BYRON SHIRE COUNCIL

2020 Annual Water Contamination Report

Myocum Landfill

Byron Shire Council

Annual Water Contamination Report 2020

Myocum Landfill, Byron Shire Council

Document Control

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Tables and Figures

1. Introduction

Byron Shire Council (BSC) operates the Myocum Landfill Facility, located on Manse road, under the Environmental Protection Licence (EPL) No. 6057, and dated 28 May 2008. The property is formally known as Lot 1 DP1052900. The site is located approximately 4.5km south of Mullumbimby and 12km North West of Byron Bay. The site location is shown in the local context in Figure 1-1. The neighbouring property to the west is also under Byron Shire Council ownership and is currently used as a quarry; it is formally referred to as Lot 1 DP591441.

In accordance with the Environmental Protection Licence, BSC implements an environmental monitoring program, as presented in the approved Landfill Environmental Management Plan (Maunsell 2002), and incorporates:

- Regional and Alluvial groundwater monitoring; and,
- Surface water monitoring.

In 2003 the landfill monitoring program commenced, commensurate with the reopening of the landfill following an extended period of closure.

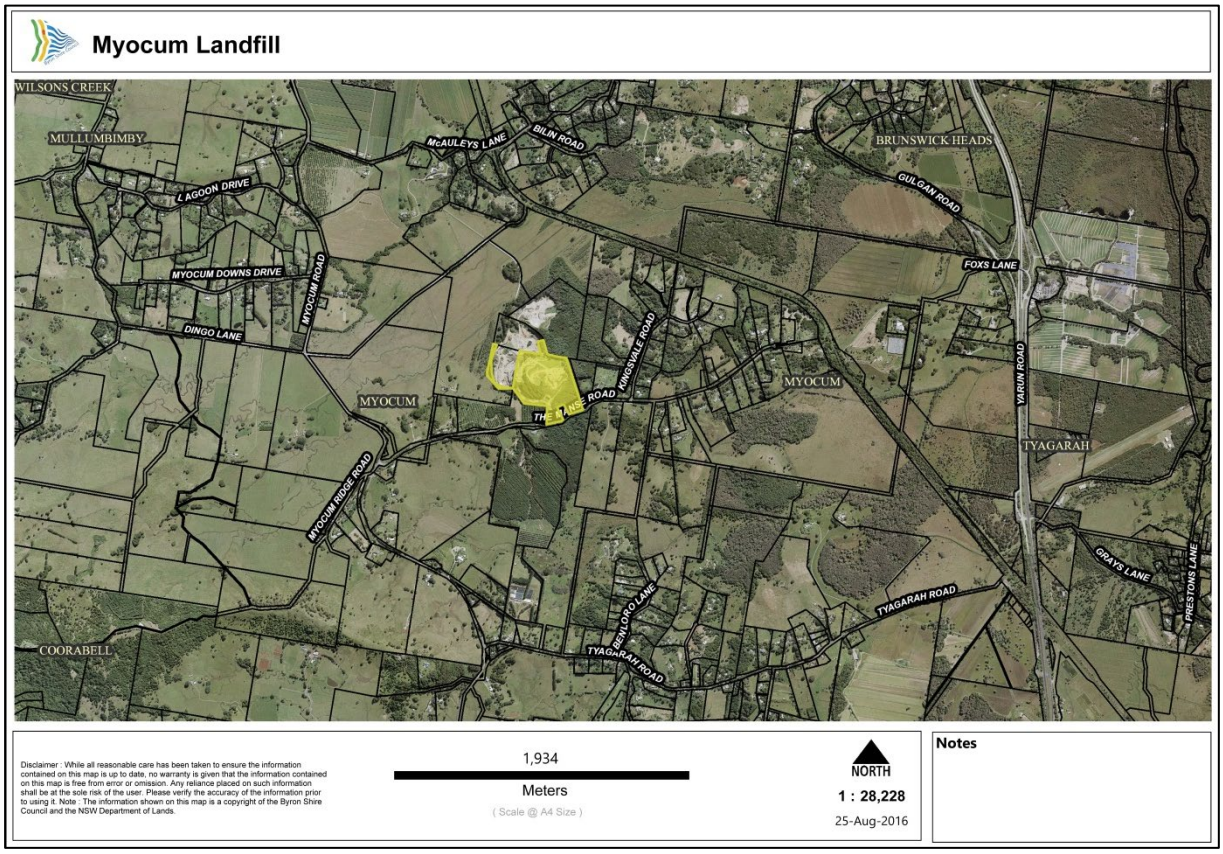


Figure 1-1: Myocum Landfill site in the locality

1.1 Project aims and objectives

The aim of this report is to present the annual 2020 monitoring data (September 2019 – September 2020), in accordance with condition U3.1 of the Environmental Protection Licence No. 6057 (EPL6057). Specific licence conditions, outlined in Section 1.2, state key requirements of this report. Key project objectives are to:

- Report all monitoring actions and results between September 2019 – 2020
- Compare monitoring results to past collected data and stated water quality trigger values
- Evaluate any human and environmental impacts resulting from the operation of the landfill
- Recommend mitigation measures for any identified human and environmental impacts

1.2 Licence conditions

Under the NSW EPL6057 issued by the NSW Environmental Protection Authority (EPA), BSC are required to annually submit a Water Contamination Report. As a minimum, this report must include the following:

Alluvial Groundwater:

(a) A tabular and graphical representation of the results of all alluvial groundwater monitoring undertaken for Monitoring Points 4 – 5 over the previous 12 months period in accordance with condition M2.

(b) Comparison of the results with the most relevant ANZECC/NWQMS triggers (see Table 1-1) and with results from previous annual reporting periods, including as assessment of any changes and trends over time.

(c) Evaluation of the nature and level of (and changes to) any human health and environmental risks to alluvial groundwaters and any other environmentally sensitive receivers.

(d) An assessment of whether the current detection monitoring program should be augmented to also sample for chemicals of concern (i.e. in addition to the leachate indicator analytes in M2).

(e) Any further mitigation measures proposed to be implemented for the subsequent 12 month period to further reduce contamination levels and risks to human health and the environment.

Regional Groundwater:

(a) A tabular and graphical representation of the results of all regional groundwater monitoring undertaken for monitoring Points 1-3 and 24-25 over the previous 12 month period in accordance with condition M2.

(b) Comparison of the results with the contamination trigger levels (see Table 1-1) and with results from previous annual reporting periods, including an assessment of any changes and trends over time.

(c) Evaluation of the nature and level of (and changes to) any human health and environmental risks to regional groundwaters and any other environmentally sensitive receivers.

(d) An assessment of whether the current monitoring regime should be augmented to also sample for chemicals of concern (i.e. in addition to the leachate indicator analytes in M2).

(e) Any further mitigation measures proposed to be implemented for the subsequent 12 month period to further reduce contamination levels and risks to human health and the environment.

Surface Water:

(a) A tabular and graphical representation of the results of all surface water monitoring undertaken for monitoring Points 6, 8 and 33 over the previous 12 month period in accordance with condition M2.

(b) Comparison of the results with the contamination trigger levels (see Table 1-1) and with results from previous annual reporting periods, including an assessment of any changes and trends over time.

(c) Evaluation of the nature and level of (and changes to) any human health and environmental risks to surface waters and any other environmentally sensitive receivers.

(d) An assessment of whether the current monitoring regime should be augmented to also sample for chemicals of concern (i.e. in addition to the leachate indicator analytes in M2).

(e) Any further mitigation measures proposed to be implemented for the subsequent 12 month period to further reduce contamination levels and risks to human health and the environment.

Table 1-1: Water quality trigger levels applied to data set

	Regional Groundwater (NSW EPA, 2011)	Alluvial Groundwater (ANZECC, 2006)	Surface water (NSW EPA, 2011)
pH	2.9 – 6.7	6.5 – 8.5	6.5 – 9.0
Conductivity (µS/cm)	3,800 (3.8mS/cm)	2,200 (2.2mS/cm)	610 (0.6mS/cm)
Calcium (mg/L)	2.0	-	20.7
Sodium (mg/L)	65	-	70
Potassium (mg/L)	1.0	-	11.8
Alkalinity (mg/L)	13.5	-	116
Chloride (mg/L)	118	-	150
Ammonia (mg/L)	1.74	1.43	0.36
Total Organic Carbon (mg/L)	13	-	20.3
Nitrate (mg/L)	1.84	-	3.4
Manganese (mg/L)	0.63	2.5	2.5
Sulfate (mg/L)	26.0	-	100
Magnesium (mg/L)	5.0	-	50
Iron (mg/L)	0.08	1	1
Dissolved Oxygen (mg/L)	-	-	>6.0

2. Relevant background information

The climate of coastal northern New South Wales is sub-tropical, characterised by warm and wet summers with generally dry and mild winters. A summary of the monthly rainfall records from Myocum Landfill between September 2019 and August 2020 is provided in Table 2.1 and Figure 2.1

The monthly rainfall totals recorded have generally consistent with historical median with the exception of January and May 2020 being slightly above and February 2020 far exceeding historical median levels as shown on Figure 2.1 below.

Table 2-1: Summary of monthly rainfall records at Myocum Landfill - Data taken from BOM station 58216 (2002-2020)

	2019						2020					
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Actual (mm)	8.2	18	11.6	88.2	198.4	771.6	138.8	38.8	176	96.4	116.4	36.8
Median (mm)	36.6	70.4	61.2	103.2	144.2	163.4	138.8	132.5	109	152.6	65.6	48.2

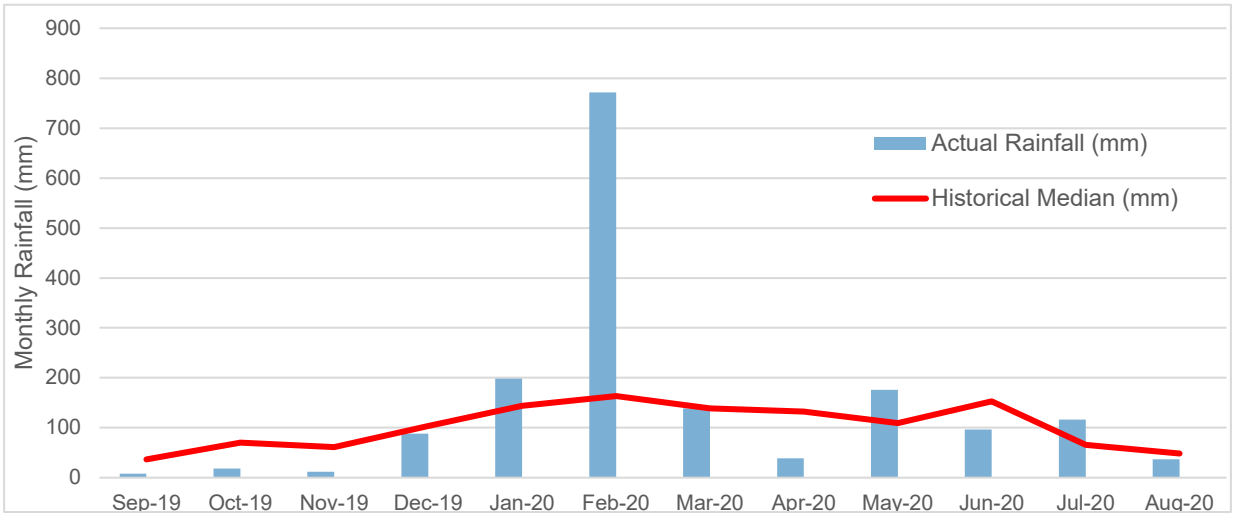


Figure 2-1: Monthly rainfall at Myocum Landfill between September 2019 and August 2020, showing historical median 50th percentile - Data taken from BOM station 58216 (2019-2020)

2.1 Landfill description

In 2003, subject to the requirements of the EPL6057 and following landfill remediation works associated with leachate management, BSC recommenced landfilling activities at Myocum Landfill to accept general solid putrescible waste to a maximum limit of 20,000t per annum plus other wastes specified in the EPL6057. In 2006, the NSW EPA approved the expansion of landfill operations to the south, termed 'Southern Expansion'. There are two main landfilling areas within the Myocum Landfill:

- Northern Landfill (Original), accepting waste between 1976-2007 (not between 2000-03 due to leachate remediation works)
- Southern Landfill, accepting waste between 2007 to 2014

The Myocum Landfill currently operates as a transfer station, accepting waste from the entire Byron Shire area for transport to a Queensland licenced waste facility.

The layout of the Myocum Landfill is shown diagrammatically in Figure 2-2, showing:

- The original northern landfill area;
- Southern expansion area;
- Landfill infrastructure;
- Site sheds and offices; and
- Neighbouring land uses and receiving environments.

Figure 2-2: Layout of Myocum Landfill

2.2 Topography, Drainage and Geology

During the Mesonzic era (252-66 million years ago) the land formations surrounding the Myocum Landfill (and wider Claremont-Moreton Basin) was shaped via heat and pressure caused by tectonics. These landforms are a sequence of old fashioned metamorphosed sedimentary rocks consisting of chert quartzite and argillte-claystone deposited during the Paleozonic Era (541-252 million years ago). The soils present within the landfill area are a mixture of yellow and red podzolics, with yellow podzolics in dominance generally comprised of fine grained clay sediments

associated with the residual weathered bedrock and/or localised alluvium deposits (Maunsels, 2002).

Topography of the site is characterised by undulating slopes with a generally westerly aspect; there has been substantial modification of ground surface due to the landfill operations and quarrying on the neighbouring allotment. To the west of the site is the flood plain with minor tributaries of the Brunswick River including Pipeclay Creek. Drainage from upslope of the landfill facility is captured and directed to the north in an unnamed drainage line that meets Pipeclay Creek.

The landfill site can be delineated into sub catchments with a variety of surface types and areas. A map showing sub catchments is provided in Figure 2-3. There are three main catchments within the Myocum Landfill, each further made up of minor sub catchments:

1. The northern catchment drains generally to the north with surface flow being directed to the sediment basin and ephemeral creek in the far north of the site (Northern Dam).
2. The southern catchment drains to the Southern Dam and ephemeral creek running along the southern boundary of the site.
3. The western catchment is predominantly vegetated on relatively undisturbed (not landfill) soil areas with an existing management and conveyance system that is adequate.

2.3 Hydrogeology

Two groundwater systems have been located within and surrounding the Myocum Landfill based on site investigation undertaken by HLA Envirosciences (2001):

1. Regional Aquifer within fractured bedrock; and
2. The perched alluvial aquifer within the alluvial soils along creek valley.

The groundwater level within the Regional Aquifer has historically ranged between 10 and RL24m (Maunsell, 2002) with movement generally in a northerly direction following the topography. There is a local depression within the Regional Aquifer within the Quarry area, due to the extraction of material within the quarry. Recharge of the Regional Aquifer is most likely to occur via rainfall infiltration on the surrounding hillsides.

The perched alluvial aquifer has been recorded at between 2-4m below ground level, adjacent to the northern landfill face. Groundwater depth decreases with topography, in a northerly direction, again resulting in a northerly flow of groundwater likely to generally follow topography. Recharge of the alluvial aquifer is most likely to occur via direct surface water to infiltration along the creek valley.

For the purpose of this report, the network of monitoring bores at the landfill for both the Alluvial and Regional aquifers have been categorised as either upslope or downslope to better investigate the potential contamination of groundwater resulting from the presence and operation of the landfill. Based on the range of reduced groundwater levels (RLs), the location of the landfill and surrounding topography, each monitoring bore can be classified as either being upslope or downslope from the landfill, as shown in Table 2.2.

