow
Sampled				26/11/2019	26/11/2019
Analyte	Method	LOR	Unit		
TRH >C16-C34	ORG007W	100	ug/L	6700	1600
TRH >C34-C40	ORG007W	100	ug/L	930	120
TRH C6-C10	ORG015W	25	ug/L	200	70
Total TRHs	ORG007WPTC	250	ug/L	18000	4800
Acenaphthene	ORG100W	0.1	ug/L	2.6	1.0
Acenaphthylene	ORG100W	0.1	ug/L	3.3	1.2
Anthracene	ORG100W	0.1	ug/L	0.7	0.2
Benz(a)anthracene	ORG100W	0.1	ug/L	0.2	<0.1
Benzo(a)pyrene	ORG100W	0.1	ug/L	0.2	<0.1
Benzo(b)fluoranthene	ORG100W	0.1	ug/L	0.2	<0.1
Benzo(g,h,i)perylene	ORG100W	0.1	ug/L	0.2	<0.1
Benzo(k)fluoranthene	ORG100W	0.1	ug/L	<0.1	<0.1
Chrysene	ORG100W	0.1	ug/L	0.2	<0.1
Dibenzo(a,h)anthracene	ORG100W	0.1	ug/L	<0.1	<0.1
Fluoranthene	ORG100W	0.1	ug/L	0.8	0.3
Fluorene	ORG100W	0.1	ug/L	0.9	0.3
Indeno(1,2,3-cd)pyrene	ORG100W	0.1	ug/L	0.1	<0.1
Naphthalene	ORG100W	0.1	ug/L	8.7	2.0
Phenanthrene	ORG100W	0.1	ug/L	2.5	0.9
Pyrene	ORG100W	0.1	ug/L	0.8	0.2
1,2,4,5-Tetrachlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
1,2,4-Trichlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
1,2-Dichlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
1,3-Dichlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
1,4-Dichlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
1-Chloronaphthalene	ORG100W	0.1	ug/L	<0.1	<0.1
2-Chloronaphthalene	ORG100W	0.1	ug/L	<0.1	<0.1
Hexachlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
Hexachlorobutadiene	ORG100W	0.1	ug/L	<0.1	<0.1
Hexachlorocyclopentadiene	ORG100W	0.1	ug/L	<0.1	<0.1
Hexachloroethane	ORG100W	0.1	ug/L	<0.1	<0.1
Hexachloropropene	ORG100W	0.1	ug/L	<0.1	<0.1
Pentachlorobenzene	ORG100W	0.1	ug/L	<0.1	<0.1
Bis(2-ethylhexyl)phthalate	ORG100W	0.1	ug/L	11	1.7
Butylbenzylphthalate	ORG100W	0.1	ug/L	0.7	0.1
Diethyl phthalate	ORG100W	0.1	ug/L	18	3.8
Dimethyl phthalate	ORG100W	0.1	ug/L	15	3.1
Di-n-butyl phthalate	ORG100W	0.1	ug/L	2.1	0.7
Di-n-octyl phthalate	ORG100W	0.1	ug/L	1.0	0.1
* Investigation	ORG100W	.0000000		see 19S2274_R1	see 19S2274_R1

Method	Method Description
iBOD1WR	Biochemical Oxygen Demand.
iNPCALC1	Total Kjeldahl Nitrogen (Calculated TN - Nitrate/Nitrite_N).
iNPCALC2	Organic Nitrogen - Filterable, calculated from TSN, TON and ammonia
iNPSi1SFAA	Low Level Nutrients by Segmented Flow Auto Analyser
iNPT1SFAA	Low Level Nutrients by Segmented Flow Auto Analyser
ORG007W	Total Recoverable Hydrocarbons in Water
ORG007WPTC	Sum of TRHs in Water with C6-C10 by Purge and Trap
ORG015W	BTEX and C6 - C10 in water

Method	Method Description
ORG095W	Per- and Polyfluoroalkyl Substances (PFAS) in Water - Standard Level (NATA Accredited as ORG095W)
ORG100W	Semi-Volatile organic compounds in water by GC-MS

"<" signifies a result is less than the limit of quantitation for the method.

