

A417 Missing Link
TR010056

8.30 Surface and ground water
monitoring (Part 1 of 2)

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Surface and ground water monitoring (Part 1 of 2)

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1 Introduction

1.1 Purpose of this document

- 1.1.1 This document summarises the methodologies and results for the surface and spring water quality, surface and spring water flow and rainfall data collected to the end of November 2021 in accordance with the 'matters agreed' within the Statement of Common Ground (SoCG) with the Environment Agency (Appendix B of the Statement of Commonality Document Reference 7.3, APP-419) for the A417 Missing Link ('the scheme').
- 1.1.2 Locations of monitoring are shown on ES Figure 13.15 Water environment monitoring locations which is provided in Appendix A.

2 Monitoring scopes

2.1 Surface water quality

Locations

- 2.1.1 Surface water quality monitoring was carried out at the six locations shown in Table 2-1.

Table 2-1 Surface water quality monitoring locations

ID	Northing	Easting	Receptor
SW1	391327	216435	Tributary of Norman's Brook (downstream of existing A417 crossing)
SW2	392303	215719	Tributary of Norman's Brook (upstream of existing A417 crossing)
SW3	394386	213349	Tributary of River Frome (within Bushley Muzzard SSSI)
SW4	394683	212717	Tributary of River Frome (downstream of Bushley Muzzard SSSI)
SW5	395010	216262	Tributary of River Churn 1 (downstream of National Star)
SW6	396171	215337	Tributary of River Churn 2 (at Coldwell Bottom)

Methodology

- 2.1.2 Each of these locations were made to be clearly identifiable using marker posts, photographs and physical features as a reference to enable locations to be consistently identified for the duration of the programme.
- 2.1.3 Plan and cross section sketches at each location were compiled to aid the recording of physical features and the precise location of the site. These were updated on a monthly basis.
- 2.1.4 At each sampling location photographs and notes of possible influencing factors, such as weather conditions, ambient air temperature, the weather, the presence of dead fish floating in the water or of oil slicks, growth of algae, any unusual sights or smells, and recent management of the watercourse, were recorded as these may have a bearing on the water quality results. Where no water is present, this has been recorded.

In-situ monitoring

- 2.1.5 The following parameters were monitored in-situ, reducing the potential for contamination or degradation of the samples. The appropriate field kit for

undertaking in-situ spot sampling was used and the manufacturer's instructions followed carefully. Calibration of the in-situ monitoring equipment was undertaken as per the manufacturer's instructions and a log detailing the type of calibration and results was kept.

2.1.6 The in-situ parameters that were sampled at all 6 locations include:

- Temperature: Water Temperature influences several other water quality parameters metabolic rates and biological activity of aquatic organismsⁱ;
- pH: If the pH is too high (Alkali) or too low (Acidic) aquatic organisms will die. pH can also affect solubility and toxicity of chemicals and heavy metals in waterⁱⁱ;
- Conductivity: Is a measure of waters capability to pass electrical flow. Conductivity is the basis of salinity and total dissolved solids calculations. Conductivity is an early indicator of change in a water systemⁱⁱⁱ;
- Total Suspended Solids (TSS): TSS are the main cause of turbidity. High TSS blocks light from reaching aquatic plants this may in turn cause them to die due to a reduction in photosynthesis. High TSS can often mean higher concentrations of metal in water^{iv};
- Dissolved oxygen (DO): DO is needed for aquatic organisms to respire. If the level is too high or low it can harm aquatic life and affect water quality^v;
- Turbidity: Turbidity is caused by particles and coloured material in water. TSS are the main cause of turbidity^{vi};
- Alkalinity: In-situ measurements of alkalinity will allow more accurate characterisation of supersaturated waters in areas of identified and potential tufa formations; and
- Redox: Oxidation-reduction potential for ion exchange environment.

Laboratory sampling

2.1.7 Testing of the below parameters followed standard water quality sampling laboratory procedures and were undertaken in a United Kingdom Accreditation Service (UKAS) accredited laboratory facility. Samples were transported to a certified laboratory for testing within 24 hours from sampling, or within the holding times of the certified laboratory for the parameters sampled (if shorter) in a sturdy insulated box to protect samples from sunlight, prevent the breakage of sample bottles, and the use of cool packs should have allowed a temperature of 4°C to be maintained during transport. The samples were delivered to the laboratory.

2.1.8 The laboratory parameters sampled at all 6 locations include:

- General parameters: pH, Electrical Conductivity (EC), alkalinity
- Aluminium (Al): Al can be toxic to fish between pH values 5.0 and 5.5, and Al ions can accumulate on gills and obstruct them, limiting the ability to breathe^{vii}
- Arsenic (As) (total and dissolved): Arsenic is toxic to wildlife in the vicinity of its release^{viii}
- Calcium (Ca): Ca is a dietary requirement for most organisms, except for some insects and bacteria^x
- Copper (Cu) (total and dissolved): Cu can be toxic to fish and aquatic organisms. In fish, the adverse effects include that gills can lose their ability to regulate transport of salts important for the functioning of the cardiovascular and nervous systems^x

- Cadmium (Cd) (total and dissolved): Cd can impact photosynthesis and transpiration in plants and can affect the growth and reproduction of micro-organisms in soil and water and of fish^{xi}
- Dissolved Organic Carbon (DOC): DOC is a primary food sources for aquatic organisms
- Lead (Pb) (total and dissolved): Exposure to high levels of lead is toxic to plants and animals and the solubility of lead increases in acidic waters^{xii}
- Zinc (Zn) (total and dissolved): Zn can be toxic even at low concentrations within aquatic organisms, with potential contributions to the water environment coming from car tires (containing Zn), brakes and motor oils^{xiii}
- Total Petroleum Hydrocarbons (TPH) (speciated, aliphatic and aromatic split): impact aquatic organisms and ecosystems;
 - Polycyclic Aromatic Hydrocarbons (16 US EPA PAHs)
 - Major ions (anions and cations)
- Nutrients: nitrates and phosphate

2.1.9 The results have been compared against available Environmental Quality Standards (EQS), including those identified in the Water Framework Directive (WFD) and by the Environment Agency, to identify where there are exceedances.

Frequency

2.1.10 Water quality sampling was undertaken on a monthly basis, with samples taken at a similar time of day throughout the programme and each sample taken approximately 4 weeks apart from the previous round.

2.2 Surface water flow

Locations

2.2.1 Surface water flow monitoring has been undertaken at the six locations shown in Table 2-2.

Table 2-2 Surface water flow monitoring locations

ID	Northing	Easting	Type of measurement	Receptor
SW1	391327	216435	Manual	Tributary of Norman's Brook (downstream of existing A417 crossing)
SW2	392303	215719	Automatic	Tributary of Norman's Brook (upstream of existing A417 crossing)
SW3	394386	213349	Manual	Tributary of River Frome (within Bushley Muzzard SSSI)
SW4	394683	212717	Automatic	Tributary of River Frome (downstream of Bushley Muzzard SSSI)
SW5	395010	216262	Manual	Tributary of River Churn 1 (downstream of National Star)
SW6	396171	215337	Automatic	Tributary of River Churn 2 (at Coldwell Bottom)

Methodology

- 2.2.2 Each of these locations were made to be clearly identifiable using marker posts, photographs and physical features as a reference to enable locations to be consistently identified for the duration of the programme.
- 2.2.3 Plan and cross section sketches at each location have been compiled to aid the recording of physical features and the precise location of the site. These have been updated on a monthly basis.
- 2.2.4 All surface water level monitoring activities and installations were conducted in accordance with relevant British Standards, industry guidance and best practice, including:
- Environment Agency (2011), Hydrometric manual
 - British Standard ISO 4373: 2008 Hydrometry – Water level measuring devices
- 2.2.5 At surface water monitoring locations, the type of flow measurement depends upon the suitability of the location. Each location has been assessed for suitability prior to installation.
- 2.2.6 Calibration of monitoring equipment was undertaken as per the manufacturer's instructions and a log detailing the type of calibration and results has been kept.

Automatic flow measurement

- 2.2.7 Acoustic (echo) correlation velocity profilers and ultrasonic doppler systems were bed mounted onto a levelled concreted slab and left in-situ for the duration of the programme.
- 2.2.8 Should this method be not appropriate due to local conditions or circumstances, plans were made for alternative solutions to be developed and proposed. This was a consideration particularly in locations that were likely to be temporarily dry for extended periods of time.

Manual flow measurement

- 2.2.9 Manual flow gauging measurements were taken using the most appropriate technique, such as a calibrated rotating element or electromagnetic current meter for wade gauging or where flow monitoring locations were greater than 0.5m at the deepest point of the cross section, flow gauging was undertaken using an Acoustic Doppler Current Profiler (ADCP). The ADCP was deployed and operated by a suitably qualified hydrologist.
- 2.2.10 Electromagnetic current meters were considered where monitoring locations experience very low velocities ($<0.1\text{m/s}$), shallow depths, high silt loads and/or vegetated conditions.
- 2.2.11 When using an electromagnetic current meter, care was taken during the site selection process to ensure the monitoring location was remote from overhead or underground power cables, or other structure which may generate an electrical magnetic field which could have interfered with the electromagnetic current meter.
- 2.2.12 Where no flow was present, this has been recorded.

Frequency

Automatic flow measurement

2.2.13 Automatic flow monitoring was undertaken throughout the baseline phase of the proposed scheme on 15-minute intervals.

Manual flow measurement

2.2.14 Manual flow measurements were undertaken on a monthly basis.

2.3 Spring water quality

Locations

2.3.1 Spring water quality monitoring was undertaken at the eight locations shown in Table 2-3.

Table 2-3 Spring water quality monitoring locations

ID	Northing	Easting	Spring Type	Receptor ¹
GW1	392415	215702	Spring (previously considered to be potential tufa formation)	81 (supplying tributary of Norman's Brook)
GW2	392839	215713	Spring considered to support tufa habitat	G231 (supplying tributary of Norman's Brook)
GW3	393056	215689	Spring	Supplying tributary of Norman's Brook
GW4	393069	215849	Spring	76 (supplying tributary of Norman's Brook)
GW5	394249	213387	Spring	Within Bushley Muzzard SSSI and supplying unnamed tributary of River Frome
GW6	394392	213186	Spring with potential tufa formation	G11 (within Bushley Muzzard SSSI)
GW7	394154	216527	Spring	Spring shown on OS mapping (at National Star)
GW8	394531	214760	Spring with potential tufa formation	G4 (supplying unnamed tributary of River Churn 2)

Methodology

2.3.2 Each of these locations were made clearly identifiable using marker posts, photographs and physical features as a reference to enable locations to be consistently identified for the duration of the programme.

2.3.3 Plan and cross section sketches at each location have been compiled to aid the recording of physical features and the precise location of the site. These were updated on a monthly basis.

2.3.4 At each sampling location photographs and notes of possible influencing factors, such as weather conditions, ambient air temperature, the weather, the presence

¹ Identification number/reference described ES Appendix 13.11 Water Features Survey (Document Reference 6.4)

of dead fish floating in the water or of oil slicks, growth of algae, any unusual sights or smells, and recent management of the watercourse, were recorded as these may have had a bearing on the water quality results. Where no water was present, this has been recorded.

- 2.3.5 Water sampling at springs with potential tufa formations had to be taken from spring inflows, runnels or outflows in conjunction with in-situ water quality parameters and notes taken on the vegetation. The samples could not be collected from pure stands. Care was taken to avoid disturbing turbidity.