The groundwater levels provided in Table 2.2 are on large higher for most February and May 2020 events especially at Bore MW01. This is directly related to rainfall as observed in Figure 2.1.

Table 2-2: Range of monitoring groundwater levels

Bore No.		Bore Location	Range of Monitored Groundwater Levels (mRL)			
			Nov-19	Feb-20	May-20	Aug-20
Regional Aquifer	MW01	**Downslope** of Northern Landfill	4.246	15.446	14.446	-
	MW02	**Upslope** of Southern Landfill	20.059	23.059	24.759	-
	MW03	Base of Myocum Quarry, **Downslope**	-1.05	-	-0.25	-
Alluvial Aquifer	MW04	20m **Downslope** of leachate inception trench	-	15.983	15.183	-
	MW05	70m **Downslope** of Northern Landfill face	-	14.693	12.593	-

2.4 Monitoring regime

In accordance with EPL 6057, BSC monitors water quality parameters in both the Regional and Alluvial Aquifer along with surface waters to the north and south of the landfill. Figure 2-3 displays the location of monitoring sites within and adjoining Myocum Landfill. Table 2-4 details relevant EPA and BSC Monitoring Point identification, general location and specific ground/surface water systems monitored. Water quality samples from the regional and alluvial aquifer monitoring sites, surface water monitoring sites and leachate monitoring sites were obtained on the:

- 14 November 2019
- 20 February 2020
- 21 May 2020
- 27 August 2020

Table 2-3 presents accumulated rainfall data over a 1-8 week period leading up to each sampling date. Rainfall conditions prior to ground and surface water sampling were variable across the four sampling events, with the lead up to sampling in February 2019 representative of dry conditions.

Water samples were taken by Tweed Laboratory Centre in accordance with AS/NZS 5667:1998 *Standards on the sampling of waters, waste waters, sediments and sludges*. Samples were transported on ice under chain of custody to the Tweed Laboratory Centre for analysis on the parameters listed in 2-4 in accordance with AS ISO 7025:2018 – *General requirements for the competence of testing and calibration laboratories*. Tweed Laboratory Centre is NATA accredited for Accreditation No: 12745 (Chemical Testing – public testing service), and Accreditation No: 13538 (Biological Testing – public testing service).

Table 2-3: Summary of water quality monitoring sites at Myocum Landfill relevant to condition U3.1

Monitoring Aspect and frequency	BSC Monitoring Site	EPA Monitoring Point	General Location
Groundwater Regional Aquifer Required every 6 months	MW01	EPA 01	Northern edge of landfill (within Sediment Dam Pond 1)
	MW02	EPA 02	Southern edge of landfill (up gradient from Southern Expansion)
	MW03	EPA 03	Western edge of landfill, within Myocum Quarry
	MW06	EPA 23	Southern edge of landfill (adjacent Southern Expansion)

	MW07	EPA 24	Within customer interface area to west of landfill
Alluvial Aquifer Required every 6 months	MW04	EPA 04	Northern edge of landfill adjacent Sediment Dam Pond 1
	MW05	EPA 05	Northern edge of landfill downstream from Sediment Dam B
Surface Water Required six months at a time when flow occurring	SW1	EPA 33	Simpsons Creek tributary (accessed from Mullumbimby Rd, 1km to the west of landfill site)
	SDP1	EPA 06	Sediment Dam Pond 1
	SDP2	EPA 08	Sediment Dam Pond 2

Table 2-4: List of parameters at each EPA Monitoring Point

EPA Monitoring Points	List of Parameters		
EPA 1-5, 23 & 24 Regional and Alluvial Groundwater	pH	Magnesium	Manganese
	Temperature	Alkalinity	Ammonia (as N)
	Electrical Conductivity	Sulphate	Nitrate (as N)
	Calcium	Chloride	Total Organic Carbon
	Sodium	Potassium	Iron
EPA 6, 8 & 33 Surface Water	pH	Magnesium	Manganese
	Temperature	Alkalinity	Ammonia (as N)
	Electrical Conductivity	Sulphate	Nitrate (as N)
	Calcium	Chloride	Total Organic Carbon
	Sodium	Potassium	Iron
	Suspended Solids	Dissolved Oxygen	
EPA 9, 10, 11 & 25 Leachate	pH	Magnesium	Manganese
	Temperature	Alkalinity	Ammonia (as N)
	Arsenic	Sulfate	Nitrate (as N)
	Calcium	Chloride	Total Organic Carbon
	Sodium	Potassium	Iron
	Fluoride	Organochlorine Pesticides	Total Phenolics

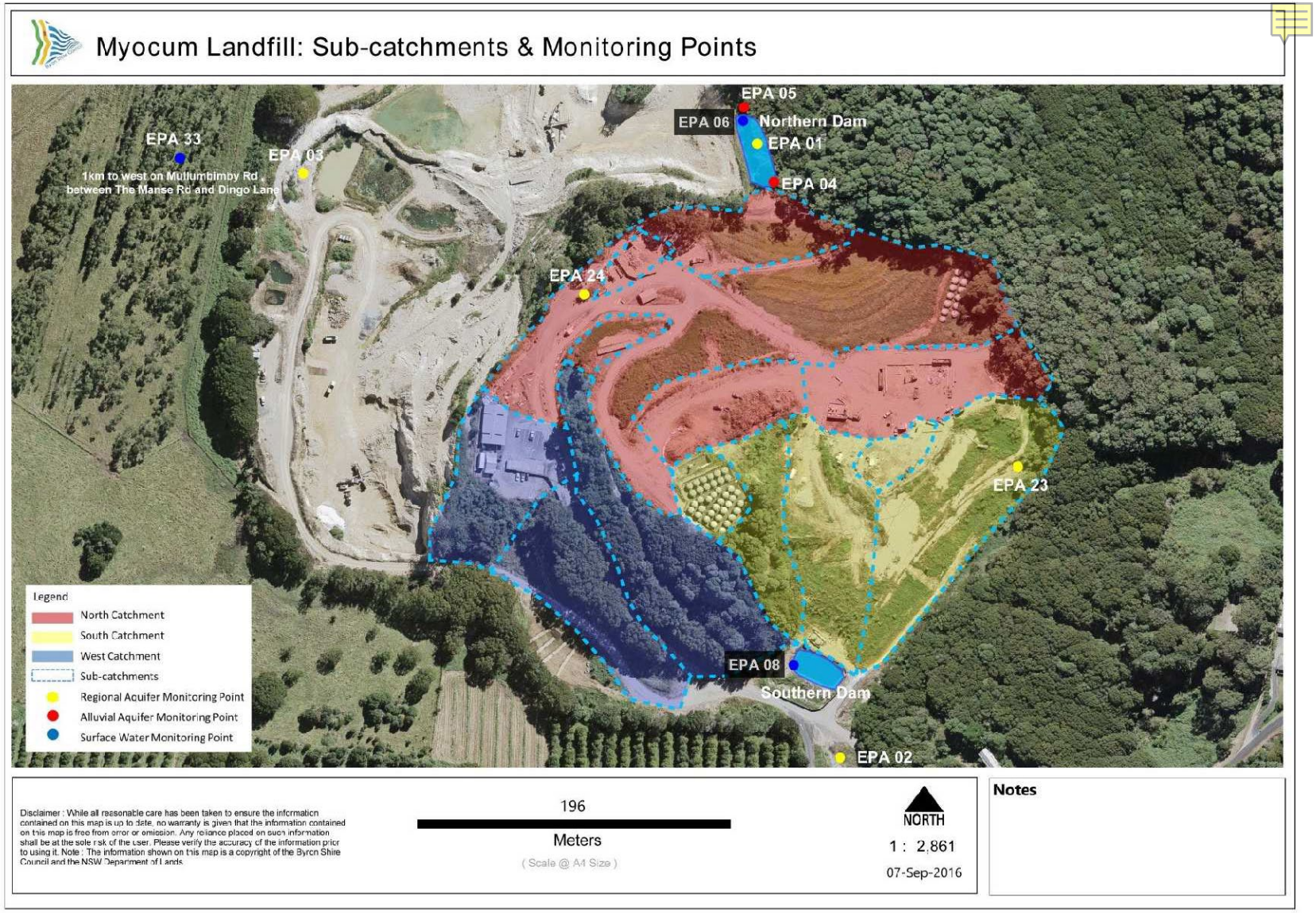


Figure 2-3: Myocum Landfill sub catchments, surface flow pathways and monitoring points

Table 2-5: Tabulated summary of regional, alluvial and surface water monitoring results between Sep 2019 and Aug 2020. BOLD and highlighted indicates excedence of relative WQ trigger value

BSC Point	EPA Point	Date	pH	Temp °C	Conductivity uS/cm	Alkalinity mg/L	Sulphate Filtered mg/L	Chloride mg/L	Calcium Filtered mg/L	Magnesium mg/L	Sodium Filtered mg/L	Potassium Filtered mg/L	Iron Total mg/L	Manganese Total mg/L	Manganese Filtered mg/L	Ammonia as N mg/L	Nitrate as N mg/L	Total Organic Carbon mg/L	Dissolved Oxygen mg/L	Suspended Solids mg/L
Regional Aquifer WQ Triggers			2.9 - 6.7	No trigger	3,800	13.5	26	118	2	5	65	1.0	0.08	No trigger	0.63	1.74	1.87	13.0	No trigger	
MW1	EPA 01	14-Nov-19	5.50	21.20	385	77.00	45.00	36.00	18.00	5.30	21.00	8.40	32.50	1.45		2.27	0.00	19.00		
MW1	EPA 01	20-Feb-20	6.00	23.50	856	117.00	247.00	75.00	92.00	11.00	25.00	14.00	41.60	3.33		3.95	0.00	19.00		
MW1	EPA 01	21-May-20	6.00	19.30	602	121.00	112.00	40.00	53.00	4.30	20.00	12.00	55.60	2.63		3.08	0.00	25.00		
MW1	EPA 01	27-Aug-20	5.80		283	26.00	51.00	30.00	9.00	2.90	22.00	13.00	2.14	0.74		5.76	0.00	9.40		
MW2	EPA 02	14-Nov-19	4.10	22.00	195	0.00	11.00	34.00	0.40	4.80	19.00	0.70	1.54		0.05	0.00	3.17	1.00		
MW2	EPA 02	20-Feb-20	4.20	22.10	184	0.00	12.00	32.00	0.50	4.10	20.00	0.70	0.43		0.06	0.03	2.79	1.00		
MW2	EPA 02	21-May-20	4.30	21.90	177	0.00	12.00	32.00	1.00	4.30	20.00	0.80	0.19		0.03	0.00	3.14	1.00		
MW2	EPA 02	27-Aug-20	4.60		158	0.00	12.00	28.00	0.90	4.10	19.00	0.80	0.28		0.03	0.05	2.71	1.40		
MW3	EPA 03	14-Nov-19	5.50	21.40	510	20.00	12.00	130.00	11.00	9.90	62.00	1.40	1.42	4.26		0.00	0.00	0.60		
MW3	EPA 03	20-Feb-20																		
MW3	EPA 03	21-May-20	5.50	20.00	503	25.00	12.00	120.00	11.00	9.60	60.00	1.60	0.26	6.63		0.00	0.00	0.50		
MW3	EPA 03	27-Aug-20	5.70		490	26.00	12.00	120.00	11.00	9.90	61.00	1.60	2.33	6.43		0.00	0.00	1.00		
MW6	EPA 23	14-Nov-19	4.20	21.40	317	0.00	21.00	70.00	0.40	3.90	45.00	0.60	3.73	0.60		0.00	0.84	1.10		
MW6	EPA 23	20-Feb-20	4.40	21.60	368	5.00	38.00	80.00	3.20	4.40	31.00	0.92	9.43	13.70		0.06	0.11	6.10		
MW6	EPA 23	21-May-20	4.10	20.90	306	0.00	21.00	64.00	0.50	3.80	43.00	0.70	2.02	1.11		0.03	0.80	1.10		
MW6	EPA 23	27-Aug-20	5.30		309	9.00	21.00	69.00	2.00	4.00	44.00	1.90	3.18	0.90		1.58	0.85	2.30		
MW7	EPA 24	14-Nov-19																		
MW7	EPA 24	20-Feb-20	5.40	24.00	428	23.00	19.00	46.00	30.00	7.70	20.00	16.00	1.25	2.54		0.03	21.50	7.10		
MW7	EPA 24	21-May-20	5.70	22.80	414	58.00	27.00	35.00	38.00	7.80	22.00	17.00	4.89	0.28		0.11	12.90	11.00		
MW7	EPA 24	27-Aug-20	5.00		302	7.00	4.90	34.00	12.00	6.90	15.00	10.00	0.93	9.99		0.07	18.80	6.10		
Alluvial Aquifer WQ Triggers			6.5 - 8.5	No trigger	2200	No trigger							1.0	No trigger	2.50	1.43	No trigger			
MW4	EPA 04	14-Nov-19																		
MW4	EPA 04	20-Feb-20	5.40	23.40	344	20.00	33.00	70.00	13.00	3.10	35.00	7.20	3.68	0.98		1.43	0.00	9.00		
MW4	EPA 04	21-May-20	5.60	21.70	318	25.00	42.00	47.00	12.00	3.50	28.00	11.00	1.64	1.00		2.97	0.33	8.80		
MW4	EPA 04	27-Aug-20	6.20		236	50.00	27.00	20.00	20.00	3.10	13.00	10.00	2.33	0.13		0.17	0.00	8.50		
MW5	EPA 05	14-Nov-19																		
MW5	EPA 05	20-Feb-20	5.50	22.70	239	24.00	27.00	36.00	12.00	2.70	20.00	11.00	2.04	0.42		0.68	0.30	9.80		
MW5	EPA 05	21-May-20	6.20	20.50	326	75.00	37.00	31.00	27.00	4.50	18.00	13.00	6.92	0.96		0.77	0.02	11.00		
MW5	EPA 05	27-Aug-20	6.00		414	76.00	86.00	26.00	33.00	5.90	18.00	8.80	25.80	1.66		2.60	0.00	18.00		
Surface Water WQ Triggers			6.5 - 9.0	No trigger	610	116	100	150	20.7	50	70	11.8	1.0	No trigger	2.50	0.36	3.40	20.30	6	No trigger
SDP1	EPA 06	14-Nov-20																		
SDP1	EPA 06	20-Feb-20	7.40	28.70	542	173.00	23.00	50.00	41.00	5.80	31.00	21.00	0.82	0.33		10.10	0.02	25.00	0.70	4.00
SDP1	EPA 06	21-May-20	7.90	19.10	307	80.00	30.00	24.00	33.00	4.10	16.00	11.00	1.96	0.20		0.04	0.85	12.00	11.00	28.00
SDP1	EPA 06	27-Aug-20	7.40		238	71.00	19.00	21.00	28.00	3.00	12.00	10.00	1.23	0.10		0.04	0.07	11.00	7.80	19.00
SDP2	EPA 08	14-Nov-19																		
SDP2	EPA 08	20-Feb-20	8.90	29.40	816	174.00	38.00	75.00	58.00	14.00	59.00	40.00	0.16	0.11		5.92	5.78	36.00	16.00	7.00
SDP2	EPA 08	21-May-20	9.20	19.60	661	85.00	39.00	88.00	40.00	9.30	55.00	34.00	1.88	0.15		0.16	16.80	22.00	16.00	51.00
SDP2	EPA 08	27-Aug-20	7.80		442	49.00	17.00	54.00	30.00	6.90	35.00	22.00	2.23	0.03		0.12	9.54	18.00	8.80	28.00
SW1	EPA 33	14-Nov-19																		
SW1	EPA 33	20-Feb-20	6.80	26.40	305	80.00	6.90	47.00	14.00	9.50	27.00	1.70	5.38	4.63		0.23	0.03	21.00	1.10	19.00
SW1	EPA 33	21-May-20	6.80	17.70	344	48.00	19.00	64.00	13.00	10.00	36.00	2.70	3.24	0.24		0.09	0.05	8.70	4.50	16.00
SW1	EPA 33	27-Aug-20	6.90		322	49.00	6.00	48.00	10.00	10.00	36.00	1.20	15.00	0.57		0.17	0.08	6.00	7.30	207.00

3. Monitoring results and discussion

The results of the 2019/20 ground and surface water monitoring at Myocum Landfill are provided in tabular form in table 2-6, showing raw results and any exceedances in stated water quality triggers (as per Table 1.1).