These results apply only to the sample(s) as received.

Results may not be reproduced except in full.

Unless requested otherwise, sample(s) will be disposed of after 30 days of the issue of this report.

*Analysis not covered by scope of ChemCentre's NATA accreditation.

Leif Cooper
Team Leader
SSD Organic Chemistry
4-Dec-2019

Hanna May
Team Leader
SSD Inorganic Chemistry

Water Assessment

1. DWER Sample Analysis Results, and
2. DBCA Sample Analysis Results.

Appendix 6 – DWER Water Analysis Results

ChemCentre
Residues Laboratory
Report of Examination

Accredited for compliance with ISO/IEC 17025 testing, Accreditation No. 8

Purchase Order: None
ChemCentre Reference: 19S2299 R0

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Department of Environmental Regulation
Locked Bag 10
JOONDALUP WA 6919

Attention: Andrew Jefferies

Report on: 1 sample received on 27/11/2019

LAB ID	Material	Client ID and Description
19S2299 / 001	water	WS01

LAB ID				001
Client ID				WS01
Sampled				27/11/2019
Analyte	**Method**	**LOR**	**Unit**	
1,1,1,2-Tetrachloroethane	ORG002W	1	ug/L	<1.0
1,1,1-Trichloroethane	ORG002W	1	ug/L	<1.0
1,1,2,2-Tetrachloroethane	ORG002W	1	ug/L	<1.0
1,1,2-Trichloroethane	ORG002W	1	ug/L	<1.0
1,1-Dichloroethane	ORG002W	1	ug/L	<1.0
1,1-dichloroethene	ORG002W	1	ug/L	<1.0
1,1-Dichloropropene	ORG002W	1	ug/L	<1.0
1,2,3-Trichlorobenzene	ORG002W	1	ug/L	<1.0
1,2,3-Trichloropropane	ORG002W	1	ug/L	<1.0
1,2,4-Trichlorobenzene	ORG002W	1	ug/L	<1.0
1,2,4-Trimethylbenzene	ORG002W	1	ug/L	<1.0
1,2-Dibromo-3-chloropropane	ORG002W	1	ug/L	<1.0
1,2-Dibromoethane	ORG002W	1	ug/L	<1.0
1,2-Dichlorobenzene	ORG002W	1	ug/L	<1.0
1,2-Dichloroethane	ORG002W	1	ug/L	<1.0
1,2-Dichloropropane	ORG002W	1	ug/L	<1.0
1,3,5-Trimethylbenzene	ORG002W	1	ug/L	<1.0
1,3-Dichlorobenzene	ORG002W	1	ug/L	<1.0
1,3-Dichloropropane	ORG002W	1	ug/L	<1.0
1,4-Dichlorobenzene	ORG002W	1	ug/L	<1.0
2,2-Dichloropropane	ORG002W	1	ug/L	<1.0
2-Chlorotoluene	ORG002W	1	ug/L	<1.0
4-Chlorotoluene	ORG002W	1	ug/L	<1.0
6:2 FtS (Fluorotelomer Sulfonate)	ORG095W	0.05	ug/L	<0.05