In-situ monitoring

- 2.3.6 The following parameters were monitored in-situ, reducing the potential for contamination or degradation of the samples. The appropriate field kit for undertaking in-situ spot sampling was acquired, and the manufacturer's instructions followed carefully. Calibration of the in-situ monitoring equipment was undertaken as per the manufacturer's instructions and a log detailing the type of calibration and results was kept.

- 2.3.7 The in-situ parameters sampled at all 8 locations include:

- Temperature: Water Temperature influences several other water quality parameters metabolic rates and biological activity of aquatic organisms^{xiv};
- pH: If the pH is too high (Alkali) or too low (Acidic) aquatic organisms will die. pH can also affect solubility and toxicity of chemicals and heavy metals in water^{xv};
- Conductivity: Is a measure of waters capability to pass electrical flow. Conductivity is the basis of salinity and total dissolved solids calculations. Conductivity is an early indicator of change in a water system^{xvi};
- Total Suspended Solids (TSS): TSS are the main cause of turbidity. High TSS blocks light from reaching aquatic plants this may in turn cause them to die due to a reduction in photosynthesis. High TSS can often mean higher concentrations of metal in water^{xvii};
- Dissolved oxygen (DO): DO is needed for aquatic organisms to respire. If the level is too high or low it can harm aquatic life and affect water quality^{xviii};
- Turbidity: Turbidity is caused by particles and coloured material in water. TSS are the main cause of turbidity^{xix};
- Alkalinity: In-situ measurements of alkalinity will allow more accurate characterisation of supersaturated waters in areas of identified and potential tufa formations; and
- Redox: Oxidation-reduction potential for ion exchange environment.

Laboratory sampling

- 2.3.8 Testing of the below parameters followed standard water quality sampling laboratory procedures and were undertaken in a United Kingdom Accreditation Service (UKAS) accredited laboratory facility. Samples were transported to a certified laboratory for testing within 24 hours from sampling, or within the holding times of the certified laboratory for the parameters sampled (if shorter) in a sturdy insulated box to protect samples from sunlight, prevent the breakage of sample bottles, and the use of cool packs allowed a temperature of 4°C to be maintained during transport. The samples were delivered to the laboratory.

2.3.9 To provide additional data on baseline water quality, to allow characterisation of emerging springs water quality in relation to the groundwater and to develop understanding of tufa formation process, the following testing suites will be required at the spring water quality monitoring locations:

- General parameters: pH, Electrical Conductivity (EC), alkalinity;
- Major ions (anions and cations); and
- Nutrients: nitrates and phosphate.

2.3.10 The results have been compared against available EQS, including those identified in the WFD and by the Environment Agency, to identify where there are exceedances.

Frequency

2.3.11 Water quality sampling was undertaken on a monthly basis, with samples taken at a similar time of day throughout the programme approximately 4 weeks apart from the previous round.

2.4 Spring water flow

Locations

2.4.1 Spring water flow monitoring will be undertaken at the five locations shown in Table 2-4.

Table 2-4 Spring water flow monitoring locations

ID	Northing	Easting	Receptor ²
GW2	392839	215713	G231 (supplying tributary of Norman's Brook)
GW4	393069	215849	76 (supplying tributary of Norman's Brook)
GW6	394392	213186	G11 (within Bushley Muzzard SSSI)
GW7	394154	216527	Spring shown on OS mapping (at National Star)
GW8	394531	214760	G4 (supplying unnamed tributary of River Churn 2)

Methodology

2.4.2 Each of these locations were made clearly identifiable using marker posts, photographs and physical features as a reference to enable locations to be consistently identified for the duration of the programme.

2.4.3 Plan and cross section sketches at each location have been compiled to aid the recording of physical features and the precise location of the site. These have been updated on a monthly basis.

2.4.4 All surface water level monitoring activities and installations were conducted in accordance with relevant British Standards, industry guidance and best practice, including:

- Environment Agency (2011), Hydrometric manual

² Identification number/reference described ES Appendix 13.11 Water Features Survey (Document Reference 6.4)

- British Standard ISO 4373: 2008 Hydrometry – Water level measuring devices

2.4.5 For spring flow monitoring locations, only manual flow measurements have been undertaken.

2.4.6 Calibration of monitoring equipment has been undertaken as per the manufacturer’s instructions and a log detailing the type of calibration and results kept.

Manual flow measurement

2.4.7 Manual flow gauging measurements were taken using the most appropriate technique, such as a calibrated rotating element (REM) or electromagnetic current meter for wade gauging.

2.4.8 Electromagnetic current meters were used where monitoring locations experience very low velocities (<0.1m/s), shallow depths, high silt loads and/or vegetated conditions.

2.4.9 Where no flow is present, this was recorded.

Frequency

Manual flow measurement

2.4.10 Manual flow measurements were undertaken on a monthly basis.

2.5 Rainfall

Locations

2.5.1 Surface water flow monitoring will be undertaken at the two locations shown in Table 2-5.

Table 2-5 Rainfall monitoring locations

ID	Northing	Easting
R1	392468	215428
R2	394733	214567

Methodology

2.5.2 Prior to installation, the height of sheltering objects around the site will be measured, taking into account anticipated growth of surrounding vegetation. If the site is considered to be unsuitable following this, it will be relocated to a more suitable location nearby and the location recorded. In locations that may be over exposed, with no natural shelter, a turf wall may be used or a wind screen.

2.5.3 Where required, protection, such as a fence, may need to be installed should the location be within a field containing livestock. If this is the case, care will be taken to ensure that this does not impact the performance of the rain gauge.

2.5.4 On a monthly basis, data will be downloaded from each of the gauges and calibration and maintenance undertaken where required, as per the manufacturer’s instructions. Additionally, photographs will be taken, and notes of possible influencing factors recorded, such as the height of sheltering objects (e.g., vegetation) at each rain gauge location.

Frequency

- 2.5.5 Data from the rain gauge will be downloaded and the location of the rain gauge will be inspected to note any changes in the exposure of the instrument on a monthly basis.

3 Results

3.1 Surface water quality

In-situ monitoring

3.1.1 Table 3-1 to Table 3-16 display surface water quality results from in-situ monitoring between August 2020 and November 2021. Monitoring for March 2021 was unable to be conducted, and samples were taken in early April 2021. Monitoring was also unable to be conducted in July 2021, and samples were taken in early August 2021.

Table 3-1 In-situ surface water quality data August 2020

Location ID	SW1	SW2	SW3	SW4	SW5
Date	24-Aug-20	24-Aug-20	25-Aug-20	25-Aug-20	24-Aug-20
Time (GMT)	11:44	13:19	10:25	13:05	16:04
pH	7.91	7.76	7.94	8.18	7.86
Actual Conductivity ($\mu\text{S/cm}$)	565.58	458.14	460.3	358.6	479.54
Specific Conductivity ($\mu\text{S/cm}$)	693.49	575.96	567.98	438.17	596.44
Salinity (PSU)	0.34	0.28	0.28	0.21	0.29
Total Dissolved Solids (ppt)	0.45	0.37	0.37	0.28	0.39
Turbidity (NTU)	11.76	20.98	42.27	20.19	9.06
Total Suspended Solids (mg/L)	0.00	0.00	0.00	0.00	0.00
RDO Concentration (mg/L)	8.39	8.43	8.41	8.49	8.48
RDO Saturation (%)	84.40	82.82	84.14	85.65	84.21
Oxygen Partial Pressure (Torr)	131.40	129.09	131.05	133.33	131.20
Temperature ($^{\circ}\text{C}$)	15.35	14.28	15.07	15.49	14.73

Table 3-2 In-situ surface water quality data September 2020

Location ID	SW1	SW2	SW3	SW4	SW5
Date	15-Sep-20	15-Sep-20	16-Sep-20	16-Sep-20	15-Sep-20
Time (GMT)	10:48	12:02	12:38	11:05	13:58
pH	8.07	7.94	7.96	7.79	8.09
Actual Conductivity ($\mu\text{S/cm}$)	504.51	471.62	590.58	490.24	536.04
Specific Conductivity ($\mu\text{S/cm}$)	634.55	590.23	739.69	621.60	663.90
Salinity (PSU)	0.31	0.29	0.36	0.30	0.33
Total Dissolved Solids (ppt)	0.41	0.38	0.48	0.40	0.43
Turbidity (NTU)	21.15	28.92	12.92	0.01	10.98
Total Suspended Solids (mg/L)	0.00	0.00	0.00	0.00	0.00
RDO Concentration (mg/L)	8.83	8.49	9.31	7.91	8.54
RDO Saturation (%)	86.77	83.73	91.88	77.15	85.00
Oxygen Partial Pressure (Torr)	135.25	130.50	143.26	120.30	132.41
Temperature ($^{\circ}\text{C}$)	14.27	14.42	14.45	13.95	14.91

Table 3-3 In-situ surface water quality data October 2020

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	20-Oct-20	20-Oct-20	21-Oct-20	21-Oct-20	22-Oct-20	22-Oct-20
Time (GMT)	15:12	12:58	15:50	14:56	12:05	10:40
pH	8.26	8.30	7.79	8.41	8.07	7.87
Actual Conductivity ($\mu\text{S}/\text{cm}$)	478.84	445.06	503.91	418.52	467.38	288.41
Specific Conductivity ($\mu\text{S}/\text{cm}$)	638.16	595.09	671.18	555.30	627.68	395.02
Salinity (PSU)	0.31	0.29	0.33	0.27	0.31	0.19
Total Dissolved Solids (ppt)	0.41	0.39	0.44	0.36	0.41	0.25
Turbidity (NTU)	12.46	13.58	19.35	7.96	3.13	1.07
Total Suspended Solids (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00
RDO Concentration (mg/L)	10.45	10.07	10.18	10.63	10.51	8.99
RDO Saturation (%)	99.84	95.89	97.39	101.97	99.77	83.79
Oxygen Partial Pressure (Torr)	126.59	121.59	123.48	129.27	126.55	106.34
Temperature ($^{\circ}\text{C}$)	11.92	11.80	11.95	12.09	11.63	10.86

Table 3-4 In-situ surface water quality data November 2020

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	18-Nov-20	18-Nov-20	19-Nov-20	19-Nov-20	18-Nov-20	18-Nov-20
Time (GMT)	15:48	11:40	11:14	13:50	14:21	15:30
pH	8.53	8.48	8.01	8.47	8.02	8.01
Actual Conductivity ($\mu\text{S}/\text{cm}$)	418.32	388.60	512.93	453.51	444.62	351.71
Specific Conductivity ($\mu\text{S}/\text{cm}$)	588.88	532.07	716.17	646.01	606.22	479.42
Salinity (PSU)	0.29	0.26	0.35	0.31	0.29	0.23
Total Dissolved Solids (ppt)	0.38	0.35	0.47	0.42	0.39	0.31
Turbidity (NTU)	18.56	55.34	5.11	2.58	1.75	0.14
RDO Concentration (mg/L)	12.37	11.62	11.52	12.38	10.74	9.80
RDO Saturation (%)	112.58	104.22	105.70	111.53	96.74	91.67
Oxygen Partial Pressure (Torr)	143.02	137.47	134.23	141.65	127.59	116.33
Temperature ($^{\circ}\text{C}$)	9.83	10.87	10.14	9.39	11.05	11.02