Figure 3.7 through to Figure 3.11 plot ground and surface water quality from all EPA monitoring points from early 2003 through to mid-2020. Table 3.1 outlines EPA monitoring sites and their applicable water management unit in which they are designed to monitor. For each of the specified water management units (regional groundwater, alluvial groundwater and surface waters), a comparison of the collected data with the stated water quality triggers (as per Table 1.1) are required, along with:

- An assessment of any spatial or temporal change in water quality.
- An evaluation (if any) of the nature and level (and changes to) of human health and environmental risks to water management units and other environmentally sensitive receivers.
- An assessment of whether the current monitoring program is adequate in detecting a full suite of possible leachate contaminants.
- Any mitigation measures recommended to be implemented for the next 12 months to reduce contamination levels and risks to human health.

Table 3-1: Reference site monitoring locations

Water Management Unit	Monitoring Site
Regional groundwater	EPA Points 1, 2, 3, 23 and 24
Alluvial groundwater	EPA Points 4 and 5
Surface water	EPA Points 6, 8 and 33

3.1 Alluvial Groundwater Aquifer

As shown in Table 2.6, a number of parameters monitored within the alluvial groundwater system exceeded the nominated trigger values. These include:

- Ammonia within bore EPA 04 and EPA05 for May and August 2020 events.
- pH in both upslope and downslope monitoring bores EPA 04 and 05 for all events.
- Iron within upslope and downslope monitoring bores EPA 04 and 05 for all events.

Within bores EPA 04 and EPA 05, ammonia concentrations exceeded the predefined water quality trigger value of 1.43mg/L in three of six sample values in this reporting period.

Review of annual 4 point median values show there has been a decline in Ammonia and Nitrate values since 2003 at both bores (EPA 04 and EPA 05) as shown in Figure 3-1. Appendix A displays yearly median results from all data gathered from the alluvial groundwater management unit between 2003 and 2019. These results show that over the past 16 years of data collection, there is a general decrease in conductivity, sodium, sulfate, magnesium, chloride and potassium concentrations, with an increase in iron concentration.

The full closure of the northern landfill area, enhanced storm water management works and general site management over the past years has resulted in a general improvement on the water quality in the alluvial groundwater. While ammonia is entering the alluvial groundwater system, it is being rapidly attenuated within the groundwater system, resulting in limited export of ammonia off site and compliance with the predetermined WQ trigger value of 1.43 mg/L in bore EPA 05.

Iron concentrations in nearly all samples collected from the upslope and downslope monitoring bores EPA 04 and EPA 05 exceeded the trigger value of 1.0mg/L. Table 2-6 shows an upward trend of elevated iron concentration in samples collected from the downslope monitoring bore EPA 05 since 2012.

3.1.1 Nature and level of human health and environmental risk

No contaminants have been recorded within any of the alluvial monitoring bores that would pose human health risks.

All pH levels within both monitoring bores EPA 04 and 05 are outside (below) the nominated trigger range. This is possibly caused by naturally acidic groundwater in the broader alluvial aquifer (caused by alluvial geology) (AWC, 2015).

As stated previously, ammonia concentrations in monitoring bore EPA 04 (upslope) exceed the nominated trigger value of 1.43mg/L, potentially posing an environmental risk to the downstream receiving environment. However, the downstream monitoring bore (EPA 05) records ammonia values routinely below the trigger value suggesting flow into the receiving environment complies with the nominated trigger value. Continued improvement in the operation and management of the Myocum Landfill is resulting in reduced environmental risk of the downslope alluvial aquifer.

Although iron concentration in the downstream monitoring bore regularly exceeds the trigger value, there is low risk of human health concerns. Iron concentrations have been found to be elevated in many of the other monitoring bores onsite, including upslope. Refer Sections 3.2 and 3.3 below.

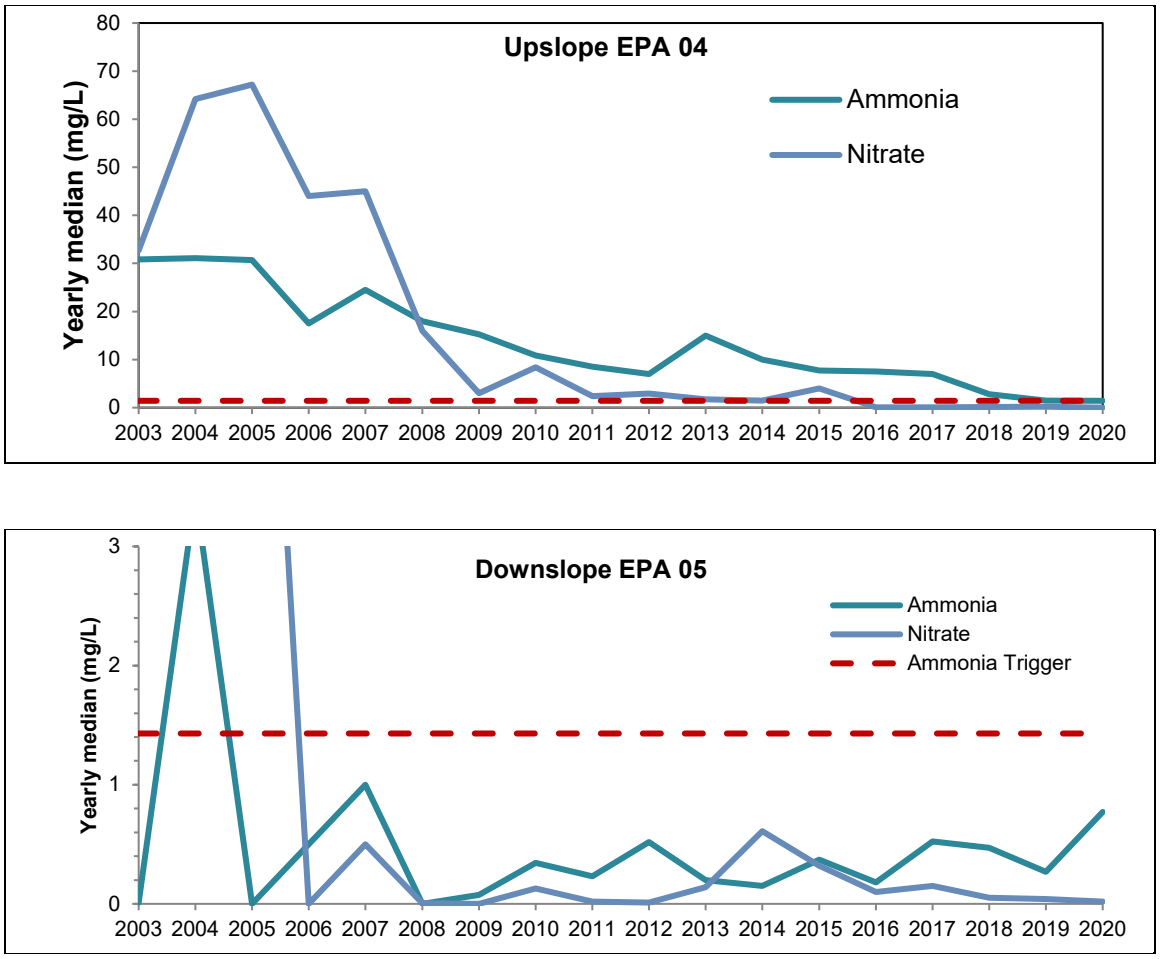


Figure 3-1: Yearly median Ammonia and Nitrate values at alluvial groundwater bores (EPA 04 upslope and EPA 05 downslope)

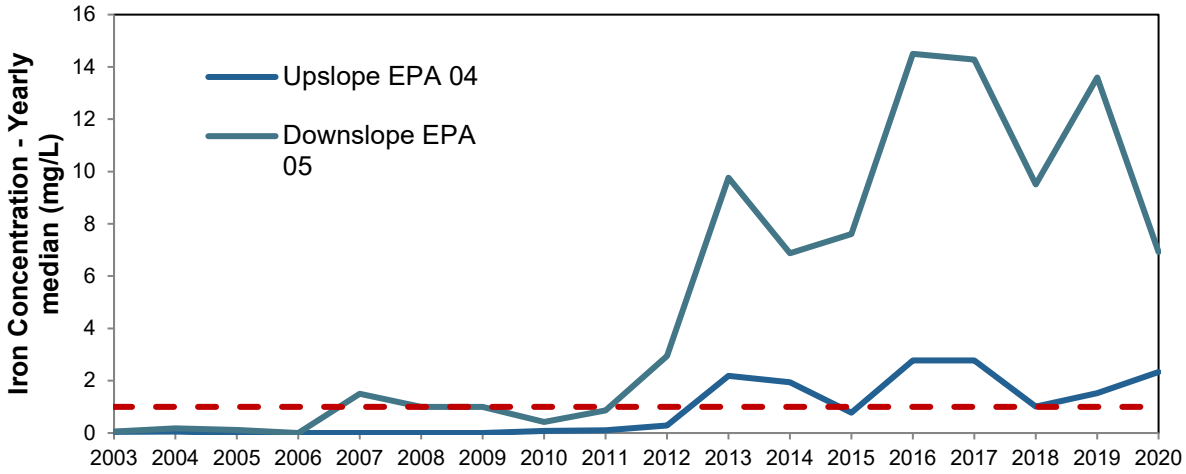


Figure 3-2: Yearly median Iron concentration values at alluvial groundwater bores (EPA 04 upslope and EPA 05 Downslope)

3.1.2 Augmenting the current monitoring regime

The current monitoring program employed to assess the potential impacts of the Myocum Landfill on the alluvial aquifer adequately monitors water quality within the aquifers moving in a northerly direction. The sampling regime provides a suitable temporal scale of data collection, allowing the assessment of the continued reduction of ammonia concentration within monitoring bore EPA 04 and the continued compliance of alluvial aquifer water quality in downslope monitoring bore EPA 05.

3.2 Regional Groundwater

3.2.1 Upslope bores – EPA 2 and EPA 23

Two of the five regional groundwater bores can be viewed as 'upslope bores' (Bores EPA 02 and 23) and hence be used to infer whether the operation of the Myocum Landfill is impacting on the regional groundwater system. As shown in Table 2.6, upslope monitoring bores EPA 02 and 23 were compliant with most monitoring parameters; exceptions being Nitrate (EPA 2 only), Potassium and Manganese (EPA 23 only), and Iron (for both EPA 2 and EPA 23):

- Potassium and iron in nearly all samples collected from the regional aquifers (upstream and downstream) exceeded the trigger value of 1.0mg/L. However, many of the values presented are at the laboratory detection limits of <5mg/L, as such the actual values may be substantially lower.
- All iron concentrations for the regional aquifer (upstream and downstream) during the reporting period, exceeded the trigger value of 0.08mg/L.
- All nitrate values from monitoring bore EPA 02 and EPA23 were all above the trigger value of 1.87mg/L, however all results from monitoring bore EPA 23 complied with the trigger value (refer Figure 3-3).
- Due to the location of upslope monitoring bores EPA 02 and 23, the above discussed exceedances are unlikely to be the result of the operation of the landfill. Observed increases in Nitrate, Potassium and Iron are possibly the results of other catchment / climatic influences, including upslope domestic onsite wastewater treatment / disposal systems (nitrate) and/or dry/wet conditions surrounding sampling resulting in more mobile Iron within the soil column (AWC, 2015).

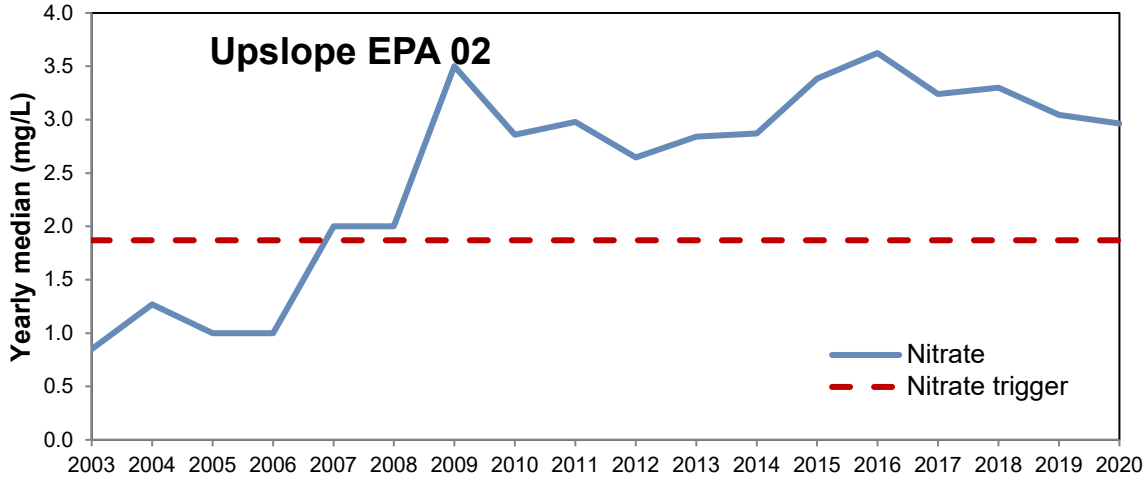


Figure 3-3: Increase in Nitrate within monitoring bore EPA 02

3.2.2 Downslope bores – EPA 1, EPA 3, and EPA 24

The remaining three regional groundwater monitoring bores (EPA 01, 03 and 24) are located downslope of the landfill:

- North of Sediment Dam Pond 1 (EPA 01);
- Within the quarry to the west of the landfill (EPA 03); and
- Just north of the weighbridge (EPA 24).

This network of bores has been located to track potential groundwater contaminants in the regional aquifer to the west and north-west of the site, in a similar direction to the topography of the site.

As shown in table 2-6, the Ammonia trigger value of 1.74mg/L, the Sulphate trigger value of 26mg/L, and the Total Organic Carbon trigger value of 13.0mg/L was exceeded in monitoring bore EPA 01, however concentrations at the other two downstream bores complied with the trigger. The Nitrate trigger value of 1.87mg/L was exceeded in monitoring bore EPA 24. Alkalinity exceeded in monitoring bore EPA 01 and EPA 03, with the Chloride and Sodium values exceeding in monitoring bore EPA 03 only. Furthermore, Magnesium values exceeded in monitoring bore EPA 03 and EPA 24

Additionally, numerous test analytes in all three sampling bores consistently exceeded their nominated trigger values, including:

- Iron
- Calcium
- Potassium
- Manganese

Select yearly median results from downslope monitoring bores EPA 01, 03 and 24 are shown in Figure 3-4.