19S2299

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LAB ID				**001**
Client ID				WS01
Sampled				27/11/2019
Analyte	**Method**	**LOR**	**Unit**	
8:2 FtS (Fluorotelomer Sulfonate)	ORG095W	0.05	ug/L	<0.05
Arsenic, total	iMET1WTMS	0.001	mg/L	0.002
Bromobenzene	ORG002W	1	ug/L	<1.0
Bromochloromethane	ORG002W	1	ug/L	<1.0
Bromodichloromethane	ORG002W	1	ug/L	<1.0
Bromoform	ORG002W	1	ug/L	<1.0
Cadmium, total	iMET1WTMS	0.0001	mg/L	0.0030
Carbon tetrachloride	ORG002W	1	ug/L	<1.0
Chlorobenzene	ORG002W	1	ug/L	<1.0
Dibromochloromethane	ORG002W	1	ug/L	<1.0
Chloroform	ORG002W	1	ug/L	<1.0
Chromium, total	iMET1WTMS	0.001	mg/L	0.042
cis-1,2-dichloroethene	ORG002W	1	ug/L	<1.0
cis-1,3-Dichloropropene	ORG002W	1	ug/L	<1.0
Copper, total	iMET1WTMS	0.001	mg/L	0.059
Dibromomethane	ORG002W	1	ug/L	<1.0
Hexachlorobutadiene	ORG002W	1	ug/L	<1.0
Isopropylbenzene	ORG002W	1	ug/L	<1.0
Lead, total	iMET1WTMS	0.0005	mg/L	0.026
Mercury, total	iMET1WTMS	0.0001	mg/L	<0.0001
Naphthalene	ORG002W	1	ug/L	8.6
n-butylbenzene	ORG002W	1	ug/L	<1.0
Nickel, total	iMET1WTMS	0.001	mg/L	0.015
n-Propylbenzene	ORG002W	1	ug/L	<1.0
PFBS (Perfluorobutane sulfonate)	ORG095W	0.05	ug/L	<0.05
PFBA (Perfluorobutanoic acid)	ORG095W	0.1	ug/L	<0.10
PFHpA (Perfluoroheptanoic acid)	ORG095W	0.05	ug/L	<0.05
PFHxA (Perfluorohexanoic acid)	ORG095W	0.05	ug/L	<0.05
PFPeA (Perfluoropentanoic acid)	ORG095W	0.05	ug/L	<0.05
p-isopropyltoluene	ORG002W	1	ug/L	7.9
sec-Butylbenzene	ORG002W	1	ug/L	<1.0
Styrene	ORG002W	1	ug/L	7.0
Tert-Butylbenzene	ORG002W	1	ug/L	<1.0
Tetrachloroethene	ORG002W	1	ug/L	2.2
Total PFHxS	ORG095W	0.05	ug/L	<0.05
Total PFOS	ORG095W	0.05	ug/L	<0.05
Total PFOA	ORG095W	0.05	ug/L	<0.05
trans-1,2-Dichloroethene	ORG002W	1	ug/L	<1.0
trans-1,3-Dichloropropene	ORG002W	1	ug/L	<1.0
Trichloroethene	ORG002W	1	ug/L	<1.0
Zinc, total	iMET1WTICP	0.01	mg/L	2.4
Benzene	ORG002W	1	ug/L	16
Ethylbenzene	ORG002W	1	ug/L	1.1
m,p-Xylene	ORG002W	1	ug/L	<1.0
o-Xylene	ORG002W	1	ug/L	<1.0
Toluene	ORG002W	1	ug/L	4.7
TRH C6-C10	ORG015W	25	ug/L	120