Table 3-5 In-situ surface water quality data December 2020 (round 1)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	14-Dec-20	14-Dec-20	16-Dec-20	15-Dec-20	16-Dec-20	16-Dec-20
Time (GMT)	10:47	11:59	09:28	12:43	14:05	12:40
pH	8.18	8.25	7.96	8.33	7.65	7.80
Actual Conductivity ($\mu\text{S}/\text{cm}$)	438.05	371.14	530.23	452.05	376.54	330.51
Specific Conductivity ($\mu\text{S}/\text{cm}$)	632.72	534.19	760.79	667.63	546.30	485.10
Salinity (PSU)	0.31	0.26	0.37	0.32	0.26	0.23
Total Dissolved Solids (ppt)	0.41	0.35	0.49	0.43	0.36	0.32
Turbidity (NTU)	36.64	56.24	17.94	2.42	177.95	1.05
RDO Concentration (mg/L)	11.16	11.14	10.58	11.55	10.31	10.11
RDO Saturation (%)	100.10	100.14	95.46	101.62	92.01	89.31
Oxygen Partial Pressure (Torr)	137.72	137.76	131.30	139.88	126.60	122.93
Temperature ($^{\circ}\text{C}$)	8.89	9.00	9.13	8.09	8.72	8.31

Table 3-6 In-situ surface water quality data December 2020 (round 2)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	21-Dec-20	21-Dec-20	22-Dec-20	22-Dec-20	21-Dec-20	22-Dec-20
Time (GMT)	09:15	10:16	11:40	10:01	14:38	15:53
pH	8.28	8.32	8.04	8.37	7.63	7.82
Actual Conductivity ($\mu\text{S}/\text{cm}$)	379.83	340.78	439.09	406.40	403.33	316.76
Specific Conductivity ($\mu\text{S}/\text{cm}$)	542.18	483.59	627.14	587.44	573.90	459.61
Salinity (PSU)	0.26	0.23	0.30	0.28	0.28	0.22
Total Dissolved Solids (ppt)	0.35	0.31	0.41	0.38	0.37	0.30
Turbidity (NTU)	110.76	81.73	41.28	8.07	6.68	2.22
RDO Concentration (mg/L)	10.88	10.87	10.58	11.14	9.67	10.70
RDO Saturation (%)	96.51	96.88	94.54	98.48	85.96	94.27
Oxygen Partial Pressure (Torr)	139.69	140.22	135.74	141.44	124.41	135.41
Temperature ($^{\circ}\text{C}$)	9.32	9.53	9.30	8.86	9.44	8.74

Table 3-7 In-situ surface water quality data January 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	26-Jan-21	26-Jan-21	27-Jan-21	26-Jan-21	27-Jan-21	27-Jan-21
Time (GMT)	11:14	12:11	10:12	16:31	14:11	13:49
pH	8.43	8.44	7.87	8.38	7.76	7.84
Actual Conductivity ($\mu\text{S}/\text{cm}$)	435.70	393.67	603.60	909.32	469.61	317.60
Specific Conductivity ($\mu\text{S}/\text{cm}$)	645.01	580.34	904.53	1402.30	691.26	473.15
Salinity (PSU)	0.31	0.28	0.44	0.69	0.34	0.23
Total Dissolved Solids (ppt)	0.42	0.38	0.59	0.91	0.45	0.31
Turbidity (NTU)	18.37	22.99	34.42	5.68	4.28	1.74
RDO Concentration (mg/L)	12.18	12.10	11.71	12.41	11.33	10.98
RDO Saturation (%)	106.69	106.37	101.61	105.33	99.78	95.59
Oxygen Partial Pressure (Torr)	142.36	141.91	135.62	140.68	133.11	127.57
Temperature ($^{\circ}\text{C}$)	8.00	8.15	7.57	6.61	8.21	7.77

Table 3-8 In-situ surface water quality data February 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	25-Feb-21	25-Feb-21	24-Feb-21	25-Feb-21	24-Feb-21	24-Feb-21
Time (GMT)	14:15	12:21	11:44	09:19	15:27	14:24
pH	8.42	8.44	7.94	8.34	7.93	8.02
Actual Conductivity ($\mu\text{S}/\text{cm}$)	437.96	397.13	541.55	478.12	454.25	338.37
Specific Conductivity ($\mu\text{S}/\text{cm}$)	624.15	566.50	766.67	701.24	645.89	471.24
Salinity (PSU)	0.30	0.27	0.37	0.34	0.31	0.23
Total Dissolved Solids (ppt)	0.41	0.37	0.50	0.46	0.42	0.31
Turbidity (NTU)	23.53	33.31	8.08	1.22	2.00	1.97
RDO Concentration (mg/L)	11.99	11.97	11.24	12.31	11.25	10.65
RDO Saturation (%)	108.69	108.35	102.50	108.79	102.15	98.37
Oxygen Partial Pressure (Torr)	144.86	144.42	136.58	145.14	136.14	131.02
Temperature ($^{\circ}\text{C}$)	9.40	9.33	9.63	8.35	9.46	10.22

Table 3-9 In-situ surface water quality data April 2021 (in lieu of March 2021 results)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	07-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21
Time (GMT)	09:44	15:45	12:08	10:55	14:47	14:03
pH	8.37	8.26	7.87	8.24	8.08	7.86
Actual Conductivity ($\mu\text{S}/\text{cm}$)	406.13	369.17	440.59	331.76	408.05	301.64
Specific Conductivity ($\mu\text{S}/\text{cm}$)	649.89	572.78	663.42	557.41	585.63	478.11
Salinity (PSU)	0.31	0.27	0.32	0.26	0.28	0.23
Total Dissolved Solids (ppt)	0.42	0.37	0.43	0.36	0.38	0.31
Turbidity (NTU)	14.08	23.64	7.17	0.00	7.36	9.08
RDO Concentration (mg/L)	12.61	12.05	11.95	13.84	10.93	11.02
RDO Saturation (%)	100.44	98.56	100.25	105.88	95.62	88.51
Oxygen Partial Pressure (Torr)	144.12	141.34	143.69	152.09	136.86	127.01
Temperature ($^{\circ}\text{C}$)	5.35	6.39	7.40	3.80	9.14	5.68

Table 3-10 In situ surface water quality data April 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	27-Apr-21	27-Apr-21	28-Apr-21	27-Apr-21	27-Apr-21	27-Apr-21
Time (GMT)	13:16	11:12	10:17	10:05	15:17	14:04
pH	8.36	8.33	7.91	8.17	8.17	7.77
Actual Conductivity ($\mu\text{S}/\text{cm}$)	456.67	407.56	631.39	378.28	476.02	326.47
Specific Conductivity ($\mu\text{S}/\text{cm}$)	666.70	601.08	928.60	590.28	653.09	479.99
Salinity (PSU)	0.32	0.29	0.45	0.28	0.32	0.23
Total Dissolved Solids (ppt)	0.43	0.39	0.60	0.38	0.42	0.31
Turbidity (NTU)	11.99	20.34	24.36	0.77	8.15	1.87
RDO Concentration (mg/L)	11.54	11.36	10.93	13.38	10.23	9.83
RDO Saturation (%)	98.93	96.51	93.10	108.24	92.52	83.63
Oxygen Partial Pressure (Torr)	142.03	138.61	133.71	155.67	132.60	120.11
Temperature ($^{\circ}\text{C}$)	8.51	8.14	8.24	6.20	10.80	8.26

Table 3-11 In situ surface water quality data May 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	27-May-21	27-May-21	26-May-21	27-May-21	26-May-21	26-May-21
Time (GMT)	08:55	09:26	10:40	11:35	14:10	13:40
pH	8.36	8.36	7.74	8.27	7.78	7.73
Actual Conductivity ($\mu\text{S}/\text{cm}$)	428.35	400.23	483.30	500.70	457.42	354.28
Specific Conductivity ($\mu\text{S}/\text{cm}$)	601.10	560.30	671.62	671.29	619.27	479.51
Salinity (PSU)	0.29	0.27	0.33	0.33	0.30	0.23
Total Dissolved Solids (ppt)	0.39	0.36	0.44	0.44	0.40	0.31
Turbidity (NTU)	24.81	22.94	6.53	1.71	6.27	1.55
RDO Concentration (mg/L)	11.17	11.15	10.69	10.90	9.97	9.79
RDO Saturation (%)	100.76	100.71	97.32	102.41	92.78	91.10
Oxygen Partial Pressure (Torr)	143.39	143.31	138.41	145.51	131.89	129.49
Temperature ($^{\circ}\text{C}$)	9.96	10.04	10.32	11.70	11.32	11.34

Table 3-12 In situ surface water quality data June 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	14-Jun-21	14-Jun-21	15-Jun-21	15-Jun-21	14-Jun-21	15-Jun-21
Time (GMT)	12:07	12:32	11:17	09:57	14:15	13:11
pH	7.97	8.00	7.97	8.21	8.00	7.92
Actual Conductivity ($\mu\text{S}/\text{cm}$)	459.01	424.97	480.91	459.73	510.96	379.30
Specific Conductivity ($\mu\text{S}/\text{cm}$)	609.59	555.69	636.94	607.53	620.00	478.20
Salinity (PSU)	0.30	0.27	0.31	0.30	0.30	0.23
Total Dissolved Solids (ppt)	0.40	0.36	0.41	0.39	0.40	0.31
Turbidity (NTU)	27.13	25.12	3.34	1.35	12.37	1.61
RDO Concentration (mg/L)	10.68	10.38	10.22	10.65	9.02	8.14
RDO Saturation (%)	99.40	97.97	95.32	99.58	91.17	79.43
Oxygen Partial Pressure (Torr)	143.66	141.53	137.77	143.91	131.27	114.64
Temperature ($^{\circ}\text{C}$)	12.06	12.69	12.16	12.25	15.82	14.20

Table 3-13 In situ surface water quality data August 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	03-Aug-21	03-Aug-21	02-Aug-21	02-Aug-21	02-Aug-21	02-Aug-21
Time (GMT)	11:17	09:14	12:46	14:12	10:37	11:32
pH	8.43	8.35	8.04	8.26	8.20	7.93
Actual Conductivity ($\mu\text{S}/\text{cm}$)	525.05	481.95	552.05	478.89	477.79	382.28
Specific Conductivity ($\mu\text{S}/\text{cm}$)	667.58	626.55	719.44	593.27	612.59	479.87
Salinity (PSU)	0.33	0.31	0.35	0.29	0.30	0.23
Total Dissolved Solids (ppt)	0.43	0.41	0.47	0.39	0.40	0.31
Turbidity (NTU)	21.91	37.69	7.80	3.11	9.93	2.50
RDO Concentration (mg/L)	10.62	10.68	10.83	9.96	10.41	8.72
RDO Saturation (%)	97.46	96.04	97.21	93.58	94.72	80.78
Oxygen Partial Pressure (Torr)	137.82	135.94	137.61	132.21	134.00	114.19
Temperature ($^{\circ}\text{C}$)	13.82	12.91	12.83	14.91	13.47	14.32