As shown in Figure 3.4, ammonia concentration within EPA 01 (northern side of landfill) increased significantly in 2008, thereafter plateauing with yearly median concentrations ranging between 2.0 to 3.14mg/L. In reference to the alluvial groundwater sampling bores that are both upslope (EPA 04) and downslope (EPA 05) of this regional monitoring bore (refer to Figure 3-1), ammonia contained within the alluvial groundwater management unit may be entering the deeper regional groundwater management unit, hence resulting in the observed presence of low concentrations of ammonia. As observed with the alluvial monitoring bores, it is likely that this observed impact reduces with distance from the landfill. All ammonia concentrations recorded for the EPA 01 monitoring bore during this monitoring period (two samples) exceeded the trigger

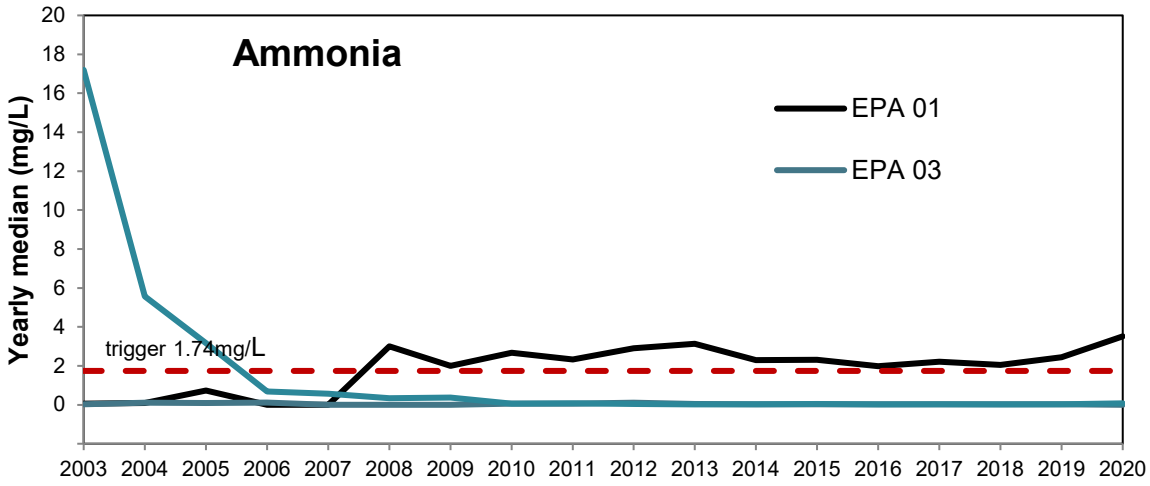
value of 1.74mg/L however the other two downstream bores' ammonia concentrations complied with the trigger. Calcium, Alkalinity and Sulfate median values markedly increased at the 2008 time period at the EPA 01 and 24 monitoring sites, values have since decreased and have become relatively stable, they do however generally exceed the trigger values assigned. Monitoring site EPA 01 had elevated levels of calcium and alkalinity since 2015.

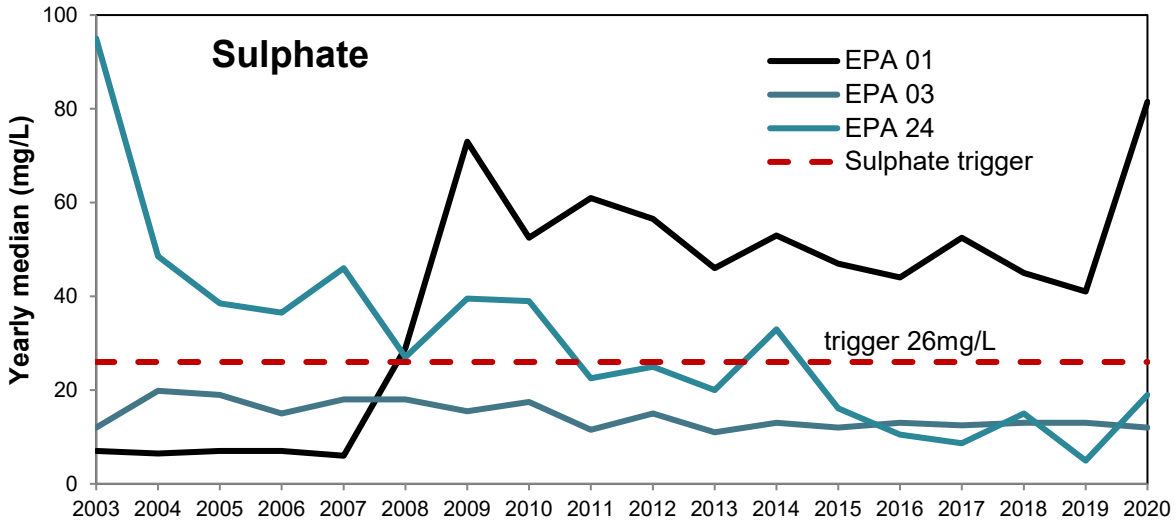
3.2.3 Nature and level of environmental risk

No contaminants have been recorded within any of the regional monitoring bores at concentrations that would pose human health risks.

Many contaminants within monitoring bores EPA 01, EPA 03 and EPA 24 exceeded their nominated trigger value, and as such pose a theoretical level of environmental risk. The location of EPA 01 is within the Northern Sediment Basin (Sediment Dam Pond 1), and since 2008 has yielded results vastly different to that collected prior to 2008. As such, water taken from monitoring bore EPA 01 is not viewed as being indicative of the wider regional aquifer.

Although there is exceedance of some analytes in the upslope bores, there is a higher degree of exceedance in the downslope bores. This may indicate the landfill site as a contamination source for the regional groundwater aquifer.





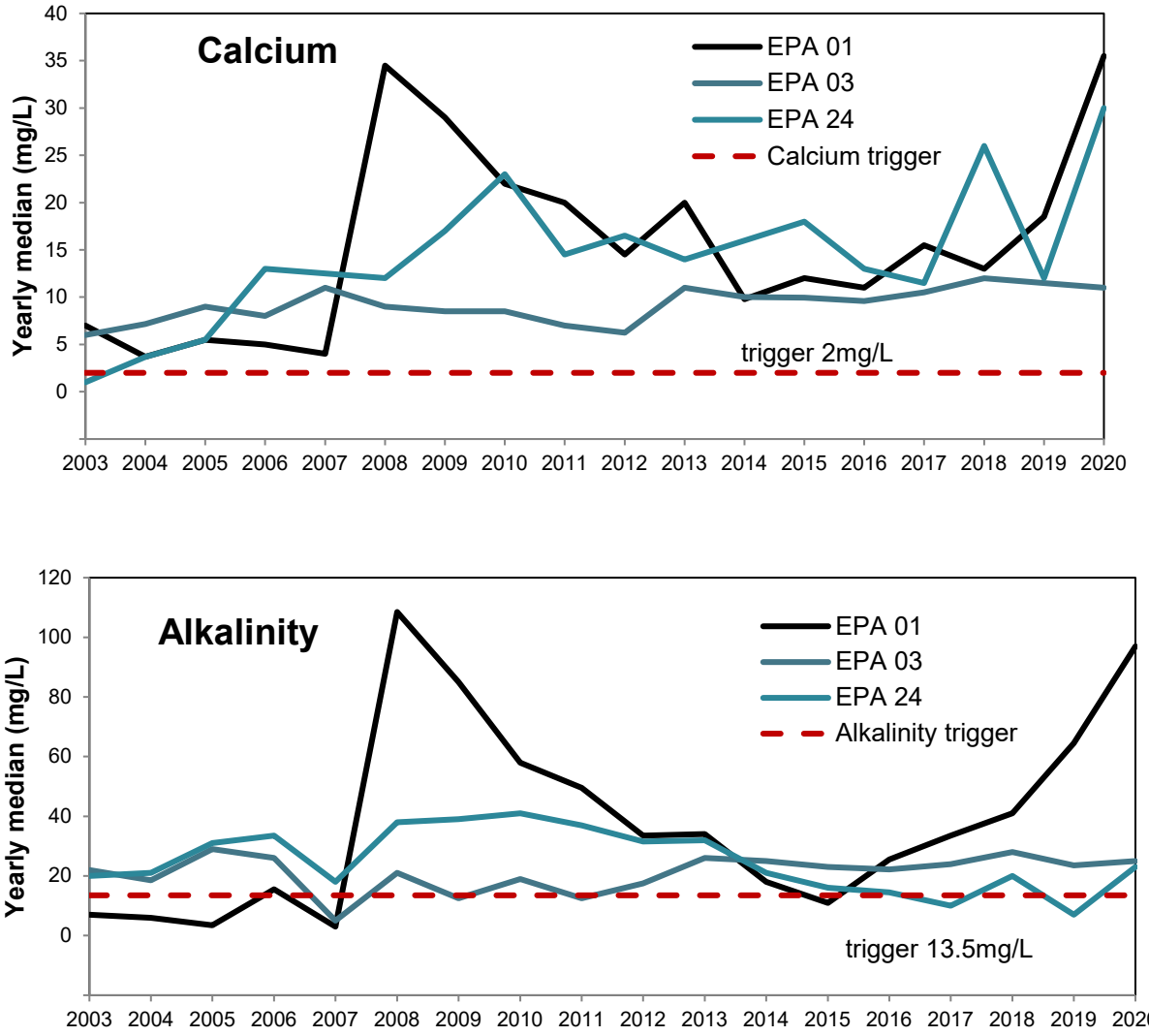


Figure 3-4: Select analytes yearly median results from downslope monitoring bores of the Regional Aquifer

3.2.4 Augmenting the current monitoring regime

The monitoring regime provides a suitable temporal scale of data collection and a wide variety of analytes associated with assessing both environmental and human health risks. There are, however, some issues with the location of downslope monitoring bores, highlighted in the previous annual reports. The location of monitoring bores EPA 01 and 03 may yield results that inadequately describe the quality of the regional aquifer.

Council has liaised with the EPA with regard to potentially decommissioning monitoring bore EPA 01 and installing another downslope regional monitoring bore north of the Northern Sediment Basin (Sediment Dam Pond 1). Council will continue to liaise with the EPA regarding this, however will need to be cognisant of any unintended impacts on any inconsistency that may arise when analysing new well data with historic data sets.

While monitoring bore EPA 03 is yielding fairly consistent results since 2003, its location within the operating quarry and low depth to groundwater (due to quarrying activities), has in the past not represented the best location to assess the impact of the landfill on the broader downslope regional aquifer (AWC, 2015). This was due to the regional aquifer surrounding monitoring bore

EPA 03 possibly being subjected to localised hydraulic and quality impacts associated with the operation of the quarry.

3.3 Surface water

Surface water sampling sites are located at the spill way of both sediment dams, and within the Simpson Creek Tributary, 1km west of the landfill site. It is important to note that results presented from sites EPA 06 and EPA 08 do not represent waters discharging to receiving environment, as samples are taken from water within the sediment basins (at the spillway end), not from water overtopping the spillway. Table 2-6 shows recorded values for the current monitoring period and Appendix A shows a table containing the collated median values.

During the 2019-20 monitoring period, all calcium and potassium values recorded from monitoring site EPA 06 and EPA 08 exceeded the trigger values of 20.7mg/L and 11.8mg/L respectively. Additionally, a number of isolated trigger exceedances occurred with other analytes, namely:

- One of the four alkalinity, total organic carbon, ammonia, and dissolved oxygen values at EPA 06.
- Three the total organic carbon and dissolved oxygen values at EPA 06 and EPA 08.
- Two of the three conductivity and alkalinity values at EPA 08.
- Three of the three nitrate and iron values at EPA 08.
- One of each of the three monitoring results for ammonia value at EPA 06 and EPA 08.
- Seven of nine results for all surface water sites.
- All of calcium results at EPA 06 and EPA 08.

The far downstream background surface water monitoring site on Simpson Creek (EPA 33) only exceeded iron, TOC and Dissolved Oxygen water quality triggers, none of which are likely to be caused by landfill operations.

Iron is a prevalent soil and groundwater element occurring at elevated levels naturally within the region, and is highly mobile within the soil and groundwater environment. During low rainfall conditions, it is probable that the concentration of iron within surface and shallow groundwater system increase due to lack of dilution from rainfall and enhanced oxidation and mobilisation of iron bound clay particles within the wider soil profiles surrounding monitoring point EPA 33 (AWC, 2015). Annual median values for iron recorded at EPA 33 have steadily increased since 2011, with an increase in 2015 and 2019 but a decrease in 2020 for EPA 33 as shown in Figure 3-5.

DO is a highly variable water quality parameter with concentrations constantly affected by complex biological and physical influencing environmental factors (e.g. diffusion and aeration, photosynthesis, respiration and decomposition, seasonal temperature, the amount of naturally occurring organic matter, salinity, algal presence and the time of day the sample was taken). As such, an exceedance of the DO trigger value at monitoring sites EPA 33, 6 and 8 is not considered to pose an environmental or health risk. Values of DO from 6-15mg/L can actually benefit types of aquatic life (e.g. fish). The trigger level for DO of >6mg/L may require review by the EPA and council may seek clarification regarding whether a DO of 6mg/L may be a minimum requirement for water quality.

Since environmental monitoring commenced at Myocum Landfill, water quality within monitoring sites EPA 06 and EPA 08 has consistently exceeded trigger values for alkalinity, calcium, potassium and total organic carbon (TOC), as shown in 3-6.

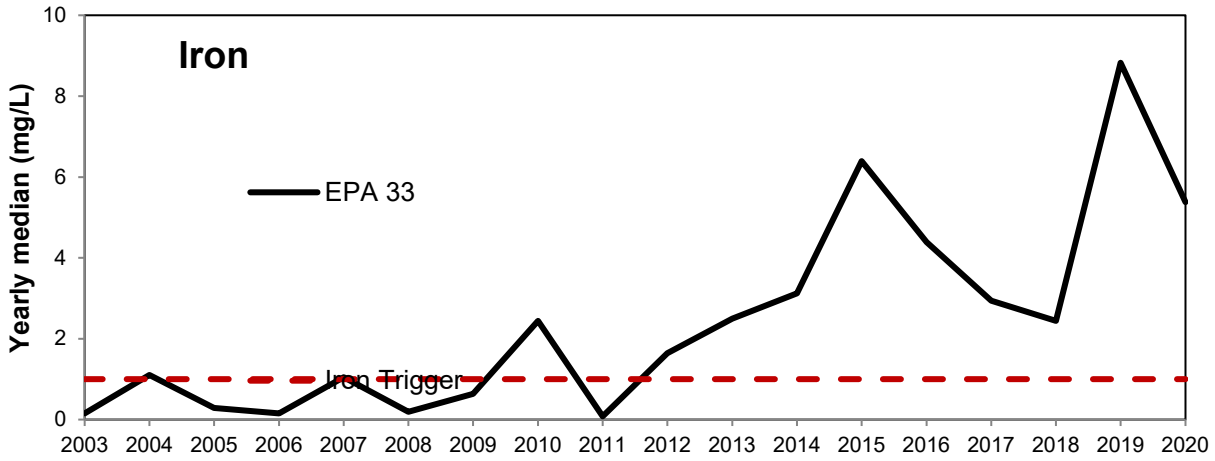


Figure 3-5: Iron annual median values recorded at EPA 33

3.3.1 Nature and level of environmental risk

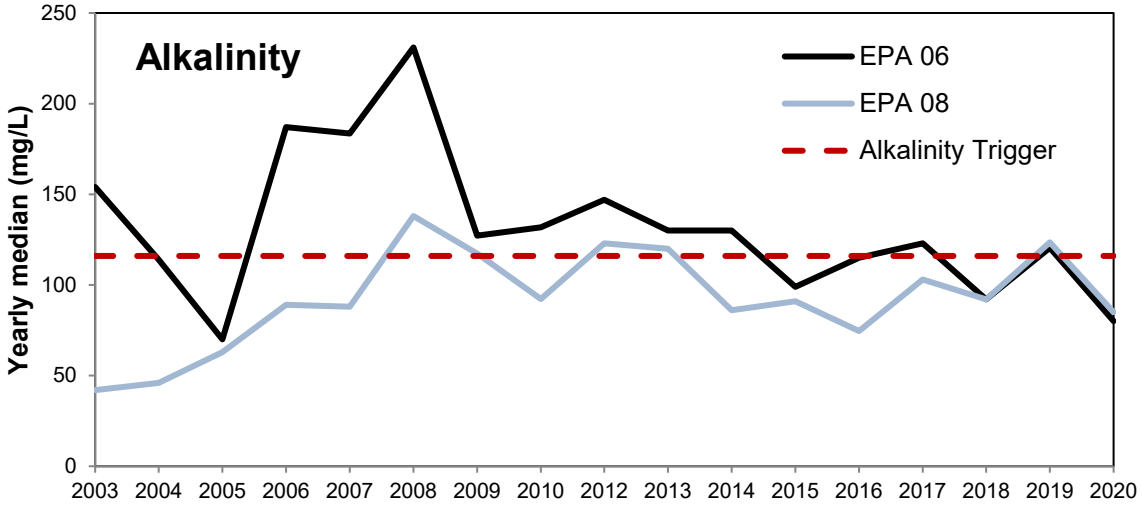
No contaminants have been recorded at any of the surface water monitoring locations that would pose human health risks.

