Upper South Creek

Advanced Water Recycling Centre and Pipelines

Surface Water Monitoring Report

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Revisions and Distribution

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Revisions

Draft issues of this document shall be identified as Revision 01, 02, 03 etc. Upon initial issue (generally Contract Award) this shall be changed to a sequential number commencing at Revision A. Revision numbers shall commence at Rev. A, B etc.

Date	Rev	Remarks	Section	Prepared By	Reviewed By & Approved By
03/04/2024	1	Initial version for review	All	D. O'Brien	R. Maxwell
07/07/2024	2	Response to SW/ER comments	All	R. Maxwell	A. Harrington
22/07/2024	3	Response to SW/ER comments	All	R. Maxwell	A. Harrington

Glossary and Abbreviations

Abbreviation	Term	Definition
AWRC	Advanced Recycling Water Centre	Proposed centre for treatment of the wastewater prior to reuse applications or discharge, which includes liquids treatment, advanced water treatment, solids treatment, odour treatment, and residuals management
AHD	Australian Height Datum	A common reference level used in Australia which is approximately equivalent to the height above sea level in metres.
-	Brine Pipeline	A pipeline to transport brine (salty/concentrated wastewater). Brine water is a byproduct of reverse osmosis in the wastewater treatment process.
DMP	Dewatering Management Plan	A DMP is generally developed as a sub-plan under an overarching Construction Environmental Management Plan to document the management procedures and controls to mitigate potential environmental impacts associated with dewatering activities during construction.
EC	Electrical Conductivity	The ability of a material to conduct an electric current. In groundwater studies, electrical conductivity is used as an indicator of water quality, as it relates to the concentration of charged particles in water. Electrical conductivity provides an indication of the amount of total dissolved solids and the amount of salts in the water. Typically measured in µS/cm.
EIS	Environmental Impact Statement	An Environmental Impact Statement is a publicly available document that provides technical information on a project, including a summary of the environmental setting, its environmental impacts and mitigation measures, and is used to inform development consent decisions
-	Hydraulic Conductivity	The measure of how easily water can pass through a porous material. High values indicate permeable material through which water can pass easily and low values indicate a less permeable material. Hydraulic conductivity is dependent upon the intrinsic permeability of the material, the degree of saturation and the fluid properties (i.e. density and viscosity).
LOR	Limit of reporting	The smallest concentration of a chemical that can be reported by the laboratory using the adopted analytical methodology. Also commonly referred to as the Estimated Quantitation Limit (EQL) or detection limit.
NATA	National Association of Testing Authorities	Water samples collected are required to be tested at laboratories/facilities which are NATA accredited.
-	Treated water pipeline	The pipelines that will convey the highly treated water to the receiving environment. The pipelines will transport water from the AWRC to the discharge points at the Nepean and Warragamba Rivers. These pipelines will range in size from about 0.6 m to 1.5 m in diameter and will generally consist of steel, glass reinforced plastic and polyethylene pipe materials.
USC	Upper South Creek	The catchment in which the AWRC will be located. South Creek discharges to the Nepean River which flows directly into the Hawkesbury River and then discharges out to the Pacific Ocean
WQO	Water Quality Objectives	Water Quality Objectives are long-term goals for water quality management. They are measures, levels or narrative statements of indicators of water quality that protect environmental values. They define what the water quality should be to protect the environmental values—after consideration of the socio-economic assessment of protecting the water quality.

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1 Background

The Upper South Creek Advanced Water Recycling Centre and Pipelines project (the project) has been proposed to support the population growth and economic development of the Western Sydney Aerotropolis Growth Area (WSAGA or Aerotropolis), South West Growth Area (SWGA) and the new Western Sydney International Airport. The project will provide wastewater services to Western Sydney to produce high-quality treated water for non-drinking reuse and for release to local waterways.

The project will comprise the following components:

- A new Advanced Water Recycling Centre (AWRC) to collect wastewater from businesses and homes and treat it, producing high-quality treated water, renewable energy and biosolids for beneficial reuse
- A new green space area around the AWRC, adjacent to South Creek and Kemps Creek, to support the ongoing development of a green spine through Western Sydney
- New infrastructure from the AWRC to South Creek, to release excess treated water during significant wet weather events, estimated to occur about 3 – 14 days each year
- A new treated water pipeline from the AWRC to Nepean River at Wallacia Weir, to release high-quality treated water to the river during normal weather conditions
- A new brine pipeline from the AWRC connecting into Sydney Water's existing wastewater system to transport brine to the Malabar Wastewater Treatment Plan
- A range of ancillary infrastructure