LAB ID				**001**
Client ID				WS01
Sampled				27/11/2019
Analyte	**Method**	**LOR**	**Unit**	
TRH >C10-C16	ORG007W	25	ug/L	22000
TRH >C16-C34	ORG007W	100	ug/L	7600
TRH >C34-C40	ORG007W	100	ug/L	600
Total TRHs	ORG007WPTC	250	ug/L	30000
Acenaphthene	ORG100W	0.1	ug/L	4.2
Acenaphthylene	ORG100W	0.1	ug/L	3.5
Anthracene	ORG100W	0.1	ug/L	0.4
Benz(a)anthracene	ORG100W	0.1	ug/L	0.1
Benzo(a)pyrene	ORG100W	0.1	ug/L	0.2
Benzo(b)fluoranthene	ORG100W	0.1	ug/L	0.2
Benzo(g,h,i)perylene	ORG100W	0.1	ug/L	0.2
Benzo(k)fluoranthene	ORG100W	0.1	ug/L	<0.1
Chrysene	ORG100W	0.1	ug/L	0.2
Dibenzo(a,h)anthracene	ORG100W	0.1	ug/L	<0.1
Fluoranthene	ORG100W	0.1	ug/L	0.4
Fluorene	ORG100W	0.1	ug/L	0.6
Indeno(1,2,3-cd)pyrene	ORG100W	0.1	ug/L	0.1
Naphthalene	ORG100W	0.1	ug/L	3.9
Phenanthrene	ORG100W	0.1	ug/L	1.2
Pyrene	ORG100W	0.1	ug/L	0.5

Method	**Method Description**
iMET1WTICP	Total metals by microwave digestion and ICPAES.
iMET1WTMS	Total metals by microwave digestion and ICPMS.
ORG002W	VOC in Water by Purge and Trap GC-MS
ORG007W	Total Recoverable Hydrocarbons in Water
ORG007WPTC	Sum of TRHs in Water with C6-C10 by Purge and Trap
ORG015W	BTEX and C6 - C10 in water
ORG095W	Per- and Polyfluoroalkyl Substances (PFAS) in Water - Standard Level (NATA Accredited as ORG095W)
ORG100W	Semi-Volatile organic compounds in water by GC-MS

"<" signifies a result is less than the limit of quantitation for the method.

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Leif Cooper
Team Leader
SSD Organic Chemistry
28-Nov-2019

Appendix 7 – Fire water runoff Impact Statement

Statement of environmental impact to the Swan and Canning estuary from the South Guilford Cleanaway facility fire

Background

A fire started in the Cleanaway recycling facility in South Guildford on 25 November 2019. The facility stored a wide variety of paper, cardboard and plastic recyclable materials. During the initial control of the fire a small volume of the Solberg ARF firefighting foam was used. After which, significant quantities of water were used to control the fire. Being in close proximity to the river Department of Water and Environmental Regulation (DWER) and Department of Fire and Emergency Services (DFES) staff ensured the drainage network was sealed to ensure fire water run-off did not flow into the Swan Estuary. However, due to the large volume of water used to control the fire, the drainage network started to flood on the evening 25 November, and run off water bypassed the bunded drainage network, via the road, and started to flow into the Hyne Road drain and then into the middle Swan Estuary. The Department of Biodiversity, Conservation and Attractions (DBCA) was made aware of the situation on 26 November and collected samples of water flowing from the Hyne Road drain at the opening of the culvert and within the estuary 5-10 metres from the discharge point. It has been estimated that by 29 November approximately 2 ML of impacted firewater had been removed from the site while 10% of this volume may have discharged into the middle Swan Estuary. Current estimates (18 December 2019) are that between 4-4.5 ML had been removed from the site. Cleanaway are no longer pumping water from the site.

Outcomes

The containment of the majority of the fire affected water within the isolated drainage network was a significant achievement and has likely avoided significant environmental impact to the Swan Estuary. The potential impacts from unmitigated discharge into the system may have included fish and crustacean kills, problematic algal blooms and an persistent increase in the occurrence of heavy metals in the system. Significant contaminant loads were identified in water within the drainage network (sampled collected by DWER). In addition, samples collected by DBCA at the outlet of the drainage system also identified a significant containment load discharging directly into the Estuary.

Summary of contaminants of concern

Nutrients

The nutrient concentrations detected at the outlet were very high relative to the receiving body and regional drainage network (Table 1). They also exceeded the ANZECC water quality guidelines and DBCA trigger levels. Excessive nutrients can result in problematic algal blooms of which some species may be toxic to wildlife, domestic animals or people. Algal blooms can rapidly collapse causing local anoxia.