Numerous contaminants within monitoring points EPA 06 and 08 exceeded their nominated trigger values (Alkalinity, Total Organic Carbon, Dissolved Oxygen, Potassium, Calcium, Iron), however these contaminants are mostly restricted to salts, which pose minor concern for the environment at the concentrations observed.

It is important to reiterate that the data reported for monitoring points EPA 06 and EPA 08 is that of the water within the ponds, rather than that exiting the ponds during wet weather events. As such, high salt concentrations of the water is expected at certain times of year, based on rainfall and evaporation patterns diluting or concentrating salts within the water column of the sediment ponds.

3.3.2 Augmenting the current monitoring regime

There will be a review of the DO trigger level with the EPA to establish whether 6mg/L is a minimum requirement rather than a threshold for water quality.



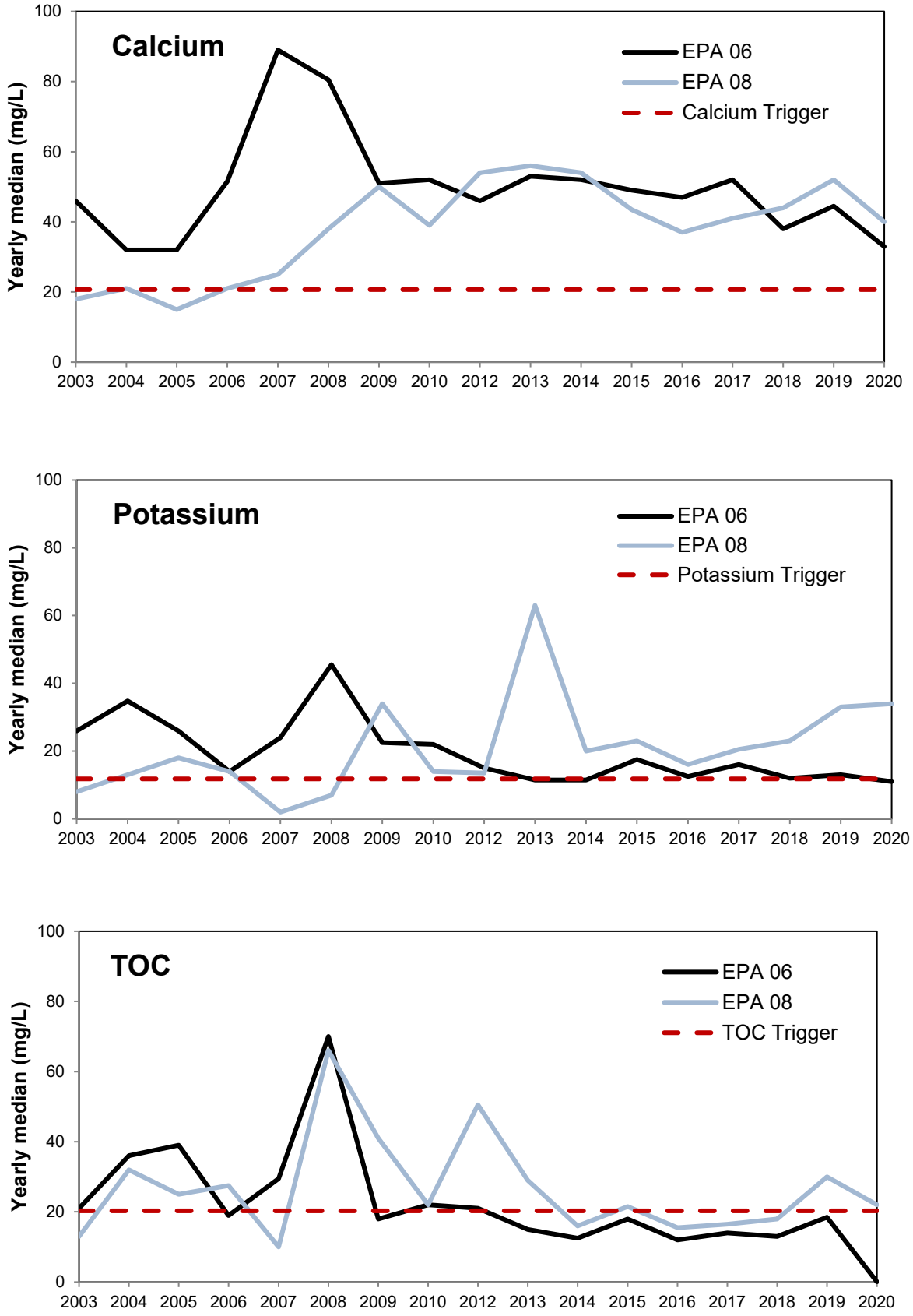


Figure 3-6: Select yearly median results from surface water Sediment Dams

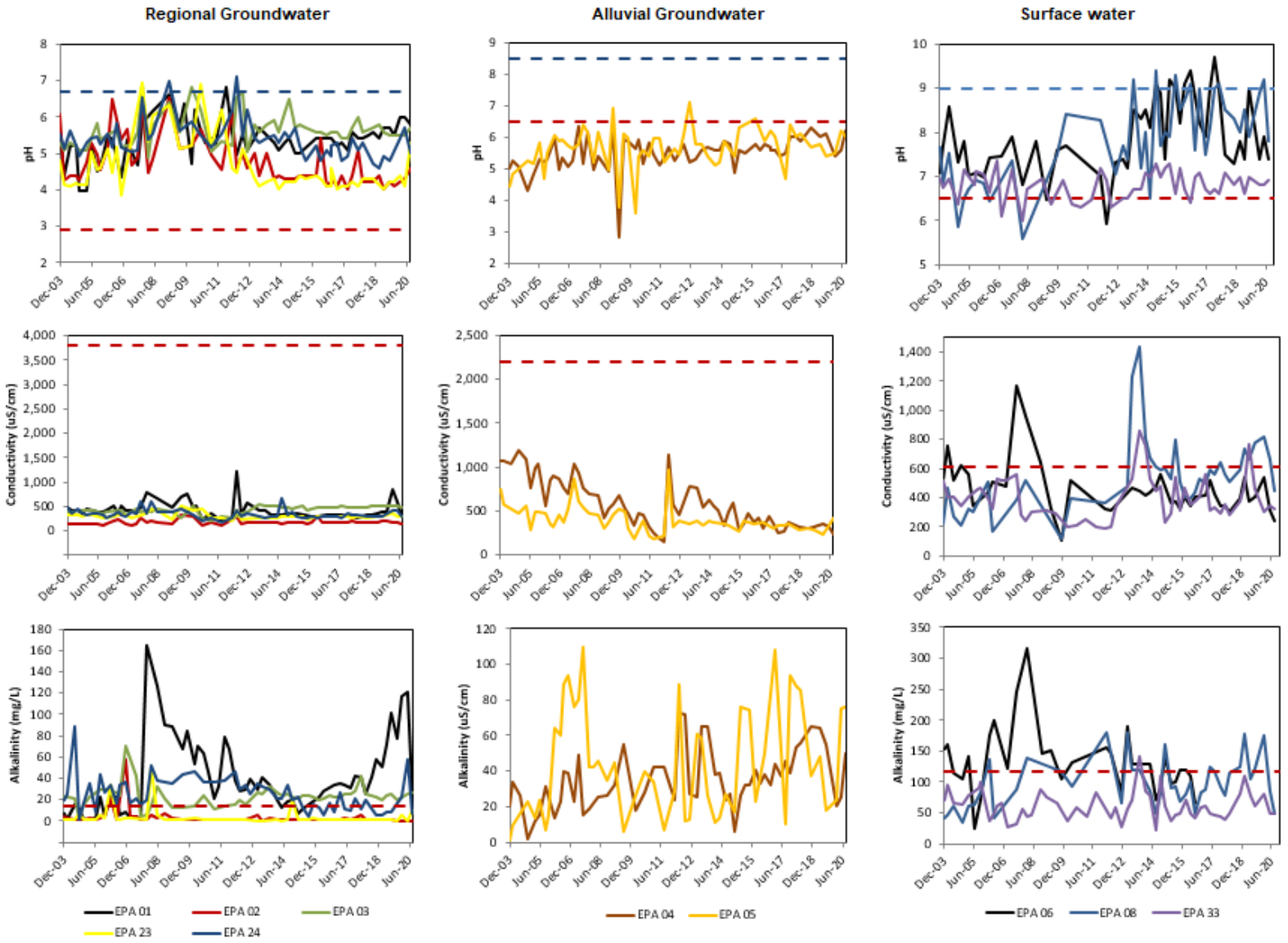


Figure 3-7: Regional Groundwater, Alluvial Groundwater and Surface water monitoring results between 2003 and 2020

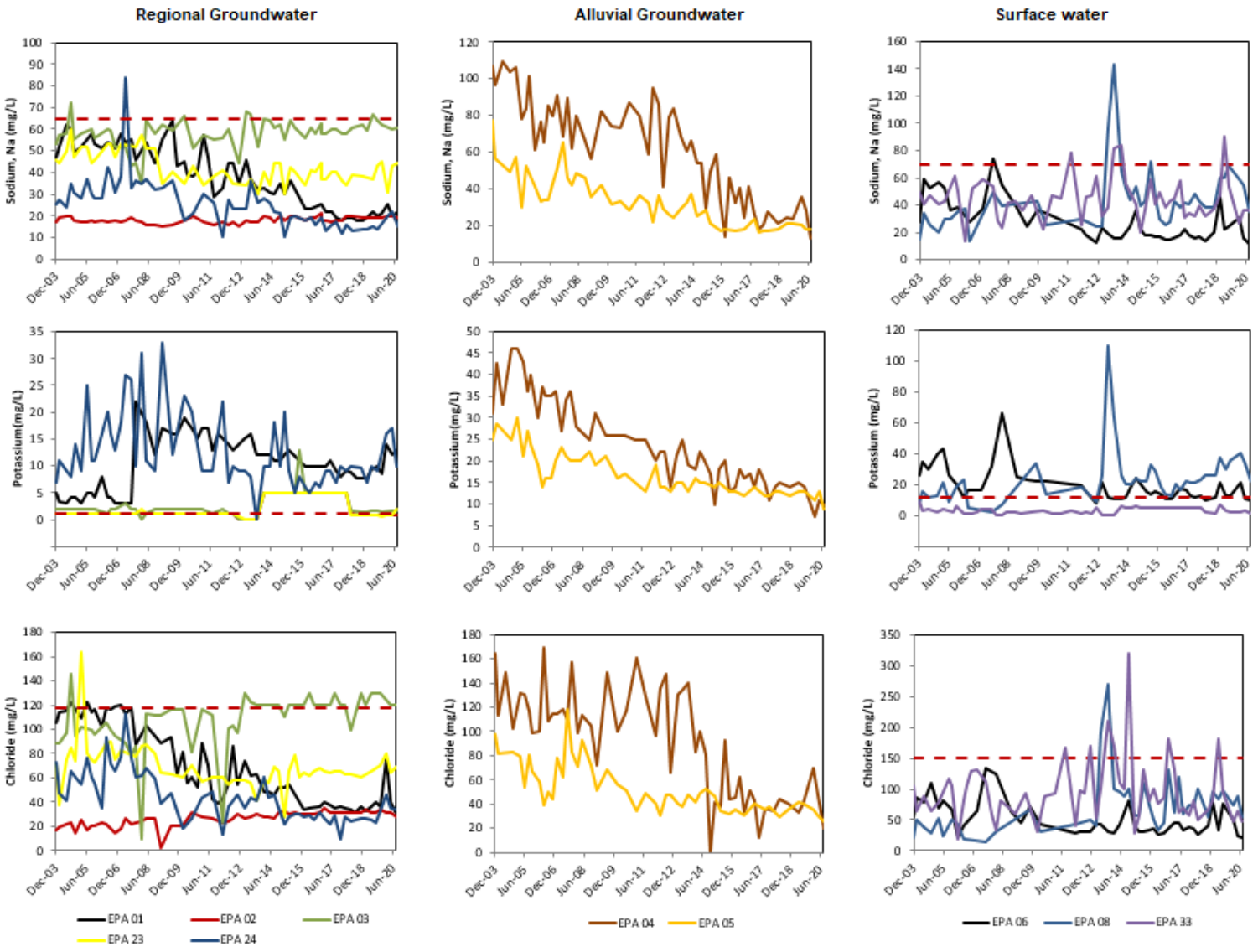


Figure 3-8: Regional Groundwater, Alluvial Groundwater and Surface water monitoring results between 2003 and 2020