Table 3-14 In situ surface water quality data September 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	30-Sep-21	29-Sep-21	30-Sep-21	30-Sep-21	29-Sep-21	30-Sep-21
Time (GMT)	10:11	14:57	13:09	11:30	12:22	15:27
pH	8.29	8.14	8.10	8.32	7.88	7.86
Actual Conductivity ($\mu\text{S}/\text{cm}$)	409.71	422.48	426.02	346.15	460.37	357.02
Specific Conductivity ($\mu\text{S}/\text{cm}$)	536.51	565.67	573.77	480.02	598.19	471.95
Salinity (PSU)	0.26	0.27	0.28	0.23	0.29	0.23
Total Dissolved Solids (ppt)	0.35	0.37	0.37	0.31	0.39	0.31
Turbidity (NTU)	42.92	31.84	6.85	1.77	17.50	4.16
RDO Concentration (mg/L)	10.03	9.88	10.09	10.27	9.49	9.51
RDO Saturation (%)	95.13	91.80	93.36	92.60	90.63	89.35
Oxygen Partial Pressure (Torr)	137.02	132.34	134.61	133.65	130.50	128.75
Temperature ($^{\circ}\text{C}$)	12.62	11.73	11.52	10.39	12.93	12.23

Table 3.15 In situ surface water quality data October 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	21-Oct-21	20-Oct-21	21-Oct-21	21-Oct-21	20-Oct-21	21-Oct-21
Time (GMT)	16:21	14:38	11:53	09:56	12:04	15:07
PH	8.24	8.00	8.04	8.40	7.83	7.65
Actual Conductivity (µS/cm)	417.27	376.29	483.28	411.80	459.24	348.67
Specific Conductivity (µS/cm)	557.25	488.65	657.17	576.11	595.08	475.77
Salinity (PSU)	0.27	0.24	0.32	0.28	0.29	0.23
Total Dissolved Solids (ppt)	0.36	0.32	0.43	0.37	0.39	0.31
Turbidity (NTU)	43.60	75.88	9.72	8.21	21.63	2.25
RDO Concentration (mg/L)	11.15	10.15	11.12	11.70	10.00	9.81
RDO Saturation (%)	83.74	90.51	95.22	97.71	89.39	83.74
Oxygen Partial Pressure (Torr)	119.28	128.70	135.55	139.26	127.01	119.28
Temperature (°C)	11.01	12.96	11.15	10.07	13.05	11.01

Table 3-16 In situ surface water quality data November 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	10-Nov-21	10-Nov-21	11-Nov-21	11-Nov-21	10-Nov-21	11-Nov-21
Time (GMT)	11:42	13:06	12:31	09:36	15:36	14:05
PH	8.22	8.24	7.68	8.30	7.96	7.71
Actual Conductivity ($\mu\text{S}/\text{cm}$)	427.30	408.14	566.95	474.66	481.74	397.08
Specific Conductivity ($\mu\text{S}/\text{cm}$)	580.85	556.10	766.81	659.21	651.66	539.32
Salinity (PSU)	0.28	0.27	0.38	0.32	0.32	0.26
Total Dissolved Solids (ppt)	0.38	0.36	0.50	0.43	0.42	0.35
Turbidity (NTU)	34.05	75.57	6.96	1.16	2.21	2.96
RDO Concentration (mg/L)	11.19	10.87	10.23	11.25	10.43	8.20
RDO Saturation (%)	97.71	94.64	89.75	96.38	91.48	71.63
Oxygen Partial Pressure (Torr)	140.81	136.42	129.36	139.00	131.85	103.32
Temperature ($^{\circ}\text{C}$)	11.17	11.07	11.36	10.35	11.36	11.19

Laboratory sampling

3.1.2 Table 3-17 to Table 3-32 display surface water quality results from laboratory samples between August 2020 and November 2021. Monitoring for March 2021 was unable to be conducted, and samples were taken in early April 2021. Monitoring was also unable to be conducted in July 2021, and samples were taken in early August 2021.

Table 3-17 Laboratory surface water quality data August 2020

Location ID	SW1	SW2	SW3	SW4	SW5
Date	24-Aug-20	24-Aug-20	25-Aug-20	25-Aug-20	24-Aug-20
Time (GMT)	11:45	13:45	10:00	13:08	16:15
Lab ID	19696091	19696092	19619033	19619034	19696093
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	0.011	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.4	8.3	8.2	8.3	8.1
Conductivity- Electrical 20C, uS/cm	608	579	485	396	636
Alkalinity as CaCO ₃ , mg/l	225	235	168	158	198
Nitrate as N, mg/l	1.2	0.7	0.8	0.9	5.3
Phosphates , Total as P, mg/l	0.12	<0.120	0.13	<0.120	0.28
TOC (Filtered), mg/l	3.3	2.4	6.2	5.9	2.6
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.11	0.47	0.41	0.2	0.25
Anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0011	0.0006	0.0011	0.0008	0.0011
Arsenic, total as As (mg/l)	0.0014	0.0003	0.0014	0.00097	0.0017
Benzo(a)anthracene, ug/l	<0.01	<0.01	0.025	0.012	<0.01
Benzo(a)pyrene, ug/l	<0.01	<0.01	0.051	0.029	<0.01
Benzo(b)fluoranthene, ug/l	<0.01	<0.01	0.048	0.029	<0.01
Benzo(ghi)perylene, ug/l	<0.01	<0.01	0.049	0.026	<0.01
Benzo(k)fluoranthene, ug/l	<0.01	<0.01	0.024	0.015	<0.01
Calcium, total as Ca (mg/l)	110	17.1	81.6	75.9	120
Chrysene, ug/l	<0.01	<0.01	0.028	0.016	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	<0.01	0.013	<0.01	<0.01
Fluoranthene, ug/l	<0.01	<0.01	0.05	0.034	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	<0.01	<0.01	0.05	0.029	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	<0.01	<0.01	0.388	0.224	<0.01
Phenanthrene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene, ug/l	<0.01	<0.01	0.051	0.034	<0.01

Location ID	SW1	SW2	SW3	SW4	SW5
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.009	0.66	0.021	0.012	0.015

Table 3-18 Laboratory surface water quality data September 2020

Location ID	SW1	SW2	SW3	SW4	SW5
Date	15-Sep-20	15-Sep-20	16-Sep-20	16-Sep-20	15-Sep-20
Time (GMT)	10:52	12:02	12:40	11:07	13:58
Lab ID	19690422	19690423	19686157	19686156	19690424
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.4	8.3	7.8	8.2	8.3
Conductivity- Electrical 20C, uS/cm	582	540	628	563	615
Alkalinity as CaCO3, mg/l	218	221	250	247	189
Nitrate as N, mg/l	0.9	1.1	1.5	1.9	9.5
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.76
TOC (Filtered), mg/l	2.3	2	1.2	1.9	2.4
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	12
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	12
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5
EPH >C10 - C44, ug/l	-	-	<10	<10	-
Acenaphthene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Acenaphthylene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Aluminium, total as Al (mg/l)	0.15	0.25	0.16	0.032	0.05
Anthracene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Arsenic, filter as As (mg/l)	0.0008	0.0007	0.0002	0.0005	0.001
Arsenic, total as As (mg/l)	0.0011	0.0013	0.00036	0.0004	0.0011
Benzo(a)anthracene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Benzo(a)pyrene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Benzo(b)fluoranthene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Benzo(ghi)perylene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Benzo(k)fluoranthene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Calcium, total as Ca (mg/l)	110	110	150	120	97
Chrysene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Dibenzo(ah)anthracene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Fluoranthene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Fluorene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Indeno(123cd)pyrene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Naphthalene, ug/l	<0.01	N/S	0.02	0.01	N/S
PAH, Total of 16, ug/l	<0.01	N/S	0.02	0.01	N/S
Phenanthrene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Pyrene, ug/l	<0.01	N/S	<0.01	<0.01	N/S
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.012	0.03	<0.006	<0.006	0.006

Table 3-19 Laboratory surface water quality data October 2020

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	20-Oct-20	20-Oct-20	21-Oct-20	21-Oct-20	22-Oct-20	22-Oct-20
Time (GMT)	15:00	13:00	15:50	14:50	12:05	10:40
Lab ID	19794641	19794642	19799582	19799581	19803374	19803375
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.4	8.3	8.2	7.9	8.1	8.1
Conductivity- Electrical 20C, uS/cm	567	532	489	601	557	457
Alkalinity as CaCO3, mg/l	238	225	232	266	209	257
Nitrate as N, mg/l	1.5	2	1.9	2.2	7.2	0.8
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.24	<0.120
TOC (Filtered), mg/l	2.3	2.3	4.5	2.9	2.4	3.7
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	12	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	12	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	12	<10	<10
Acenaphthene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Acenaphthylene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Aluminium, total as Al (mg/l)	-	-	0.11	0.12	0.1	0.021
Anthracene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Arsenic, filter as As (mg/l)	0.0006	0.001	0.0004	0.0003	0.0007	0.001
Arsenic, total as As (mg/l)	0.0011	0.0041	0.00042	0.00036	0.00099	0.0014
Benzo(a)anthracene, ug/l	-	-	<0.01	0.01	<0.10	<0.10
Benzo(a)pyrene, ug/l	-	-	<0.01	0.01	<0.10	<0.10
Benzo(b)fluoranthene, ug/l	-	-	0.01	0.02	<0.10	<0.10
Benzo(ghi)perylene, ug/l	-	-	<0.01	0.02	<0.10	<0.10
Benzo(k)fluoranthene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Calcium, total as Ca (mg/l)	100	100	96.8	120	110	110
Chrysene, ug/l	-	-	<0.01	0.01	<0.10	<0.10
Dibenzo(ah)anthracene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Fluoranthene, ug/l	-	-	0.02	0.02	<0.10	<0.10
Fluorene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Indeno(123cd)pyrene, ug/l	-	-	<0.01	0.02	<0.10	<0.10
Naphthalene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
PAH, Total of 16, ug/l	-	-	0.04	0.13	<0.10	<0.10
Phenanthrene, ug/l	-	-	<0.01	<0.01	<0.10	<0.10
Pyrene, ug/l	-	-	0.02	0.02	<0.10	<0.10
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.008	0.014	0.008	0.01	0.007	<0.006

Table 3-20 Laboratory surface water quality data November 2020

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	19-Nov-20	18-Nov-20	19-Nov-20	19-Nov-20	18-Nov-20	18-Nov-20
Time (GMT)	15:40	11:40	11:11	13:55	14:21	15:30
Lab ID	19890569	19886167	19890570	19890571	19886168	19886169
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.4	8.3	8	8	8.1	8.1
Conductivity- Electrical 20C, uS/cm	532	488	651	547	553	439
Alkalinity as CaCO3, mg/l	226	215	290	232	222	247
Nitrate as N, mg/l	2.1	2.2	3.2	3.6	8.4	1.4
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.21	<0.120
TOC (Filtered), mg/l	2.2	2.2	2.5	2.5	1.7	2
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	20	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	20	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	20	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.18	0.45	0.078	0.11	0.069	0.015
Anthracene, ug/l	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0005	0.0007	<0.0002	0.0002	0.0007	0.0008
Arsenic, total as As (mg/l)	0.00081	0.0024	0.00026	0.00029	0.00082	0.00097
Benzo(a)anthracene, ug/l	0.01	0.06	<0.01	0.03	<0.01	<0.01
Benzo(a)pyrene, ug/l	0.02	0.09	<0.01	0.05	<0.01	<0.01
Benzo(b)fluoranthene, ug/l	0.02	0.09	<0.01	0.05	<0.01	<0.01
Benzo(ghi)perylene, ug/l	0.02	0.1	0.01	0.05	<0.01	<0.01
Benzo(k)fluoranthene, ug/l	0.01	0.06	<0.01	0.03	<0.01	<0.01
Calcium, total as Ca (mg/l)	100	100	140	130	120	100
Chrysene, ug/l	0.02	0.07	<0.01	0.03	<0.01	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	0.02	<0.01	0.01	<0.01	<0.01
Fluoranthene, ug/l	0.02	0.1	<0.01	0.04	<0.01	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	0.02	0.09	<0.01	0.05	<0.01	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	0.15	0.82	0.01	0.37	<0.01	<0.01
Phenanthrene, ug/l	<0.01	0.04	<0.01	<0.01	<0.01	<0.01
Pyrene, ug/l	0.02	0.1	<0.01	0.04	<0.01	<0.01
Zinc, filter as Zn (mg/l)	0.013	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.024	0.026	<0.006	0.008	0.01	<0.006