Given the majority of the excessive nutrients were dissolved, they could be rapidly taken up by phytoplankton and result in a problematic algal bloom. Co-incidentally a phytoplankton bloom was observed at the location during routine monitoring on the Monday 25th November but was likely unrelated to the fire run off. There were local reports of a green discolouration in the estuary at this location during the week suggesting an intensification of the bloom. It is difficult to say if the

nutrient run off may have contributed to this bloom. No anoxia was observed close to the site on the day of the fire and or a week later (Figure 1).

Table 1. Nutrient concentrations measured in the fire water run off at the outlet of the Hyne Road drain on the 26th November. For comparative purposes background nutrient data for the two neighbouring drains and the receiving body are also presented.

Site	NH4 (mg/L)	NOx (mg/L)	Dissolved Org N (mg/L)	TN (mg/L)	TP (mg/L)	FRP (mg/L)
Airport south 2018 November median	0.035	0.115	0.73	0.88	0.014	0.006
Airport North 2018 November median	0.017	0.074	0.42	0.51	0.011	<0.005
Estuary median 2017-18	0.26	0.067	0.257	0.65	0.047	<0.005
Fire sampling (DBCA data)	**1.00**	**0.44**	**7.2**	**10.0**	**0.53**	**0.027**

BOD/COD

The biochemical oxygen demand (BOD) measured at the drain outlet by DBCA was 460 mg/L. At this level there was significant risk of an anoxic event in the estuary near the outlet. Such an event would have likely resulted in fish kills and a nuisance odour.

In the routine weekly estuary sampling conducted by DBCA, no anoxic event was observed on the 2nd December (Figure 1).

Hydrocarbons

Hydrocarbons are rarely detected in the surface water and many will rapidly bind to organic sediments or evaporate into the atmosphere. The detection of many hydrocarbons in the fire runoff water suggested that this event could have input a significant load of hydrocarbon contaminants into the system. Many were combustion by-products and not considered harmful. However, there were detections of some harmful PAH's (anthracene, benzo(a)pyrene and phenathrene exceeding the 95% species protection guideline) and the firefighting foam (2-(2-Butoxyethoxy)ethanol). The firefighting foam has an extremely high BOD and chemical oxygen demand (COD).

Heavy metals

The concentration of many metals were multiple orders of magnitude greater than that recorded in the area. Given recent unpublished data suggests that heavy metals contamination of the estuary seems to be increasing within some regions, particularly of copper, lead and zinc, there was considerable risk of exacerbating these impacts with the concentrations detected here.

Copper, lead and zinc all exceed the 80% species guideline but also exceed many of the acute toxicity thresholds determined for both marine and freshwater species. Routine monitoring by DBCA indicated that at the time the estuary was brackish with a salinity of approximately 12-15, thus likely receptors were euryhaline species. As a result, there was a potential short- and long-term significant risk to estuary ecological health from the fire water run off if it occurred unmitigated.

Table 2. Heavy metal concentrations in samples collected by DWER in the Hyne road drainage network. Data are compared to the ANZECC guidelines and the background concentrations detected in the neighbouring drainage network in previous work (Nice et al 2009).

Site	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L
Airport south	<0.001	~0.0001	>0.001	~0.009	<0.001	~0.006	~0.1
Airport North	0.002	~0.0001	>0.001	~0.005	<0.001	~0.001	~0.03
Fire sampling (DWER data)	**0.002**	**0.003**	**0.042**	**0.059**	**0.026**	**0.015**	**2.4**
Highest ANZECC Guideline exceeded Freshwater	>99% assuming all AsV	>80%	>80% Assuming all CrIV	>80%	>80%	>90%	>80%
Highest ANZECC Guideline exceeded Marine	N/A	>99%	>90% Assuming all CrIV	>80%	>80%	>99%	>80%

Figure 1. Estuary water quality profiles before (25 November 2019) and after (2 December 2019) the fire event.