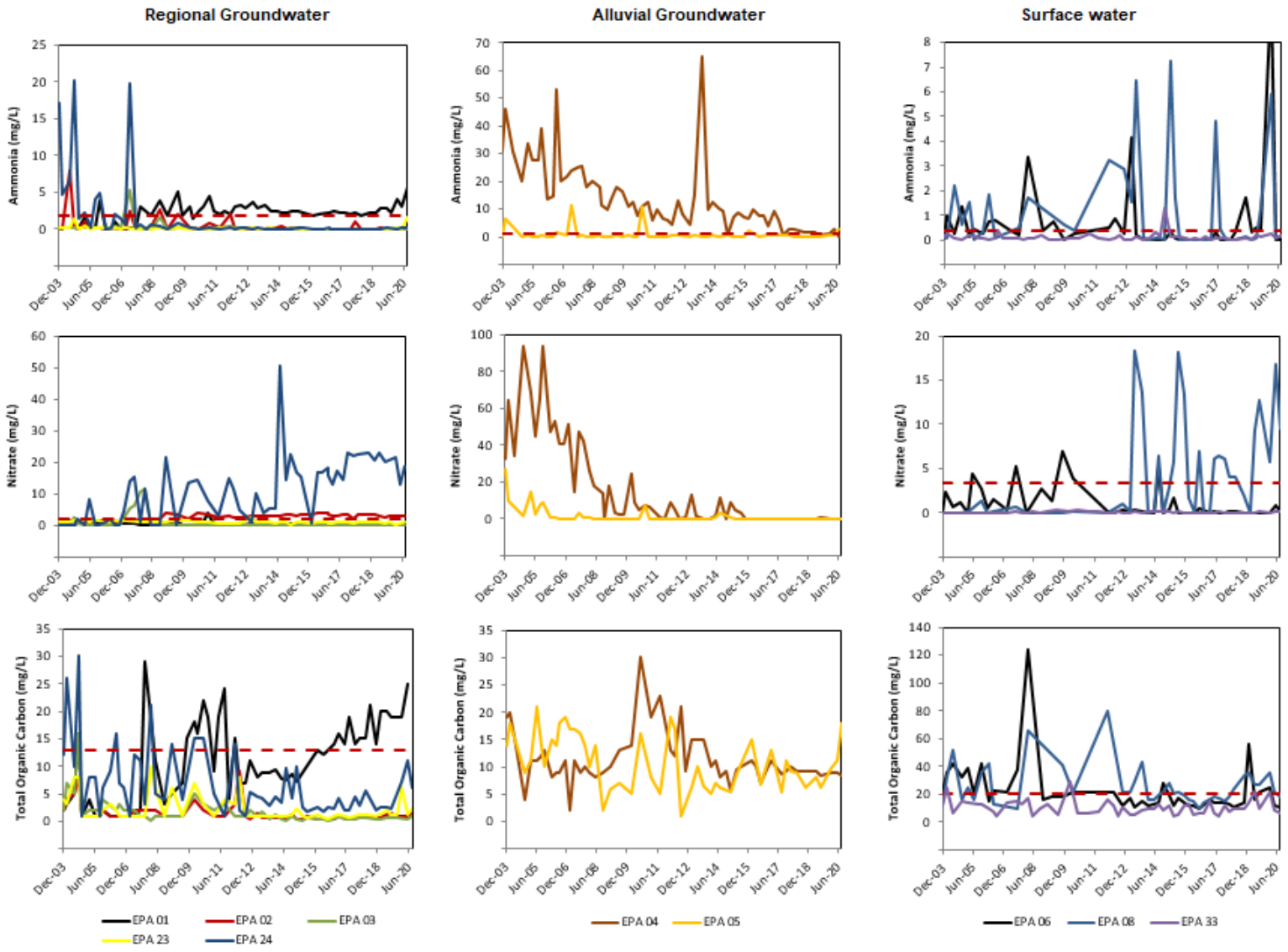


Figure 3-9: Regional Groundwater, Alluvial Groundwater and Surface water monitoring results between 2003 and 2020

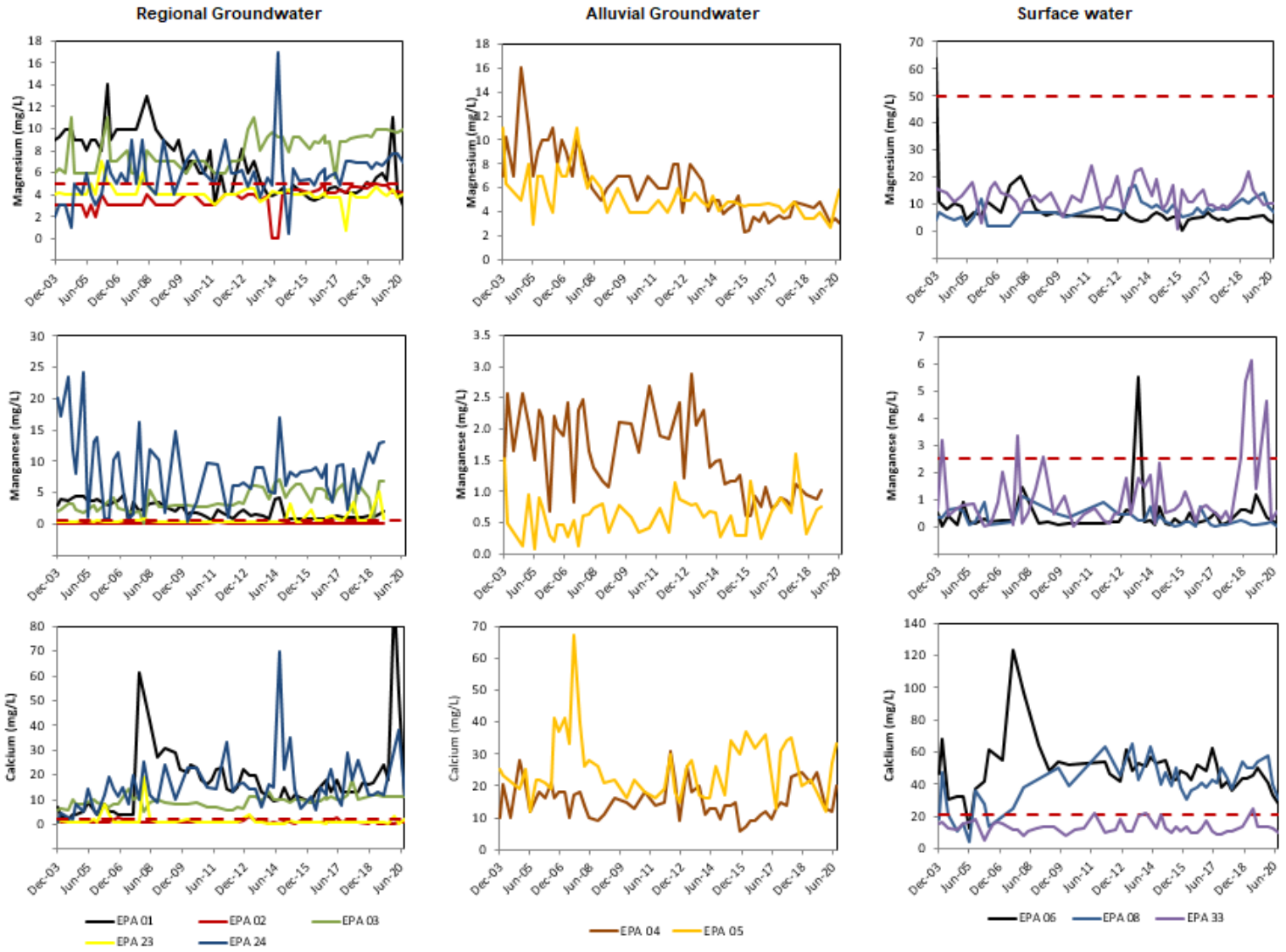


Figure 3-10: Regional Groundwater, Alluvial Groundwater and Surface water monitoring results between 2003 and 2020

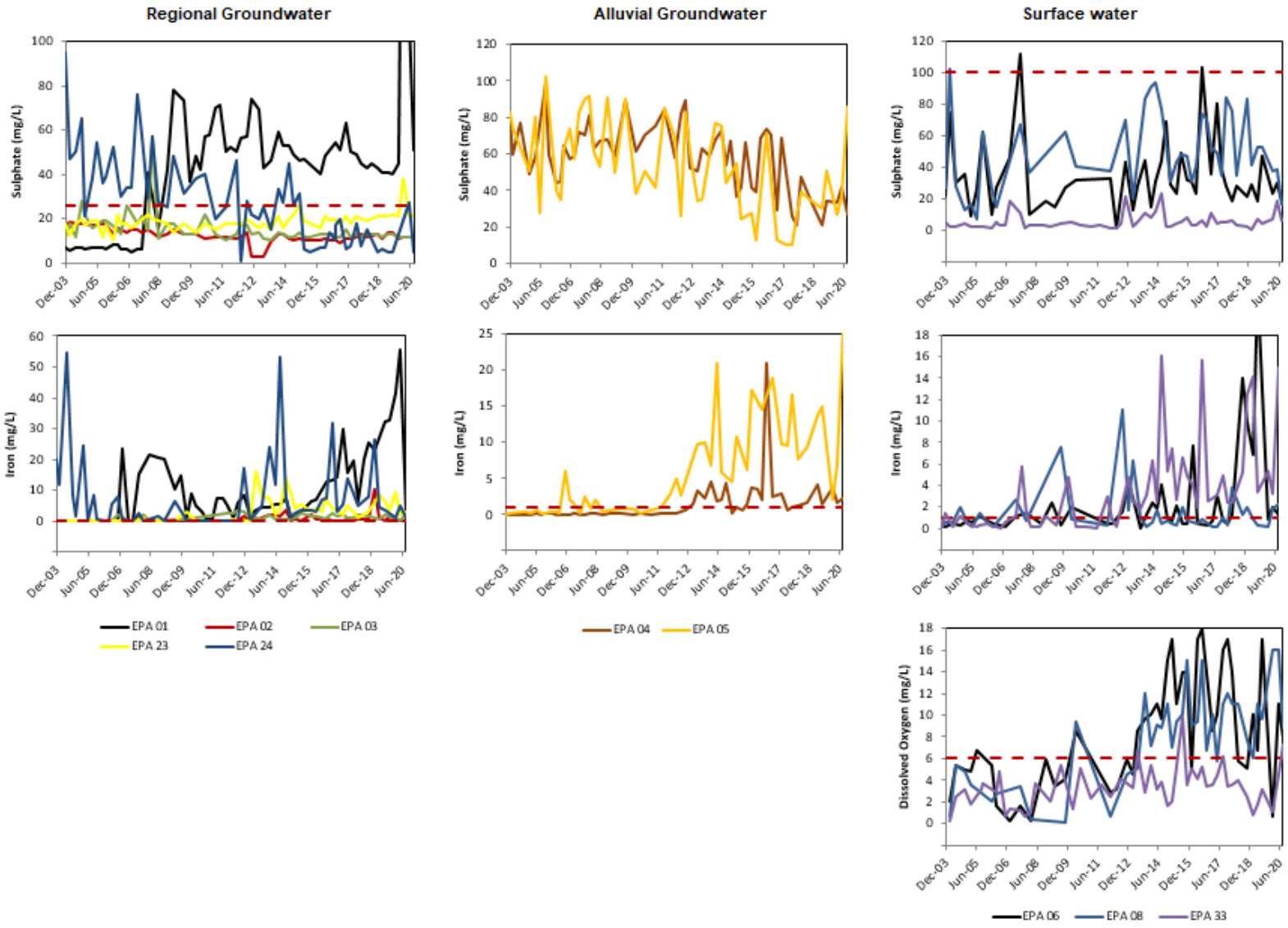


Figure 3-11: Regional Groundwater, Alluvial Groundwater and Surface water monitoring results between 2003 and 2020

4. Conclusion

Presented in this report is new ground and surface water data collected during the monitoring period between September 2019 and September 2020, along with all historical data collected since 2003. Water quality within both the alluvial and regional groundwater management units were investigated, along with surface water in the site sediment dams and one off-stream permanent creek system (Simpsons Creek).

4.1 Alluvial Groundwater

Groundwater data collected from the alluvial aquifer indicate historical landfilling activities are impacting on water quality. Ammonia concentration in monitoring point EPA 04 routinely exceeds the trigger value. This contamination is, however, not apparent in the downslope monitoring point EPA 05, indicating rapid attenuation within the alluvial aquifer system. This environmental impact has improved considerably since 2003, with compliant results likely to be achieved in coming years, based on the trajectory of the monitoring data.

No contaminants have been recorded within any of the alluvial monitoring bores that would pose human health risks.

No augmentation is recommended for assessing potential impacts of the Myocum Landfill on the alluvial aquifer.

4.2 Regional Groundwater

Monitoring points EPA 02 and 23 represent upslope monitoring points that provide a good reference point to review the potential impact of the landfill on the regional groundwater aquifer. The regional aquifer downslope of the landfill has an elevated range of contaminants compared with the upslope aquifer, mainly restricted to salts.

A substantial change occurred in water quality results sourced from EPA 01 in 2008. Concentrations of Alkalinity and Calcium increased markedly. Annual median values have remained high for Ammonia and Sulphate.

Council will continue to investigate the integrity of EPA 01 and EPA 03 in sampling the regional aquifer, and will continue to liaise with the EPA regarding the installation of a new regional aquifer bore in place of EPA 01 north of Sediment Dam Pond 1, and also relocating EPA 03.

No contaminants have been recorded within any of the regional monitoring bores that would pose human health risks.

4.3 Surface water

Sampling results from monitoring sites EPA 06 and 08 presented in this report represent water within the respective sediment basins, rather than the actual flow of water entering the receiving environment. It is recommended that future assessment surface water samples be collected from the sedinet basin overflow point.

No contaminants have been recorded that would pose human health risks within any of the surface water monitoring sites.

5. References

Anzecc (2000), The Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Australian Wetlands Consulting (AWC) (2014), 2014 Annual Water Contamination Report, prepared on behalf of Byron Shire Council.

Australian Wetlands Consulting (AWC) (2015), 2015 Annual Water Contamination Report, prepared on behalf of Byron Shire Council.

ATC Williams (2012) Myocum Landfill – 2012 Annual Water Contamination Report, prepared on behalf of Byron Shire Council.

AWA (2006), Myocum Landfill - Water Quality Assessment (Addressing Groundwater, Surface Water and Leachate), prepared on behalf of Byron Shire Council, Ref: 0109-bsc-003 (r009-d).

AWA (2006a), Myocum Solid Waste Landfill – Southern Expansion, Design Report for Landfill Development, prepared on behalf of Byron Shire Council, Ref: 0185-bsc - 001(r001-d).

AWA (2007), Myocum Landfill - Assessment of Groundwater Monitoring Bore MW04, prepared on behalf of Byron Shire Council, Ref: 0109-bsc-006 (r001-b).

AWA (2009), Myocum Landfill – 2009 Annual Water Contamination Report, prepared on behalf of Byron Shire Council, Ref: 0109-bsc-003 (r017-b).

Byron Shire Council (2016), 2016 Annual Water Contamination Report – Myocum Landfill.

Earth2Water (E2W) (2012), Annual Technical Review: The Groundwater Monitoring Network and Data for Myocum Landfill (Lic No: 6057), prepared on behalf of Byron Shire Council.

Maunsell (2002), Myocum Landfill Remediation Project – Landfill Environmental Management Plan, prepared on behalf of Byron Shire Council.