Table 3-21 Laboratory surface water quality data December 2020 (round 1)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	14-Dec-20	14-Dec-20	16-Dec-20	15-Dec-20	16-Dec-20	16-Dec-20
Time (GMT)	10:45	11:55	09:25	11:48	14:00	12:38
Lab ID	19971908	19971909	19981986	19981985	19981988	19981987
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	0.0007
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	0.012	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	0.009	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.1	8.2	7.8	8	7.6	7.8
Conductivity- Electrical 20C, uS/cm	578	489	688	529	489	451
Alkalinity as CaCO3, mg/l	221	200	279	240	212	232
Nitrate as N, mg/l	2.1	2.4	2.8	3.2	6.1	1.7
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.26	<0.120
TOC (Filtered), mg/l	3.9	3	2	1.9	4.2	1.8
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<20	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<20	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	31	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<20	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	31	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<20	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<20	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<20	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<20	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<20	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<20	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	31	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	0.12	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
Aluminium, total as Al (mg/l)	0.26	0.48	0.14	0.11	1	0.044
Anthracene, ug/l	<0.01	<0.01	0.01	<0.01	0.09	<0.01
Arsenic, filter as As (mg/l)	0.0005	0.0004	0.0004	0.0004	0.0008	0.0006
Arsenic, total as As (mg/l)	0.001	0.0009	0.00067	0.00039	0.0027	0.0011
Benzo(a)anthracene, ug/l	0.02	0.01	0.05	<0.01	0.68	<0.01
Benzo(a)pyrene, ug/l	0.03	0.02	0.06	0.01	1.01	<0.01
Benzo(b)fluoranthene, ug/l	0.03	0.03	0.06	0.01	1.01	<0.01
Benzo(ghi)perylene, ug/l	0.03	0.03	0.06	<0.01	0.99	<0.01
Benzo(k)fluoranthene, ug/l	0.02	0.01	0.05	<0.01	0.76	<0.01
Calcium, total as Ca (mg/l)	110	97.8	120	110	94.3	87.7
Chrysene, ug/l	0.02	0.02	0.06	<0.01	0.68	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	<0.01	0.01	<0.01	0.2	<0.01
Fluoranthene, ug/l	0.03	0.03	0.09	0.02	1.14	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	0.12	<0.01
Indeno(123cd)pyrene, ug/l	0.03	0.02	0.06	<0.01	1.08	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	0.05	<0.01
PAH, Total of 16, ug/l	0.25	0.23	0.63	0.06	9.44	<0.01
Phenanthrene, ug/l	<0.01	0.01	0.04	<0.01	0.44	<0.01
Pyrene, ug/l	0.04	0.04	0.09	0.02	1.05	<0.01
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	0.0092	<0.0050
Zinc, total as Zn (mg/l)	0.015	0.015	0.016	<0.006	0.064	<0.006

Table 3-22 Laboratory surface water quality data December 2020 (round 2)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	21-Dec-20	21-Dec-20	22-Dec-20	22-Dec-20	21-Dec-20	22-Dec-20
Time (GMT)	09:12	10:17	11:42	09:40	14:35	15:55
Lab ID	19995616	19995617	19999304	19999303	19995618	19999305
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	0.007	<0.006	<0.006	0.007	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.3	8.3	8.2	8.4	8	8.1
Conductivity- Electrical 20C, uS/cm	511	454	588	548	532	425
Alkalinity as CaCO3, mg/l	200	187	264	263	211	231
Nitrate as N, mg/l	2.1	2.3	3	3	7.7	2.3
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
TOC (Filtered), mg/l	3.5	3.4	2.8	2.8	6.3	2.1
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.87	0.66	0.3	0.34	0.095	0.16
Anthracene, ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0005	0.0004	0.0007	0.0004	0.0005	0.0005
Arsenic, total as As (mg/l)	0.0014	0.001	0.00089	0.00066	0.00063	0.0014
Benzo(a)anthracene, ug/l	0.07	0.02	<0.01	0.01	<0.01	<0.01
Benzo(a)pyrene, ug/l	0.09	0.03	<0.01	0.02	0.01	<0.01
Benzo(b)fluoranthene, ug/l	0.09	0.03	<0.01	0.02	0.01	<0.01
Benzo(ghi)perylene, ug/l	0.09	0.03	<0.01	0.01	0.01	<0.01
Benzo(k)fluoranthene, ug/l	0.07	0.03	<0.01	0.01	<0.01	<0.01
Calcium, total as Ca (mg/l)	100	86.4	120	130	110	96.1
Chrysene, ug/l	0.08	0.03	<0.01	0.02	<0.01	<0.01
Dibenzo(ah)anthracene, ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene, ug/l	0.11	0.04	<0.01	0.02	0.02	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	0.08	0.03	<0.01	0.01	<0.01	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	0.86	0.3	0.01	0.14	0.07	<0.01
Phenanthrene, ug/l	0.04	0.01	<0.01	<0.01	<0.01	<0.01
Pyrene, ug/l	0.12	0.04	0.01	0.02	0.01	<0.01
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.031	0.021	0.023	0.022	0.008	0.013

Table 3-23 Laboratory surface water quality data January 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	26-Jan-21	26-Jan-21	27-Jan-21	26-Jan-21	27-Jan-21	27-Jan-21
Time (GMT)	11:11	12:10	10:13	16:17	14:10	13:45
Lab ID	20082976	20082977	20088124	20082978	20087903	20088125
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.3	8.4	8	8.1	8	8
Conductivity- Electrical 20C, uS/cm	552	493	852	1030	594	406
Alkalinity as CaCO3, mg/l	198	186	254	239	202	216
Nitrate as N, mg/l	3.3	3.4	2.7	4	7.4	2
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
TOC (Filtered), mg/l	1.4	1	1.7	1.5	1.8	1.3
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.2	0.29	0.4	0.097	0.057	0.083
Anthracene, ug/l	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0004	0.0008	0.0003	0.0002	0.0005	0.0004
Arsenic, total as As (mg/l)	0.00062	0.00064	0.00067	0.00028	0.00062	0.00083
Benzo(a)anthracene, ug/l	<0.01	<0.01	0.1	<0.01	<0.01	<0.01
Benzo(a)pyrene, ug/l	<0.01	<0.01	0.16	<0.01	0.01	<0.01
Benzo(b)fluoranthene, ug/l	<0.01	<0.01	0.13	<0.01	0.01	<0.01
Benzo(ghi)perylene, ug/l	<0.01	<0.01	0.14	<0.01	0.01	<0.01
Benzo(k)fluoranthene, ug/l	<0.01	<0.01	0.1	<0.01	<0.01	<0.01
Calcium, total as Ca (mg/l)	100	91.8	120	130	100	90
Chrysene, ug/l	<0.01	<0.01	0.12	<0.01	0.01	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Fluoranthene, ug/l	<0.01	<0.01	0.17	0.01	0.02	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	<0.01	<0.01	0.12	0.01	0.01	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	<0.01	<0.01	1.29	0.02	0.09	<0.01
Phenanthrene, ug/l	<0.01	<0.01	0.06	<0.01	<0.01	<0.01
Pyrene, ug/l	<0.01	<0.01	0.17	<0.01	0.02	<0.01
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	0.011	0.006	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.009	0.01	0.041	0.008	<0.006	<0.006

Table 3-24 Laboratory surface water quality data February 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	25-Feb-21	25-Feb-21	24-Feb-21	25-Feb-21	24-Feb-21	24-Feb-21
Time (GMT)	14:14	12:17	11:44	09:16	15:31	14:23
Lab ID	20184682	20184683	20178334	20184684	20178336	20178335
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.3	8.4	8	8.1	8	8.1
Conductivity- Electrical 20C, uS/cm	529	481	646	574	543	398
Alkalinity as CaCO3, mg/l	203	187	268	246	201	213
Nitrate as N, mg/l	2.9	2.9	3.2	3.6	7.6	2.4
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
TOC (Filtered), mg/l	2	2	1.4	1.8	2.7	3
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.24	0.26	0.17	0.026	0.057	0.095
Anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0004	0.0004	0.0002	0.0002	0.0006	0.0005
Arsenic, total as As (mg/l)	0.00065	0.00064	0.00037	<0.00024	0.00061	0.001
Benzo(a)anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium, total as Ca (mg/l)	100	91.1	140	130	110	96.4
Chrysene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene, ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.009	0.006	0.006	<0.006	0.006	0.007

Table 3-25 Laboratory surface water quality data April 2021(in lieu of March 2021 results)

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	07-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21	06-Apr-21
Time (GMT)	09:42	15:43	12:08	11:00	14:45	14:02
Lab ID	20311120	20305977	20305974	20305973	20305976	20305975
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.1	8	7.8	7.9	8.3	8.2
Conductivity- Electrical 20C, uS/cm	592	538	620	568	542	427
Alkalinity as CaCO3, mg/l	213	208	272	231	198	238
Nitrate as N, mg/l	1.9	2.3	2.6	3.3	7.7	1.9
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.17	<0.120
TOC (Filtered), mg/l	2.2	1.9	1.7	2.4	3.4	2.6
Aliphatic EPH >C10 - C12, ug/l	<100	<100	<10	<100	<100	<100
Aliphatic EPH >C12 - C16, ug/l	<100	<100	<10	<100	<100	<100
Aliphatic EPH >C16 - C35, ug/l	<100	<100	<10	<100	<100	<100
Aliphatic EPH >C35 - C44, ug/l	<100	<100	<10	<100	<100	<100
Aliphatic EPH >C10 - C44, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C10 - C12, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C12 - C16, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C16 - C21, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C21 - C35, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C35 - C44, ug/l	<100	<100	<10	<100	<100	<100
Aromatic EPH >C10 - C44, ug/l	<100	<100	<10	<100	<100	<100

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<100	<100	<10	<100	<100	<100
Acenaphthene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium, total as Al (mg/l)	0.35	0.67	0.053	0.027	0.079	0.36
Anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic, filter as As (mg/l)	0.0005	0.0004	<0.0002	0.0002	0.0006	0.0005
Arsenic, total as As (mg/l)	0.001	0.0012	<0.00024	0.00025	0.00077	0.0022
Benzo(a)anthracene, ug/l	<0.01	<0.01	0.01	0.01	<0.01	<0.01
Benzo(a)pyrene, ug/l	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Benzo(b)fluoranthene, ug/l	<0.01	<0.01	0.03	0.01	<0.01	<0.01
Benzo(ghi)perylene, ug/l	<0.01	0.01	0.04	0.01	<0.01	<0.01
Benzo(k)fluoranthene, ug/l	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Calcium, total as Ca (mg/l)	110	94.7	120	110	100	94.7
Chrysene, ug/l	<0.01	<0.01	0.02	0.01	<0.01	<0.01
Dibenzo(ah)anthracene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene, ug/l	0.01	<0.01	0.02	0.02	<0.01	<0.01
Fluorene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(123cd)pyrene, ug/l	<0.01	<0.01	0.04	0.01	<0.01	<0.01
Naphthalene, ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH, Total of 16, ug/l	0.03	0.02	0.25	0.12	<0.01	<0.01
Phenanthrene, ug/l	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Pyrene, ug/l	0.01	0.01	0.02	0.02	<0.01	<0.01
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.012	0.016	<0.006	0.01	0.007	0.01