2 Purpose

The purpose and scope of the Surface Water Quality Construction Monitoring Program (SWQ-CMP) (Appendix E of the Surface Water and Groundwater CEMP Sub-plan) is to address the Ministers Conditions of Approval (CoA) for SSI 8609189 requirements (C13-C18) for a Surface Water Quality Construction Monitoring Program. The SWQ-CMP establishes how John Holland will monitor the effectiveness of mitigation measures applied during the construction phase of the AWRC site, treated water and brine pipelines. This SWQ-CMP is based on baseline studies developed for the Upper South Creek Advanced Water Recycling Centre Environmental Impact Statement (EIS) dated September 2021. The purpose of this Surface Water Monitoring Report (SWMoR) is to detail the findings of this monitoring program for the months of August 2023 – February 2024 inclusive (the reporting period). Monitoring reports will be produced every 6 months as specified in Section 7.3 of the Monitoring Program in accordance with the Ministers Conditions of Approval (MCoA) C18. The report captures the following details:

- The location and description of surface water monitoring undertaken during the reporting period
- A tabulation of NATA laboratory data and in-situ field measurements
- Summary and analysis of any measurements exceeding the nominated criteria

3 Construction Update

Activities undertaken at AWRC throughout the reporting period are as follows. It's noted that there were no planned or unplanned water discharges to waterways or outside the project boundary.

- Site Establishment
- Clearing and Grubbing
- Bulk Earthworks
- Structure Construction Works including:
  - Piling Works
  - Steel fixing
  - Installation of structural elements
  - Form, reo, pour (FRP) works
  - Concrete pours.

Activities undertaken on pipelines throughout the reporting period are as follows. It's noted that there were no planned or unplanned water discharges to waterways or outside the project boundary. Further, there were no construction works which occurred within or in the direct vicinity of waterways.

- Compound establishment, including pedestrian and traffic management controls
- Clearing and grubbing
- Potholing

- Open-trench excavation
- Horizontal directional drilling (HDD)
- Pipe installation
- Trench backfilling and surface reinstatement

4 Surface Water Quality Monitoring

4.1 Monitoring Network

Surface water quality monitoring was carried out at the locations specified in Table 1 for AWRC and Table 2 for the Treated Water Pipeline. These monitoring locations are also presented in Figure 1 for the AWRC site and Figure 2 for Pipelines. Water quality monitoring was not required along the brine pipeline during the reporting period as per SWMoP.

Table 1: Surface Water Quality Monitoring Locations (AWRC)

Site Code	Site Description	Easting	Northing
SW01	AWRC site drainage line 1 located downgradient of the site. The receiving waters for this monitoring point is South Creek.	33.85518	150.77018
SW02	AWRC site drainage line 2 located downgradient of the site. These locations will only be sampled if there is a damage to the perimeter berm. The receiving waters of this monitoring point is Kemps Creek.	33.85543	150.77852
SW03	AWRC site drainage line 3 located downgradient of the site. The receiving waters for this monitoring point is South Creek.	33.85406	150.77011
SW04	Additional stormwater control facilities (e.g. sediment ponds) that drain directly to South Creek (to be confirmed based on construction plans) located adjacent the upgradient watershed boundary. The receiving waters for this monitoring point is South Creek.	33.85966	150.76794
SW05	Additional stormwater control facilities (e.g. sediment ponds) that drain directly to Kemps Creek. (to be confirmed based on construction plans) located downgradient of the site. These locations will only be sampled if there is a damage to the perimeter berm. The receiving waters of this monitoring point is Kemps Creek.	33.85251	150.77414
SW06a	AWRC wet weather sampling only In receiving water above the confluence of site water discharge point (location is indicative and subject to accessibility and safety of sampler). If sampling from this point is not possible, the alternative point SW06c can be used. The receiving waters for this monitoring point is South Creek.	33.854340	150.769619
SW06b	AWRC wet weather sampling only In receiving water below the confluence of site water discharge point, but upstream of the AWRC site boundary (location is indicative and subject to accessibility and safety of sampler). If sampling from this point is not possible, the alternative point SW06d can be used. The receiving waters for this monitoring point is South Creek.	33.855140	150.769275
SW06c	Alternative AWRC wet weather sampling only Only required if samples from SW06a are not possible. In receiving water above the confluence of site water discharge point (location is indicative and subject to accessibility and safety of sampler). The receiving waters for this monitoring point is South Creek.	33.859645	150.768084
SW06d	Alternative AWRC wet weather sampling only Only required if samples from SW06b are not possible. In receiving water below the confluence of site water discharge point, but upstream of the AWRC site boundary (location is indicative and subject to accessibility and safety of sampler). The receiving waters for this monitoring point is South Creek.	33.860121	150.769525
SW07	South Creek surveyed stream level gauging point to confirm groundwater flow direction if AWRC_MW04 groundwater drawdown criteria is exceeded. The receiving waters for this monitoring point is South Creek. Note – monitoring at SW07 has not been triggered as groundwater has not been extracted or interfered with during construction during the monitoring period.	33.855140	150.769275