Appendix A: Yearly median water quality results

Regional groundwater yearly medians

BSC Point	EPA Point	Year	No	pH	Temperature	Conductivity	Alkalinity	Sulphate	Chloride	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese Total	Manganese Filtered	Ammonia as N	Nitrate as N	Total Organic Carbon	Total Phenols
					°C	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L
Trigger Value				2.9 - 6.7	No trigger	3,800	13.5	26	118	2	5	65	1.0	0.08		0.63	1.74	1.87	13.0	No trigger
MW1	EPA 01	2003	1	5.68	19.80	470.00	7.00	7.00	105.00	7.00	9.00	47.00	5.00	0.02	3.06		0.06	0.53	2.00	0.05
		2004	4	4.80	18.20	426.00	6.00	6.50	116.00	3.70	9.60	56.00	3.60	0.02	4.11		0.10	0.27	4.00	0.05
		2005	4	4.56	19.25	405.50	3.50	7.00	115.50	5.50	9.00	54.00	4.50	0.00	4.00		0.74	0.84	1.50	0.00
		2006	4	5.12	18.95	471.00	15.50	7.00	117.00	5.00	9.50	52.00	4.00	0.00	3.50		0.00	1.00	1.00	0.00
		2007	4	5.03	19.85	414.00	3.00	6.00	115.50	4.00	10.00	54.50	3.00	7.50	2.50		0.00	1.00	1.50	0.00
		2008	1	6.00	20.00	1000.00	108.50	29.00	99.00	34.50	11.50	49.00	15.00	21.00	3.00		3.00	0.00	7.00	0.00
		2009	3	6.38	21.00	751.00	85.00	73.00	88.00	29.00	9.00	55.00	16.00	14.60	2.87		2.00	0.14	7.00	0.00
		2010	4	5.46	20.20	389.50	58.00	52.50	58.00	22.00	6.50	40.00	17.50	3.99	1.66		2.68	0.20	18.50	0.05
		2011	4	5.81	18.85	239.00	49.50	61.00	56.00	20.00	6.00	39.00	16.50	4.00	1.48		2.32	0.55	14.00	0.05
		2012	4	5.32	17.65	459.50	33.50	56.50	55.00	14.50	5.00	39.50	14.00	5.63	1.50		2.90	0.09	9.00	0.05
		2013	3	5.50	20.30	432.00	34.00	46.00	63.00	20.00	6.00	37.00	15.00	3.59	1.32		3.14	0.06	8.80	
		2014	3	5.30	21.60	329.00	18.00	53.00	48.00	9.80	4.00	31.00	12.00	5.34	3.90		2.30	0.06	7.70	
		2015	3	5.00	21.30	345.00	11.00	47.00	52.00	12.00	4.60	35.00	12.00	1.39	0.81		2.31	0.17	8.60	
		2016	2	5.40	23.00	290.00	25.50	44.00	34.50	11.00	3.55	23.00	10.00	6.55	0.72		1.98	0.10	12.50	
		2017	4	5.25	21.10	327.50	33.50	52.50	37.00	15.50	4.50	22.00	10.00	13.55	1.10		2.22	0.06	15.00	
		2018	4	5.45	20.85	294.50	41.00	45.00	34.50	13.00	4.20	18.50	8.45	17.75	1.07		2.05	0.07	15.00	
		2019	4	5.65	20.40	343.50	64.50	41.00	36.00	18.50	5.35	19.50	8.45	26.25	2.03	1.46	2.45	0.02	19.50	
		2020		5.90	21.20	493.50	97.00	81.50	38.00	35.50	4.80	21.50	12.50	37.05	2.04		3.52	0.00	19.00	
MW2	EPA 02	2003	1	6.09	19.80	135.00	4.00	17.00	17.00	2.00	3.00	17.00	1.00	0.01	0.03		0.04	0.85	2.00	0.05
		2004	4	4.33	19.50	134.50	1.00	18.00	20.50	1.00	3.00	19.70	1.00	0.01	0.04		0.06	1.27	4.50	0.06
		2005	4	4.86	22.05	133.00	3.00	17.00	20.00	1.00	2.50	17.00	1.00	0.00	0.00		0.00	1.00	1.00	0.00
		2006	3	5.38	18.70	194.00	21.00	14.00	22.00	1.00	3.00	18.00	1.00	0.00	0.00		0.00	1.00	1.00	0.00
		2007	4	5.44	21.20	68.50	2.50	15.00	22.50	1.00	3.00	18.00	1.00	0.00	0.00		0.00	2.00	2.00	0.00
		2008	2	4.50	21.00	0.00	6.00	13.00	26.00	1.00	3.00	16.00	1.00	0.00	0.00		0.00	2.00	2.00	0.00
		2009	2	6.00	21.50	0.00	1.50	14.00	11.50	1.00	3.00	15.50	1.00	0.00	0.00		1.00	3.50	1.00	0.00
		2010	2	5.44	21.50	218.50	1.00	12.00	26.00	1.00	4.00	19.00	1.00	0.18	0.05		0.04	2.86	3.00	0.05
		2011	2	4.76	22.40	108.00	1.00	12.00	27.00	1.00	3.00	16.50	1.00	0.12	0.20		0.39	2.98	1.00	0.05
		2012	4	4.80	19.40	191.50	1.00	11.50	25.00	1.00	4.00	16.50	1.00	0.12	0.06		0.05	2.65	2.00	0.05
		2013	3	5.00	22.20	169.00	2.00	2.84	28.00	2.30	4.00	17.00	0.00	0.26	0.02		0.02	2.84	0.70	
		2014	3	4.30	21.40	169.00	1.00	13.00	28.00	0.50	0.04	19.00	5.00	2.07	0.03		0.10	2.87	0.60	
		2015	4	4.35	22.10	175.50	1.00	10.00	31.50	0.80	4.35	20.00	5.00	0.41	0.03		0.06	3.39	0.65	
		2016	4	4.35	22.50	180.50	1.00	10.00	30.00	0.80	4.25	18.50	5.00	0.59	0.05		0.02	3.63	0.40	
		2017	4	4.15	22.60	179.00	1.00	10.50	31.50	1.00	4.30	18.00	5.00	0.24	0.05		0.02	3.24	0.65	
		2018	3	4.40	22.50	183.00	2.00	12.00	32.00	1.00	4.70	20.00	5.00	0.38	0.06		0.02	3.30	0.90	
		2019	4	4.20	21.80	182.00	1.00	13.50	32.00	0.50	4.85	19.00	0.70	0.73	0.04	0.06	0.02	3.05	1.00	
		2020		4.25	22.00	180.50	0.00	12.00	32.00	0.70	4.20	19.50	0.75	0.36		0.04	0.02	2.97	1.00	
MW3	EPA 03	2003	1	5.29	23.40	390.00	22.00	12.00	88.00	6.00	6.00	53.00	2.00	0.02	2.08		0.03	0.07	2.00	0.05
		2004	4	5.14	18.40	405.00	18.50	19.85	96.00	7.15	6.20	57.60	2.00	0.03	2.75		0.10	0.49	6.00	0.05
		2005	3	5.39	20.40	383.00	29.00	19.00	99.00	9.00	6.00	58.00	2.00	0.06	2.06		0.09	0.11	2.00	0.05
		2006	3	5.58	19.20	412.00	26.00	15.00	100.00	8.00	7.00	59.00	2.00	0.10	3.80		0.11	0.03	2.00	0.05
		2007	3	5.57	21.70	388.00	5.00	18.00	86.00	11.00	6.00	44.00	2.00	0.00	2.00		0.00	6.00	1.00	0.00
		2008	2	5.50	20.50	0.00	21.00	18.00	111.00	9.00	7.00	58.00	1.00	0.00	3.00		0.00	0.00	1.00	0.00
		2009	2	6.00	20.50	0.00	12.50	15.50	114.00	8.50	7.00	60.50	2.00	0.50	3.00		0.00	0.00	1.00	0.00
		2010	2	6.51	19.80	398.00	19.00	17.50	99.00	8.50	6.50	58.50	2.00	0.88	2.88		0.06	0.08	4.00	0.05
		2011	4	5.19	19.75	255.50	12.50	11.50	116.00	7.00	6.50	56.00	1.50	1.99	3.03		0.06	0.06	2.50	0.05
		2012	4	5.87	19.00	322.00	17.50	15.00	99.00	6.25	7.00	54.50	1.00	2.74	3.12		0.11	0.01	1.00	0.05
		2013	3	5.80	20.50	514.50	26.00	11.00	123.00	11.00	10.00	67.00	0.00	0.96	6.16		0.04	0.04	1.00	0.00
		2014	3	5.90	22.15	498.00	25.00	13.00	120.00	10.00	9.20	64.00	5.00	0.76	6.60		0.03	0.06	0.30	0.00
		2015	4	5.75	20.80	487.00	23.00	12.00	120.00	9.95	9.25	61.50	5.00	0.80	5.84		0.03	0.03	0.55	
		2016	4	5.60	21.20	473.00	22.15	13.00	120.00	9.60	8.70	58.00	5.00	1.33	4.99		0.02	0.02	0.30	
		2017	4	5.50	20.6	489.5	24.0	12.5	120.0	10.5	8.9	60.0	5.0	1.78	5.27		0.02	0.04	0.35	
		2018	3	5.70	21.60	494.00	28.00	13.00	120.00	12.00	9.10	58.00	5.00	1.28	3.53		0.02	0.02	0.60	
		2019	4	5.65	20.90	501.50	23.50	13.00	130.00	11.50	9.70	63.00	1.55	1.35	6.72	5.55	0.02	0.02	0.55	
		2020	4	5.50	20.70	503.00	25.00	12.00	120.00	11.00	9.90	61.00	1.60	1.42	6.43		0.00	0.00	0.60	

BSC Point	EPA Point	Year	No	pH	Temperature	Conductivity	Alkalinity	Sulphate	Chloride	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese Total	Manganese Filtered	Ammonia as N	Nitrate as N	Total Organic Carbon	Total Phenols
					°C	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L
Trigger Value				2.9 - 5.7	No trigger	3,800	13.5	26	118	2	5	65	1.0	0.08		0.63	1.74	1.87	13.0	No trigger
MW6	EPA 23	2003	1	4.81	20.80	325.00	1.00	18.00	72.00	1.00	4.00	46.00	1.00	0.02	0.41		0.06	0.98	4.00	0.05
		2004	4	4.13	19.35	316.00	1.00	17.50	74.50	1.00	4.00	48.50	1.00	0.01	0.36		0.16	1.25	5.50	0.05
		2005	4	4.58	20.10	279.00	1.50	18.00	77.50	1.00	4.00	49.00	1.00	0.00	0.00		0.00	1.00	1.00	0.00
		2006	4	4.79	19.75	332.00	1.50	18.00	86.00	2.50	5.00	51.50	1.00	0.00	0.00		0.00	1.00	1.50	0.00
		2007	2	6.00	21.00	0.00	2.00	19.00	80.00	1.00	4.00	52.50	1.00	0.00	0.00		0.00	1.00	1.00	0.00
		2008	2	5.50	20.50	0.00	5.00	19.00	86.00	2.00	5.00	51.00	1.00	0.00	0.00		0.00	1.00	6.00	0.00
		2009	2	5.50	21.50	0.00	1.00	16.00	63.50	1.00	4.00	37.50	1.00	0.00	0.00		0.00	1.00	3.50	0.00
		2010	2	6.05	20.00	430.00	1.50	16.00	65.00	1.50	4.00	39.00	1.00	1.57	0.33		0.02	1.18	5.00	0.05
		2011	2	5.70	20.55	265.00	1.00	16.50	58.50	1.00	3.50	36.00	1.00	0.09	0.32		0.06	0.84	2.50	0.10
		2012	3	4.58	17.80	220.00	1.00	18.00	58.00	1.00	4.00	38.00	1.00	0.05	0.29		0.04	0.54	3.00	0.05
		2013	3	4.20	21.70	273.00	0.00	16.00	56.00	1.10	4.60	34.00	0.00	7.88	0.35		0.03	1.04	0.90	
		2014	3	4.20	20.80	270.00	1.00	20.00	58.00	0.40	4.20	40.00	5.00	4.04	0.37		0.04	0.87	0.80	
		2015	4	4.25	20.75	298.00	1.00	20.50	65.50	0.75	4.05	41.00	5.00	7.34	0.46		0.82	1.05		
		2016	4	4.35	21.00	284.50	1.00	19.00	63.00	0.95	3.85	38.50	5.00	3.60	0.84		0.02	0.78	0.70	
		2017	4	4.10	21.20	295.00	1.00	19.00	65.50	0.80	3.80	40.00	5.00	3.69	0.65		0.02	0.85	0.90	
		2018	3	4.20	21.20	283.00	1.00	20.00	63.00	0.70	3.70	36.00	5.00	3.14	1.51		0.02	0.86	1.10	
		2019	3	4.20	20.60	297.00	1.00	21.00	65.00	0.90	4.10	38.00	0.80	6.55	0.78	0.67	0.02	0.84	1.30	
		2020	4	4	21.40	313.00	2.50	21.00	69.50	1.25	3.95	43.50	0.81	3.46	1.01		0.05	0.82	1.70	
MW7	EPA 24	2003	1	5.52	20.80	480.00	20.00	95.00	73.00	1.00	2.00	25.00	7.00	20.20	20.20		17.20	0.14	12.00	0.05
		2004	4	5.18	19.40	349.50	21.00	48.55	53.50	3.70	3.00	29.30	10.00	10.21	14.65		5.57	0.01	18.00	0.05
		2005	4	5.36	21.40	347.00	31.00	38.50	58.50	5.50	4.00	29.00	11.00	4.35	13.40		3.17	0.11	7.00	0.05
		2006	4	5.36	19.65	324.00	33.50	36.50	68.00	13.00	5.50	35.00	16.00	2.83	5.51		0.69	0.66	8.00	0.05
		2007	4	5.10	21.60	378.00	18.00	46.00	77.00	12.50	5.50	37.00	22.00	0.46	2.86		0.57	9.10	7.00	0.10
		2008	2	5.44	21.25	495.50	38.00	27.00	62.00	12.00	5.00	35.00	11.00	0.63	10.10		0.34	0.12	5.00	0.05
		2009	2	6.31	22.25	420.50	39.00	39.50	43.00	17.00	6.50	34.50	22.50	3.37	8.23		0.38	10.84	9.00	0.05
		2010	2	5.70	22.15	259.00	41.00	39.00	22.00	23.00	7.50	19.50	21.50	0.13	1.83		0.06	13.90	15.00	0.05
		2011	2	5.36	22.10	215.20	37.00	22.50	46.50	14.50	5.50	28.00	9.00	0.05	9.63		0.07	5.38	3.00	
		2012	4	6.19	19.95	314.50	31.50	25.00	38.50	16.50	6.10	23.00	9.50	0.05	6.12		0.05	11.40	3.65	0.05
		2013	3	5.40	23.30	287.00	32.00	20.00	41.00	14.00	4.70	26.00	8.00	2.43	8.93		0.02	3.94	4.10	0.00
		2014	3	5.50	22.70	310.00	21.00	33.00	46.00	16.00	5.50	26.00	10.00	24.00	5.09		0.03	5.46	4.40	
		2015	4	5.30	22.70	314.00	16.00	16.10	29.00	18.00	5.70	19.50	9.50	3.22	7.82		0.05	3.40		
		2016	4	5.15	23.10	269.50	14.50	10.50	28.50	13.00	5.35	18.50	6.50	5.13	7.97		0.02	16.20	2.50	
		2017	4	4.90	23.40	287.50	10.00	8.65	28.00	11.50	5.80	16.50	8.00	6.62	9.29		0.03	15.75	2.10	
		2018	3	5.30	23.20	339.00	20.00	15.00	24.00	26.00	7.00	13.00	10.00	9.12	4.87		0.02	22.60	4.60	
		2019	4	4.75	22.95	293.50	7.00	4.95	25.50	12.00	6.75	14.00	9.45	6.05	13.00	11.90	0.03	21.70	2.45	
		2020	4	5.40	23.40	414.00	23.00	19.00	35.00	30.00	7.70	20.00	16.00	1.25	2.54		0.07	18.80	7.10	