Table 3-26 Laboratory surface water quality data April 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	27-Apr-21	27-Apr-21	27-Apr-21	27-Apr-21	27-Apr-21	27-Apr-21
Time (GMT)	13:14	11:05	10:13	09:52	15:11	14:01
Lab ID	20379554	20379553	20385795	20379552	20379556	20379555
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.2	8.2	8.1	8.1	8.1	7.8
Conductivity- Electrical 20C, uS/cm	623	562	837	548	606	449
Alkalinity as CaCO3, mg/l	155	167	231	165	190	186
Nitrate as N, mg/l	2.1	1.9	2.3	3	9.6	1.9
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.47	<0.120
TOC (Filtered), mg/l	2.6	1.9	6.1	1.8	2.8	1.8
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	16	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	16	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	16	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al (mg/l)	<0.0075	0.29	0.35	0.023	0.067	0.008
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As (mg/l)	0.0005	0.0005	0.0004	0.0002	0.0006	0.0006
Arsenic, total as As (mg/l)	0.0017	0.00095	0.00075	<0.00024	0.00085	0.00089
Benzo(a)anthracene, ug/l	<0.010	<0.010	0.042	<0.010	<0.010	<0.010
Benzo(a)pyrene, ug/l	<0.010	<0.010	0.055	<0.010	0.012	<0.010
Benzo(b)fluoranthene, ug/l	<0.010	<0.010	0.061	<0.010	0.013	<0.010
Benzo(ghi)perylene, ug/l	<0.010	<0.010	0.063	<0.010	0.012	<0.010
Benzo(k)fluoranthene, ug/l	<0.010	<0.010	0.06	<0.010	<0.010	<0.010
Calcium, total as Ca (mg/l)	120	110	120	110	110	100
Chrysene, ug/l	<0.010	<0.010	0.045	<0.010	0.01	<0.010
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	0.015	<0.010	<0.010	<0.010
Fluoranthene, ug/l	<0.010	<0.010	0.078	<0.010	0.016	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	<0.010	<0.010	0.089	<0.010	0.013	<0.010
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	<0.010	<0.010	0.607	<0.010	0.092	<0.010
Phenanthrene, ug/l	<0.010	<0.010	0.027	<0.010	<0.010	<0.010
Pyrene, ug/l	<0.010	<0.010	0.073	<0.010	0.016	<0.010
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	0.0086	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	<0.006	0.007	0.023	<0.006	0.008	<0.006

Table 3-27 Laboratory surface water quality data May 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	27-May-21	27-May-21	26-May-21	27-May-21	26-May-21	26-May-21
Time (GMT)	08:55	09:26	10:40	11:35	14:10	13:40
Lab ID	20489473	20489474	20478813	20489475	20478815	20478814
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	0.007	<0.006	<0.006	<0.006	<0.006
pH	8.3	8.4	8.3	8	8.3	8.3
Conductivity- Electrical 20C, uS/cm	538	506	646	553	549	424
Alkalinity as CaCO3, mg/l	197	198	293	219	224	251
Nitrate as N, mg/l	2.7	3	2.4	3.6	5.4	1
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	<0.120	<0.120
TOC (Filtered), mg/l	2.4	2.6	2	2.1	2.8	1.7
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al (mg/l)	0.26	0.2	0.11	0.027	0.062	0.027
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As (mg/l)	0.0004	0.0004	0.0004	0.0002	0.0005	0.0006
Arsenic, total as As (mg/l)	0.00083	0.00065	0.00053	0.00026	0.00076	0.00091
Benzo(a)anthracene, ug/l	0.016	0.011	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene, ug/l	0.032	0.012	<0.010	<0.010	0.015	<0.010
Benzo(b)fluoranthene, ug/l	0.016	0.015	<0.010	<0.010	0.015	<0.010
Benzo(ghi)perylene, ug/l	0.014	0.012	<0.010	0.013	0.012	<0.010
Benzo(k)fluoranthene, ug/l	<0.010	<0.010	<0.010	<0.010	0.01	<0.010
Calcium, total as Ca (mg/l)	100	91.4	140	130	120	110
Chrysene, ug/l	0.014	0.012	<0.010	<0.010	0.012	<0.010
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	0.03	0.017	<0.010	<0.010	0.022	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	0.016	0.015	<0.010	<0.010	0.014	<0.010
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	0.181	0.113	<0.010	0.013	0.122	<0.010
Phenanthrene, ug/l	0.016	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene, ug/l	0.027	0.019	<0.010	<0.010	0.02	<0.010
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.014	0.01	<0.006	<0.006	<0.006	<0.006

Table 3-28 Laboratory surface water quality data June 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	14-Jun-21	14-Jun-21	15-Jun-21	15-Jun-21	14-Jun-21	15-Jun-21
Time (GMT)	12:05	12:26	11:14	09:51	14:11	13:05
Lab ID	20536449	20536450	20541123	20541122	20536451	20541124
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.2	8.1	7.8	7.8	8	8.1
Conductivity- Electrical 20C, uS/cm	552	507	599	508	575	430
Alkalinity as CaCO3, mg/l	210	197	246	208	200	237
Nitrate as N, mg/l	2.8	2.6	2.4	2.9	7.8	2
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.35	<0.120
TOC (Filtered), mg/l	1.8	1.7	1.3	1.5	2.2	2.1
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<10
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al (mg/l)	0.2	0.37	0.087	0.026	0.081	0.014
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As (mg/l)	0.0005	0.0004	<0.0002	0.0003	0.0008	0.0007
Arsenic, total as As (mg/l)	0.00078	0.0014	0.00027	0.00025	0.00098	0.0011
Benzo(a)anthracene, ug/l	0.01	<0.010	<0.010	<0.010	0.016	<0.010
Benzo(a)pyrene, ug/l	0.012	0.014	<0.010	<0.010	0.021	<0.010
Benzo(b)fluoranthene, ug/l	0.011	0.011	<0.010	<0.010	0.02	<0.010
Benzo(ghi)perylene, ug/l	0.014	0.015	<0.010	<0.010	0.019	<0.010
Benzo(k)fluoranthene, ug/l	<0.010	<0.010	<0.010	<0.010	0.011	<0.010
Calcium, total as Ca (mg/l)	96.4	85.7	120	110	100	98.1
Chrysene, ug/l	0.015	0.013	<0.010	<0.010	0.02	<0.010
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	0.016	0.016	0.01	<0.010	0.027	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	0.014	0.013	<0.010	<0.010	0.019	<0.010
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	0.111	0.103	0.021	<0.010	0.179	<0.010
Phenanthrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pyrene, ug/l	0.018	0.02	0.01	<0.010	0.026	<0.010
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.013	0.013	<0.006	<0.006	<0.006	<0.006

Table 3-29 Laboratory surface water quality data August 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	03-Aug-21	03-Aug-21	02-Aug-21	02-Aug-21	02-Aug-21	02-Aug-21
Time (GMT)	11:17	09:14	12:46	14:12	10:37	11:32
Lab ID	20709612	20709613	20707858	20707857	20707855	20707856
Cadmium, Total as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Cadmium, Filtered as Cd, mg/l	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper, Filtered as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Copper, Total as Cu, mg/l	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Lead , Total as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Lead, Filtered as Pb, mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
pH	8.3	8.2	8.1	8.3	8.2	8
Conductivity- Electrical 20C, uS/cm	620	585	648	538	559	443
Alkalinity as CaCO3, mg/l	236	234	231	229	203	238
Nitrate as N, mg/l	1.3	2	1.6	2.5	6	1.7
Phosphates , Total as P, mg/l	<0.120	<0.120	<0.120	<0.120	0.2	<0.120
TOC (Filtered), mg/l	3.2	3	1.6	2.1	2.9	2.3
Aliphatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<100
Aliphatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<100
Aliphatic EPH >C16 - C35, ug/l	<10	<10	<10	<10	<10	<100
Aliphatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<100
Aliphatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C10 - C12, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C12 - C16, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C16 - C21, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C21 - C35, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C35 - C44, ug/l	<10	<10	<10	<10	<10	<100
Aromatic EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<100

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
EPH >C10 - C44, ug/l	<10	<10	<10	<10	<10	<100
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	0.013	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al (mg/l)	0.42	0.6	0.093	0.053	0.036	0.01
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As (mg/l)	0.0009	0.0007	0.0002	0.0004	0.0008	0.0008
Arsenic, total as As (mg/l)	0.0014	0.0015	0.00033	0.00059	0.00096	0.0013
Benzo(a)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	0.018	<0.010
Benzo(a)pyrene, ug/l	0.011	0.01	<0.010	<0.010	0.019	<0.010
Benzo(b)fluoranthene, ug/l	0.012	0.01	<0.010	<0.010	0.021	<0.010
Benzo(ghi)perylene, ug/l	0.013	0.011	<0.010	<0.010	0.015	<0.010
Benzo(k)fluoranthene, ug/l	0.01	<0.010	<0.010	0.012	0.024	0.013
Calcium, total as Ca (mg/l)	110	110	130	110	100	100
Chrysene, ug/l	0.01	<0.010	<0.010	<0.010	0.018	<0.010
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	0.017	0.015	<0.010	<0.010	0.024	0.011
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	0.015	0.013	<0.010	<0.010	0.014	<0.010
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	0.119	0.104	<0.010	0.012	0.176	0.024
Phenanthrene, ug/l	0.011	0.011	<0.010	<0.010	<0.010	<0.010
Pyrene, ug/l	0.02	0.021	<0.010	<0.010	0.023	<0.010
Zinc, filter as Zn (mg/l)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn (mg/l)	0.031	0.037	0.009	<0.006	0.009	<0.006

Table 3-30 Laboratory surface water quality data September 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	30-Sep-21	29-Sep-21	30-Sep-21	30-Sep-21	29-Sep-21	30-Sep-21
Time (GMT)	10:11	14:57	13:09	11:30	12:22	15:27
Lab ID	20909903	20909904	20909905	20909906	20909907	20909908
pH	8.3	8.4	8.2	8.3	8.5	8.1
Conductivity- Electrical 20C, uS/cm	542	558	588	489	595	479
Alkalinity as CaCO3, mg/l	194	236	242	221	215	262
Bicarbonate Alkalinity, mg/l	194	234	242	218	215	262
Nitrate as N, mg/l	0.9	0.8	0.7	<0.7	5.6	<0.7
Sulphate as SO4, mg/l	65.4	53.1	53.6	29.7	63.4	16.6
TOC (Filtered), mg/l	5.2	4.1	2.9	3.3	3.6	4.4
EH >C6 - C40, ug/l	126	13	10	<10	13	<10
EH >C6 - C8, ug/l	<10	<10	<10	<10	<10	<10
EH >C8 - C10, ug/l	<10	<10	<10	<10	<10	<10
EH >C16 - C24, ug/l	22	<10	<10	<10	<10	<10
EH >C24 - C40, ug/l	104	13	10	<10	13	<10
EH >C10 - C16, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al, mg/l	0.29	0.3	0.11	0.082	0.11	0.04
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As, mg/l	0.001	0.0008	0.0003	0.0005	0.001	0.0009
Arsenic, total as As, mg/l	0.0014	0.0012	0.00051	0.00057	0.0012	0.0015
Benzo(a)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene, ug/l	0.012	<0.010	<0.010	<0.010	0.011	<0.010
Benzo(b)fluoranthene, ug/l	0.014	<0.010	<0.010	<0.010	0.013	<0.010
Benzo(ghi)perylene, ug/l	0.015	<0.010	<0.010	<0.010	0.012	<0.010

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Benzo(k)fluoranthene, ug/l	0.019	<0.010	0.013	0.011	<0.010	<0.010
Cadmium, filter as Cd, mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Cadmium, total as Cd, mg/l	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Calcium, total as Ca, mg/l	91.7	100	120	99.2	100	110
Chrysene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper, filter as Cu, mg/l	0.0045	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Copper, total as Cu, mg/l	0.0075	0.0045	0.0028	0.003	0.0023	0.0019
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	0.029	<0.010	<0.010	<0.010	0.011	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	<0.010	<0.010	<0.010	<0.010	0.012	<0.010
Lead, filter as Pb, mg/l	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Lead, total as Pb, mg/l	0.0018	0.0013	0.0005	0.0008	0.0011	<0.0003
Magnesium, total as Mg, mg/l	6.8	7.5	3	3	3.9	2.8
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	0.131	<0.010	0.013	0.011	0.071	<0.010
Phenanthrene, ug/l	0.015	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphates, Total as P, mg/l	0.1	0.066	0.035	0.064	0.33	0.028
Potassium, total as K, mg/l	5.3	2	2.2	3	2.9	0.92
Pyrene, ug/l	0.028	<0.010	<0.010	<0.010	0.012	<0.010
Sodium, total as Na, mg/l	30	26	24	18	38	10
Total Chlorine, mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc, filter as Zn, mg/l	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn, mg/l	0.02	0.013	<0.006	<0.006	0.007	<0.006
Nitrate as NO3	4.1	3.7	3.1	<3.1	24.6	<3.1

Table 3-31 Laboratory surface water quality data October 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	21-Oct-21	20-Oct-21	21-Oct-21	21-Oct-21	20-Oct-21	21-Oct-21
Time (GMT)	16:13	14:31	11:34	09:51	12:05	15:02
Lab ID	20986535	20986531	20986533	20986532	20986530	20986534
pH	8.4	7.8	8.2	8.3	7.9	7.8
Conductivity- Electrical 20C, uS/cm	530	472	630	549	568	458
Alkalinity as CaCO ₃ , mg/l	212	209	263	253	217	249
Bicarbonate Alkalinity, mg/l	208	209	263	244	217	249
Nitrate as N, mg/l	1.4	1.1	3.7	2.6	5.1	1.9
Sulphate as SO ₄ , mg/l	61.5	33.3	31.1	20.5	28.5	5.7
TOC (Filtered), mg/l	6.1	7.3	4.1	4.4	5.4	3.7
EH >C6 - C40, ug/l	19	39	14	12	33	<10
EH >C6 - C8, ug/l	<10	<10	<10	<10	<10	<10
EH >C8 - C10, ug/l	<10	<10	<10	<10	<10	<10
EH >C16 - C24, ug/l	<10	<10	<10	<10	<10	<10
EH >C24 - C40, ug/l	19	39	14	12	33	<10
EH >C10 - C16, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al, mg/l	0.33	0.68	0.12	0.062	0.11	0.042
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As, mg/l	0.0009	0.0007	0.0005	0.0005	0.0009	0.0006
Arsenic, total as As, mg/l	0.0013	0.0016	0.00064	0.0005	0.0011	0.0011
Benzo(a)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene, ug/l	0.013	0.013	<0.010	<0.010	0.014	<0.010
Benzo(b)fluoranthene, ug/l	0.014	0.016	0.011	<0.010	0.016	<0.010
Benzo(ghi)perylene, ug/l	0.012	0.013	<0.010	<0.010	0.015	<0.010

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Benzo(k)fluoranthene, ug/l	0.018	0.017	0.015	<0.010	0.019	<0.010
Cadmium, filter as Cd, mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Cadmium, total as Cd, mg/l	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Calcium, total as Ca, mg/l	96.6	92.5	120	110	97.1	99.9
Chrysene, ug/l	0.012	0.013	<0.010	<0.010	0.01	<0.010
Copper, filter as Cu, mg/l	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Copper, total as Cu, mg/l	0.0058	0.0064	0.0024	0.0019	0.0026	<0.0018
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	0.014	0.017	<0.010	<0.010	0.012	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	0.012	0.013	<0.010	<0.010	0.015	<0.010
Lead, filter as Pb, mg/l	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Lead, total as Pb, mg/l	0.0014	0.0029	0.0004	<0.0003	0.001	<0.0003
Magnesium, total as Mg, mg/l	6	5.7	2.7	2.4	3.2	2.4
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	0.111	0.121	0.026	<0.010	0.115	<0.010
Phenanthrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphates, Total as P, mg/l	0.077	0.11	0.08	0.054	0.29	0.02
Potassium, total as K, mg/l	4.7	2.3	2.2	1.9	2.7	0.62
Pyrene, ug/l	0.017	0.019	<0.010	<0.010	0.013	<0.010
Sodium, total as Na, mg/l	19	15	25	17	31	6
Total Chlorine, mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc, filter as Zn, mg/l	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn, mg/l	0.014	0.02	<0.006	0.009	0.01	0.009
Nitrate as NO3	6.2	4.9	16.3	11.5	22.7	8.6

Table 3-32 Laboratory surface water quality data November 2021

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Date	10-Nov-21	10-Nov-21	11-Nov-21	12-Nov-21	10-Nov-21	11-Nov-21
Time (GMT)	11:40	13:00	12:20	09:30	15:35	10:00
Lab ID	21063537	21063538	21063539	21063540	21063541	21063542
pH	8.2	8.1	7.7	7.6	7.9	8.2
Conductivity- Electrical 20C, uS/cm	503	477	693	540	594	474
Alkalinity as CaCO ₃ , mg/l	239	234	290	250	211	266
Bicarbonate Alkalinity, mg/l	239	234	290	250	211	266
Nitrate as N, mg/l	1.2	1.2	2.5	2.9	7.6	1
Sulphate as SO ₄ , mg/l	38.2	29.9	31.3	25.2	32.1	5.5
TOC (Filtered), mg/l	2.2	2.7	2.8	1.9	2	6.5
EH >C6 - C40, ug/l	<10	<10	11	<10	<10	<10
EH >C6 - C8, ug/l	<10	<10	<10	<10	<10	<10
EH >C8 - C10, ug/l	<10	<10	<10	<10	<10	<10
EH >C16 - C24, ug/l	<10	<10	<10	<10	<10	<10
EH >C24 - C40, ug/l	<10	<10	11	<10	<10	<10
EH >C10 - C16, ug/l	<10	<10	<10	<10	<10	<10
Acenaphthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminium, total as Al, mg/l	0.27	0.45	0.075	0.017	0.043	<0.0075
Anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic, filter as As, mg/l	0.0006	0.0006	0.0002	0.0003	0.0006	0.0007
Arsenic, total as As, mg/l	0.00098	0.00088	<0.00024	0.00027	0.00073	0.00092
Benzo(a)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b)fluoranthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(ghi)perylene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

Location ID	SW1	SW2	SW3	SW4	SW5	SW6
Benzo(k)fluoranthene, ug/l	<0.010	0.02	0.023	0.021	<0.010	<0.010
Cadmium, filter as Cd, mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Cadmium, total as Cd, mg/l	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Calcium, total as Ca, mg/l	100	100	130	120	100	110
Chrysene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper, filter as Cu, mg/l	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Copper, total as Cu, mg/l	<0.0018	0.0021	<0.0018	<0.0018	0.0019	<0.0018
Dibenzo(ah)anthracene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(123cd)pyrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead, filter as Pb, mg/l	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Lead, total as Pb, mg/l	0.0007	0.001	<0.0003	<0.0003	0.0004	<0.0003
Magnesium, total as Mg, mg/l	6.2	5.4	2.9	2.9	3	2.7
Naphthalene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, Total of 16, ug/l	<0.010	0.02	0.023	0.021	<0.010	<0.010
Phenanthrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphates, Total as P, mg/l	0.052	0.052	<0.013	<0.013	0.32	<0.013
Potassium, total as K, mg/l	2.1	1.6	1.3	1.3	2.9	0.8
Pyrene, ug/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sodium, total as Na, mg/l	18	15	35	21	29	7.4
Total Chlorine, mg/l	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc, filter as Zn, mg/l	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc, total as Zn, mg/l	0.006	0.007	<0.006	<0.006	0.007	<0.006
Nitrate as NO3	5.1	5.5	10.9	13	33.8	4.6

Water quality analysis






- 3.1.3 The results from the laboratory have been compared against relevant Environmental Quality Standard (EQS) values to identify where there are exceedances. The parameters that are identified as exceeding their EQS value are noted in red in the tables provided in Appendix B. There are also parameters where an applicable EQS value is not available to compare the results to, however these parameters have also been included in Appendix B for completeness. For some parameters, the level of detection is above the EQS value and therefore it cannot be determined if there is an exceedance. These values are denoted in yellow in Appendix B.
- 3.1.4 For each parameter the minimum, maximum and average value is calculated to help provide an understanding of the existing baseline and typical values for each location. Where a parameter is noted as being below the level of detection ('<'), this value has been excluded from these calculations.
- 3.1.5 In relation to exceedances, there were exceedances noted for aluminium in every month at locations SW3, SW4 and SW5, with the other locations also seeing multiple exceedances across the monitoring period to date. The most exceedances were noted at SW3, SW4 and SW5 (16) and the least at SW6 (10). Exceedances are identified for benzo(a)pyrene and fluoranthene at all locations, particularly around December 2020- January 2021. SW1, SW2 and SW5 are also identified as having continuous exceedances from May 2021 – October 2021. All locations apart from SW6 are also identified as having exceedances for benzo(b)fluoranthene and benzo(k)fluoranthene. These parameters are exceeded less often than benzo(a)pyrene and fluoranthene.
- 3.1.6 Exceedances are noted at each location in relation to zinc, with the least number of exceedances occurring at SW4 and SW6 (1 in December 2020) and the most at SW2 (11 exceedances including August – December 2020, April 2021 and June – October 2021). Exceedances in copper are noted at each location. The exceedances are identified in September and October 2021 for all and also in November 2021 at locations SW1, SW3 and SW5.
- 3.1.7 Petroleum hydrocarbons (e.g. Aliphatic EPH and Aromatic EPH) are generally identified as being below the limit of detection across the monitoring period. Traces are noted at locations SW1, SW3, SW4 and SW5 once or twice across the monitoring period (maximum 31 µg/l) and are identified in different months at the different locations.
- 3.1.8 The following points are also noted in relation to water quality:
- There is an unusually large peak in PAH (9.4 µg/l) in December 2020 at SW5. PAH values across the monitoring period are less than 1 µg/l at all other locations.
 - Higher concentrations of Nitrate as N are recorded consistently at SW5 (5.1-9.6 mg/l). Values at all other locations are less than 3 mg/l.
 - There is a large variation in TOC values across the monitoring period - greatest values occurring at SW2 (1-7.3 mg/l).