Alluvial groundwater yearly medians

BSC Point	EPA Point	Year	No	pH	Temperature	Conductivity	Alkalinity	Sulphate	Chloride	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese Filtered	Ammonia as N	Nitrate as N	Total Organic Carbon	Total Phenols
					°C	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L
Trigger Value				6.5-8.5	No trigger	2,200	No trigger							1.00	2.50	1.43	No trigger		
MW4	EPA 04	2003	1	5.00	20.40	1070.00	20.00	79.00	164.00	10.00	7.00	107.00	31.00	0.04	1.46	30.80	32.70	19.00	0.05
		2004	3	5.06	19.90	1075.00	26.00	59.80	113.00	20.60	10.20	104.00	42.60	0.05	2.57	31.10	64.20	14.00	0.05
		2005	4	5.25	19.40	1006.50	20.00	68.00	123.50	17.00	9.50	92.50	41.50	0.00	2.00	30.70	67.20	11.50	0.00
		2006	4	5.23	19.10	850.00	31.00	51.00	111.00	17.00	10.00	70.50	35.00	0.00	2.00	17.50	44.00	9.00	0.00
		2007	4	5.59	20.15	1000.00	21.00	71.00	116.50	17.50	9.00	84.50	35.00	0.00	2.00	24.50	45.00	9.50	0.00
		2008	3	5.00	19.10	1000.00	25.00	67.00	105.00	10.00	6.00	66.00	27.00	0.00	1.00	18.00	16.00	9.00	0.00
		2009	4	5.95	21.00	840.50	43.50	74.00	110.50	13.50	6.50	69.00	28.50	0.00	1.50	15.25	3.00	11.50	0.00
		2010	4	5.73	20.15	469.00	23.00	65.50	108.50	14.00	6.00	73.50	26.00	0.08	1.86	10.85	8.38	22.00	0.05
		2011	4	5.42	19.15	283.00	42.00	79.50	145.00	16.00	6.50	83.50	25.00	0.10	2.29	8.50	2.40	21.00	0.05
		2012	4	5.39	18.30	516.50	49.50	70.00	115.50	18.50	7.00	72.50	21.00	0.29	2.02	7.00	2.97	12.50	0.05
		2013	3	5.60	21.10	774.00	65.00	59.00	134.00	20.00	7.50	79.00	21.00	2.18	2.30	15.00	1.75	15.00	
		2014	3	5.60	21.10	562.00	38.00	68.00	83.00	13.00	5.00	60.00	20.00	1.94	1.47	10.00	1.48	9.90	
		2015	4	5.55	20.60	490.00	26.50	54.00	40.00	14.00	4.40	51.50	17.50	0.78	1.16	7.75	4.03	9.35	
		2016	4	5.70	21.05	360.00	35.50	55.50	44.50	8.05	2.85	32.00	15.00	2.78	0.68	7.56	0.06	10.00	
		2017	4	5.55	20.85	386.00	40.50	59.50	39.50	11.50	3.60	33.00	16.00	2.78	0.84	7.02	0.06	9.80	
		2018	3	6.00	21.90	273.00	53.00	26.00	36.00	15.00	3.60	20.00	14.00	1.01	0.84	2.81	0.12	9.30	
		2019	3	6.10	20.30	316.00	64.00	33.00	40.00	24.00	4.60	23.00	14.00	1.52	0.95	1.46	0.22	9.20	
		2020	4	5.60	22.55	318.00	25.00	33.00	47.00	13.00	3.10	28.00	10.00	2.33	0.98	1.43	0.00	8.80	
MW5	EPA 05	2003	1	4.47	21.00	740.00	1.00	83.00	97.00	25.00	11.00	77.00	25.00	0.05	1.54	0.01	26.90	14.00	0.05
		2004	2	5.05	21.45	516.50	16.00	62.70	82.50	21.15	5.70	52.60	26.80	0.18	0.31	3.44	5.84	13.50	0.05
		2005	4	5.34	18.85	486.50	14.50	82.00	73.00	22.00	7.00	50.00	25.50	0.12	0.97	0.00	8.00	12.50	0.00
		2006	4	5.89	19.40	403.00	76.50	51.50	47.00	29.00	6.00	34.00	16.00	0.00	0.00	0.50	0.00	16.50	0.00
		2007	4	6.00	19.55	698.00	78.00	86.50	80.50	40.50	8.50	48.50	20.50	1.50	0.50	1.00	0.50	16.50	0.00
		2008	3	5.00	19.35	460.00	42.00	61.00	72.00	26.00	6.00	46.00	20.00	1.00	1.00	0.00	0.01	10.00	0.00
		2009	4	5.99	21.00	0.00	25.50	70.00	59.50	21.50	5.00	38.50	20.00	1.00	0.50	0.08	0.00	6.50	0.00
		2010	4	5.40	19.40	285.50	33.00	44.50	53.50	19.00	4.00	32.00	16.50	0.42	0.47	0.35	0.13	10.50	0.05
		2011	3	5.95	19.40	209.00	20.50	63.50	41.50	17.00	4.50	32.00	14.00	0.87	0.58	0.23	0.02	6.50	0.05
		2012	4	5.86	16.85	345.50	21.00	65.00	43.50	18.50	5.00	30.50	14.00	2.95	0.87	0.52	0.01	17.00	0.05
		2013	3	5.80	20.90	370.50	58.00	35.00	40.00	26.00	5.00	26.00	15.00	9.76	0.77	0.20	0.14	6.40	
		2014	3	5.20	20.70	362.00	14.00	75.00	49.00	16.00	4.40	32.00	15.00	6.88	0.65	0.15	0.61	6.20	
		2015	4	5.85	21.35	336.50	46.50	39.50	40.00	25.50	4.80	24.50	14.50	7.62	0.46	0.37	0.32	7.05	
		2016	3	6.20	20.10	342.00	50.00	28.00	32.00	32.00	4.60	17.00	13.00	14.50	0.29	0.18	0.10	10.90	
		2017	2	5.35	21.50	335.00	59.00	35.50	38.00	24.50	4.55	20.50	13.00	14.28	0.79	0.53	0.15	9.20	
		2018	3	6.10	21.70	335.00	88.00	26.00	34.00	34.00	4.40	17.00	13.00	9.51	0.79	0.47	0.05	9.10	
		2019	3	5.70	19.90	283.00	37.00	34.00	40.00	20.00	3.50	21.00	13.00	13.60	0.71	0.27	0.04	6.30	
		2020	4	6.00	21.60	326.00	75.00	37.00	31.00	27.00	4.50	18.00	11.00	6.92	0.96	0.77	0.02	11.00	

Surface water yearly medians

BSC Point	EPA Point	Year	No	pH	Temperature	Conductivity	Alkalinity	Sulphate	Chloride	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese Filtered	Ammonia as N	Nitrate as N	Total Organic Carbon	Total Phenols	DO	TSS
					°C	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L
Trigger Value				6.5 - 9.0	No trigger	610	116	100	150	20.7	50	70	11.8	1.0	2.50	0.36	3.40	20.30		>6.0	No Trigger
SDP1	EPA 06	2003	1	7.10	27.30	520.00	154.00	21.00	54.00	46.00	64.00	28.00	26.00	0.19	0.49	0.09	0.01	21.00	0.05		131
		2004	3	7.68	22.40	619.00	114.00	36.00	86.00	32.00	10.00	57.00	34.80	0.30	0.04	0.96	1.17	36.00	0.05	4.90	59
		2005	3	7.10	21.90	450.00	70.00	26.00	69.00	32.00	7.00	39.00	26.00	0.70	0.18	0.26	2.67	39.00	0.05	5.80	148
		2006	2	7.20	17.95	468.00	187.00	18.50	31.50	51.50	8.50	30.00	14.00	0.55	0.23	0.74	0.95	19.00	0.08	3.45	61
		2007	2	7.68	17.25	823.00	183.50	79.00	99.00	89.00	12.00	55.50	24.00	0.67	0.22	0.34	2.70	29.50	0.06	0.90	151
		2008	2	7.32	22.30	801.00	231.00	14.50	94.00	80.50	14.00	47.00	45.50	0.93	0.78	1.89	1.31	70.00	0.42	3.13	47
		2009	2	7.04	20.50	213.00	127.20	21.00	59.00	51.00	6.50	30.00	22.50	1.33	0.12	0.37	4.10	18.00	0.05	3.75	49
		2010	1	7.70		517.00	131.80	32.00	43.00	52.00	6.00	34.00	22.00	2.00	0.10	0.27	3.82	22.00		8.60	27
		2012	3	7.03	19.40	319.00	147.00	33.00	30.00	46.00	4.00	18.00	15.00	0.46	0.19	0.47	0.09	21.00	0.05	3.20	32
		2013	3	7.95	24.65	466.00	130.00	36.00	37.00	53.00	4.70	17.50	11.50	1.37	3.08	0.10	0.11	15.00		9.05	34
		2014	4	8.30	23.45	424.50	130.00	23.00	35.00	52.00	4.00	18.00	11.50	1.53	0.18	0.03	0.03	12.50		10.00	30
		2015	4	9.00	21.05	425.00	99.00	39.00	35.50	49.00	5.45	20.00	17.50	1.50	0.19	0.04	0.21	18.00		14.50	58
		2016	4	9.05	23.20	371.50	115.00	31.50	31.00	47.00	4.45	16.00	12.50	0.43	0.13	0.02	0.02	12.00		15.50	30
		2017	3	8.20	21.00	422.00	123.00	39.00	45.00	52.00	5.10	18.00	16.00	0.74	0.36	0.02	0.02	14.00		10.00	40.00
		2018	3	9.00	26.90	340.00	92.00	28.00	35.00	38.00	4.00	16.00	12.00	0.64	0.14	0.03	0.07	13.00		14.00	26.00
		2019	4	7.60	21.80	402.50	120.50	25.00	58.50	44.50	4.75	23.00	13.00	11.93	0.55	0.48	0.02	18.50		8.40	286.00
		2020		7.40	23.90	307.00	80.00	23.00	24.00	33.00	4.10	16.00	11.00	1.23	0.20		0.04	0.07	12.00	7.80	19.00
SDP2	EPA 08	2003	1	7.65	26.20	220.00	42.00	27.00	21.00	18.00	4.00	15.00	8.00	0.20	0.35	0.11	0.01	13.00	0.05		27
		2004	3	6.84	19.90	273.00	46.00	28.00	39.00	21.00	5.00	26.00	13.00	0.58	0.61	0.60	0.01	32.00	0.05	4.80	100
		2005	3	6.72	23.20	312.50	63.00	17.00	49.00	15.00	5.00	30.00	18.00	0.43	0.17	0.29	0.43	25.00	0.05	3.40	27
		2006	2	6.65	22.20	340.50	89.00	20.50	31.50	21.00	7.00	25.50	14.00	0.34	0.49	0.94	0.08	27.50	0.05	2.40	108
		2007	2	7.37	19.60	387.00	88.00	67.00	13.00	25.00	2.00	49.00	2.00	2.65	0.18	0.49	0.60	10.00	0.05	3.40	197
		2008	2	5.58	23.90	517.00	138.00	37.00	32.00	38.00	7.00	40.00	7.00	0.65	1.14	1.74	0.01	66.00	0.14	0.40	57
		2009	2	7.50		117.00	117.40	62.00	66.00	50.00	7.00	43.00	34.00	7.53	0.45	0.61	0.02	41.00		0.10	676
		2010	1	8.40		396.00	92.20	40.00	31.00	39.00	5.00	26.00	14.00	0.80	0.36	0.35	0.10	22.00		9.40	40
		2012	3	7.67	23.10	365.00	123.00	54.00	47.00	54.00	8.45	27.50	13.50	5.67	0.68	3.04	0.47	50.50	0.05	2.55	182
		2013	3	7.70	21.05	1233.00	120.00	43.00	190.00	56.00	16.00	96.00	63.00	1.72	0.44	1.54	13.54	29.00	0.00	8.55	46
		2014	4	7.20	19.70	607.00	86.00	91.00	96.00	54.00	9.90	52.00	20.00	0.50	0.25	0.06	0.12	16.00		8.80	16
		2015	4	7.95	17.90	595.00	91.00	45.50	79.00	43.50	8.85	48.50	23.00	0.45	0.13	0.88	4.31	21.50		9.70	18
		2016	4	8.90	22.55	422.50	74.50	43.50	47.00	37.00	5.95	29.00	16.00	0.67	0.12	0.02	4.34	15.50		12.20	31
		2017	4	7.85	23.90	546.00	103.00	51.00	91.00	41.00	7.95	41.50	20.50	0.31	0.15	0.22	3.05	16.50		8.35	15
		2018	3	9.00	25.30	558.00	92.00	76.00	75.00	44.00	8.20	43.00	23.00	0.98	0.07	0.02	4.09	18.00		11.00	30
		2019	4	8.15	22.70	696.50	123.50	53.00	89.00	52.00	11.50	60.00	33.00	1.04	0.13	0.11	5.59	30.00		8.70	30
		2020		8.90	24.50	661.00	85.00	38.00	75.00	40.00	9.30	55.00	34.00	1.88	0.11	0.16	9.54	22.00		16.00	28
SW1	EPA 33	2003	1	6.95	27.40	520.00	70.00	5.00	104.00	15.00	16.00	49.00	9.00	0.15	0.61	0.11	0.01	12.00	0.05		10
		2004	3	6.75	20.90	404.00	65.00	2.70	65.00	13.00	14.00	41.00	3.40	1.10	0.68	0.07	0.01	15.00	0.05	2.40	31
		2005	3	7.12	21.30	459.00	90.00	2.00	106.00	17.00	16.00	50.00	4.00	0.29	0.76	0.07	0.01	13.00	0.13	3.10	20
		2006	2	7.02	18.20	459.00	55.50	3.00	93.50	13.00	14.00	46.50	1.00	0.16	0.14	0.06	0.03	8.50	0.05	2.95	5
		2007	2	6.61	19.00	520.00	33.00	11.00	113.00	12.00	13.00	54.00	4.00	1.05	2.03	0.07	0.01	14.00	0.05	1.20	17
		2008	2	6.37	18.35	268.00	46.00	3.00	69.00	11.00	11.00	42.00	2.00	0.19	0.52	0.07	0.03	10.00	0.03	2.40	21
		2009	2	6.67	20.15	301.50	71.00	3.00	76.00	14.00	12.50	41.50	1.50	0.64	1.51	0.01	0.16	9.00	0.05	3.70	12
		2010	1	6.65	20.10	202.00	48.00	4.00	60.00	10.00	9.00	34.50	2.00	2.45	0.56	0.06	0.14	17.50	0.05	3.25	101
		2011	3	6.38	20.35	221.50	63.50	2.50	130.00	17.50	17.50	61.50	2.00	0.08	0.56	0.18	0.06	6.50	0.05	2.95	14
		2012	3	6.91	17.20	195.00	47.00	2.50	95.50	11.50	12.50	46.50	1.50	1.64	0.35	0.05	0.03	11.50	0.05	3.30	13
		2013	4	6.50	21.80	689.50	70.00	5.20	100.00	11.00	13.00	39.00	0.00	2.50	1.79	0.03	0.03	5.80		3.30	18
		2014	4	7.00	17.50	446.00	78.00	12.00	110.00	18.00	17.00	56.00	5.00	3.12	1.46	0.14	0.07	10.00		3.80	20
		2015	4	7.25	19.30	382.50	53.00	3.40	94.00	13.50	13.50	38.50	5.00	6.39	0.59	0.14	0.06	7.10		3.60	27
		2016	4	6.95	20.30	410.50	49.00	4.65	89.50	12.50	13.00	45.00	5.00	4.39	0.82	0.08	0.03	8.70		4.60	30
		2017	4	6.85	20.90	367.50	53.50	4.55	100.00	12.00	11.45	39.50	5.00	2.94	0.65	0.08	0.03	6.15		4.00	22
		2018	3	6.70	19.40	286.00	45.00	5.60	56.00	11.00	8.40	32.00	2.00	2.44	0.29	0.03	0.02	10.00		3.60	9
		2019	4	6.90	19.20	472.00	79.50	3.10	88.00	16.00	15.00	50.50	2.45	8.83	3.95	0.09	0.02	11.75		2.10	27
		2020		6.80	22.05	322.00	49.00	6.90	48.00	13.00	10.00	36.00	1.70	5.38	0.57	0.17	0.05	8.70		4.50	19