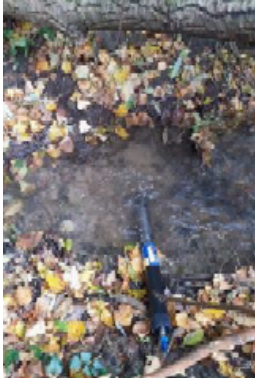


- Peaks in aluminium and zinc concentration typically occur at the same time at each of the monitoring locations.





Visual observations




3.1.9 Table 3-33 to Table 3-38 show visual data collected between July 2020 and November 2021. Monitoring for March 2021 was unable to be conducted, and samples were taken in early April 2021. Monitoring was also unable to be conducted in July 2021, and samples were taken in early August 2021.




Table 3-33 Visual observations for SW1 between July 2020 and November 2021

Month	Observations	Images	
July 2020	None taken	None taken	
August 2020	The channel upstream was very overgrown with vegetation. Further downstream, the channel was clear of vegetation with very limited flow moving downstream.		 
September 2020	The channel downstream was clear of vegetation. Some leaves/debris present in the channel.		

Month	Observations	Images	
October 2020	The channel was clear of vegetation downstream. More leaves/debris accumulating on the edges of the channel and on the banks.		
November 2020	The channel had increased in depth and was flowing quicker than previous visit. The leaves/debris appear to have been washed downstream. There is no vegetation build up in the channel.		
December 2020 (Round 1)	Weather: Cloudy Air temperature: 11°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images	
December 2020 (Round 2)	Weather: Cloudy Air temperature: 10°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 6°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		
February 2021	Weather: Overcast Air temperature: 11°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images
April 2021 (in lieu of March 2021 results)	Weather: Overcast Air temperature: 6°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
May 2021	Weather: Sunny Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
June 2021	Weather: Sunny Air temperature: 24°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Sunny/ cloudy Air temperature: 17°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	
September 2021	Weather: Cloudy Air temperature: 13°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	















Month	Observations	Images
October 2021	Weather: Sunny/ light cloud Air temperature: 13°C Water colour: Mild brown Algae growth: No Smell: No Dead fish: No	
November 2021	Weather: Drizzle/ overcast Air temperature: 13°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	



Table 3-34 Visual observations for SW2 between July 2020 and November 2021


Month	Observations	Images		
July 2020	There was very little flow in the channel. There was a lot of vegetation on the banks, but the channel was clear.			
August 2020	There was very little flow in the channel. There was a lot of vegetation on the banks, but channel was clear.			



Month	Observations	Images	
September 2020	As observed in prior visits, channel flow has been very limited. There was vegetation on the banks, but the channel was clear.		
October 2020	There was more leaf and twig debris in the channel than previous months. The water level was deeper and flowing more quickly.		
November 2020	The water level was deeper than the previous visit with a lot more debris in the channel. The colour of the water was less clear than previous visits.		

Month	Observations	Images	
December 2020 (Round 1)	Weather: Cloudy Air temperature: 11°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		
December 2020 (Round 2)	Weather: Cloudy Air temperature: 13°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 6°C Water colour: Clear Noticeable orange sediment and oil on bank (possibly natural) Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images
February 2021	Weather: Overcast Air temperature: 11°C Water colour: Clear. Noticeable orange sediment and oil on bank (possibly natural) Algae growth: No Smell: Yes Dead fish: No	
April 2021(in lieu of March 2021 results)	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
April 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
May 2021	Weather: Sunny Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
June 2021	Weather: Sunny Air temperature: 24°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Sunny/ Cloudy Air temperature: 17°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
September 2021	Weather: Sunny/ Cloudy Air temperature: 15°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	
October 2021	Weather: Sunny/ Cloudy Air temperature: 16°C Water colour: Mild brown Algae growth: No Smell: No Dead fish: No	


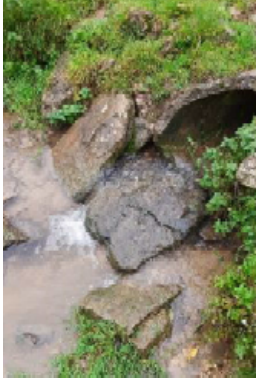










Month	Observations	Images
November 2021	Weather: Drizzle/overcast Air temperature: 12°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	




Table 3-35 Visual observations for SW3 between July 2020 and November 2021

Month	Observations	Images
July 2020	None taken	None taken
August 2020	No vegetation build-up in the channel. The water was fast flowing, and the water depth was shallow. The water was clear.	
September 2020	No vegetation build up in the channel. The water wasn't flowing as fast as it was during the previous visit. The water was clear.	

Month	Observations	Images
October 2020	The channel as per previous months had no vegetation in the channel. The water was deeper and flowing faster than the previous visit. The colour of the water was less clear too.	
November 2020	The water was flowing quicker out of the pipe than last month. The water colour was clearer than the last visit.	
December 2020 (Round 1)	Weather: Heavy rain Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images	
December 2020 (Round 2)	Weather: Cloudy Air temperature: 8°C Water colour: Cloudy Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 10°C Water colour: Cloudy Algae growth: No Smell: No Dead fish: No		
February 2021	Weather: Overcast Air temperature: 15°C Water colour: Clear Algae growth: No Smell: Yes Dead fish: No		

Month	Observations	Images
April 2021 (in lieu of March 2021 results)	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021	Weather: Overcast Air temperature: 7°C Water colour: Slightly cloudy Algae growth: No Smell: No Dead fish: No	
May 2021	Weather: Sunny Air temperature: 11°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
June 2021	Weather: Sunny Air temperature: 18°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Cloudy Air temperature: 17°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
September 2021	Weather: Rain Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	





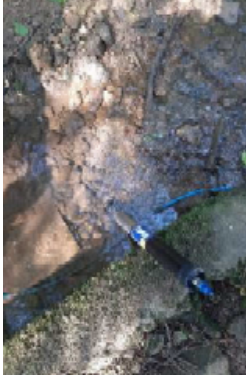












Month	Observations	Images
October 2021	Weather: Sunny/light cloud Air temperature: 8°C Water colour: Slight brown Algae growth: No Smell: No Dead fish: No	
November 2021	Weather: Overcast Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	




Table 3-36 Visual observations for SW4 between July 2020 and November 2021

Month	Observations	Images
July 2020	There was very little water in the channel, there was no vegetation, and the water was clear.	
August 2020	There was very little water in the channel, there was no vegetation, and the water was clear.	

Month	Observations	Images	
September 2020	There was very little water in the channel, there was no vegetation, and the water was clear.		
October 2020	There was very little water and no vegetation in the channel, and the water was clear.		
November 2020	There was a higher volume of water in the channel than previous visit. The water was clear and there was no vegetation in the channel.		

Month	Observations	Images	
December 2020 (Round 1)	Weather: Cloudy Air temperature: 11°C Water colour: Light brown Algae growth: No Smell: No Dead fish: No		
December 2020 (Round 2)	Weather: Cloudy Air temperature: 8°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 6°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images
February 2021	Weather: Overcast Air temperature: 11°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021 (in lieu of March 2021 results)	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
May 2021	Weather: Sunny Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
June 2021	Weather: Sunny Air temperature: 17°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Cloudy Air temperature: 17°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	








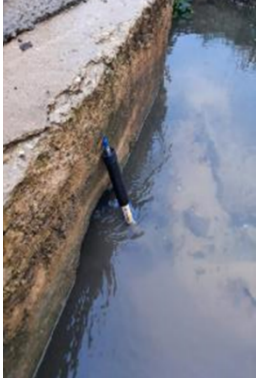








Month	Observations	Images
September 2021	Weather: Light rain Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
October 2021	Weather: Sunny/clear Air temperature: 9°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
November 2021	Weather: Cloudy Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	




Table 3-37 Visual observations for SW5 between July 2020 and November 2021

Month	Observations	Images
July 2020	None taken	None taken
August 2020	The water was clear. The bed was free of vegetation but very silty.	
September 2020	The water was clear. The bed was free of vegetation but very silty.	

Month	Observations	Images	
October 2020	The water was clear. The bed was free of vegetation but very silty.		
November 2020	The water was clear. The bed was free of vegetation but very silty.		
December 2020 (Round 1)	Weather: Heavy rain Air temperature: 8°C Water colour: Dark brown/silty Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images	
December 2020 (Round 2)	Weather: Cloudy Air temperature: 13°C Water colour: Clear/Silty on the bed Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear but cloudy outside of main flow Algae growth: No Smell: No Dead fish: No		
February 2021	Weather: Overcast Air temperature: 11°C Water colour: Clear, but <i>cloudy outside of main flow.</i> <i>Small quantity of oil/iron oxide near bank.</i> Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images	
April 2021 (in lieu of March 2021 results)	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		
April 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear in main channel. Small concentration of oil near bank Algae growth: No Smell: No Dead fish: No		
May 2021	Weather: Sunny Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images
June 2021	Weather: Sunny Air temperature: 25°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Sunny/ cloudy Air temperature: 15°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
September 2021	Weather: Sunny/ cloudy Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	













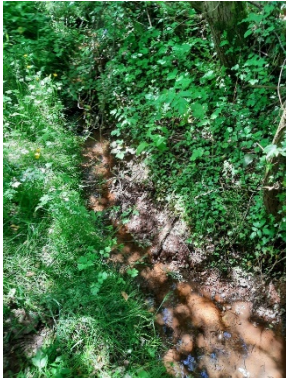

Month	Observations	Images
October 2021	Weather: Sunny/ cloudy Air temperature: 15°C Water colour: Slightly brown Algae growth: No Smell: No Dead fish: No	
November 2021	Weather: Sunny/ cloudy Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	



Table 3-38 Visual observations for SW6 between July 2020 and November 2021

Month	Observations	Images
July 2020	Unable to access location	Unable to access location
August 2020	Unable to access location	Unable to access location
September 2020	Unable to access location	Unable to access location
October 2020	The water was clear. small twigs and debris sitting on the bed of the channel. The channel was free of vegetation and the water was freely moving.	
November 2020	The water was moving freely in the channel. No vegetation present. Water is a slightly brown/orange/red. Some deposits visible on the gauge board and on top of the Nivus PCM4 meter.	

Month	Observations	Images	
December 2020 (Round 1)	Weather: Heavy rain Air temperature: 9°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		
December 2020 (Round 2)	Weather: Cloudy Air temperature: 8°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		
January 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No		

Month	Observations	Images
February 2021	Weather: Overcast Air temperature: 15°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021 (in lieu of March 2021 results)	Weather: Overcast Air temperature: 7°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
April 2021	Weather: Overcast Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
May 2021	Weather: Sunny Air temperature: 13°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
June 2021	Weather: Sunny Air temperature: 20°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
August 2021	Weather: Sunny/ cloudy Air temperature: 17°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	

Month	Observations	Images
September 2021	Weather: Rain Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
October 2021	Weather: Sunny/light cloud Air temperature: 10°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	
November 2021	Weather: Overcast Air temperature: 12°C Water colour: Clear Algae growth: No Smell: No Dead fish: No	