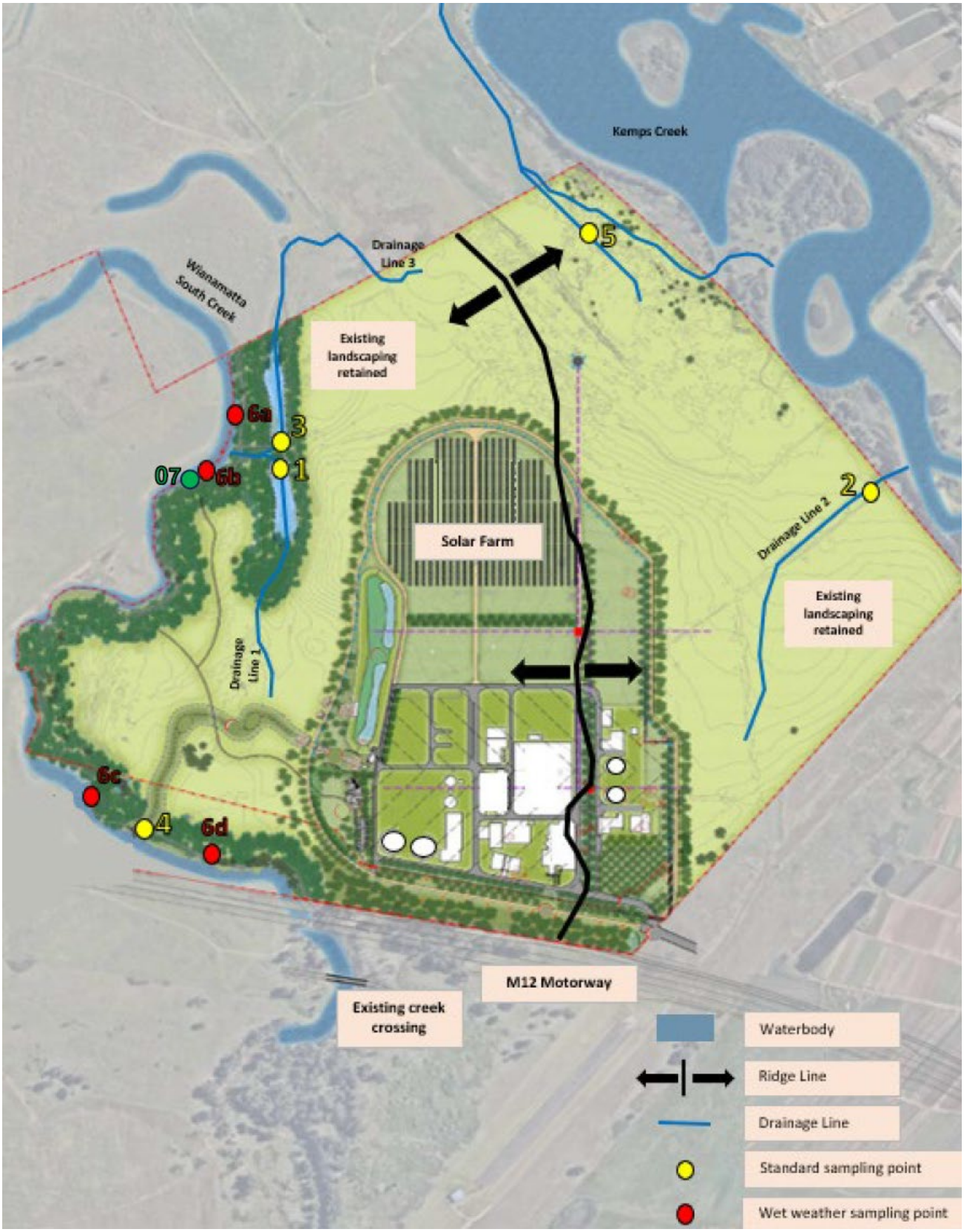

Figure 1: Surface water construction monitoring locations at AWRC

Table 2: Surface Water Quality Monitoring Locations (Pipelines)

Site Code	Site Description	Easting (U - Upstream)	Northing (U - Upstream)	Easting (D – Downstream)	Northing (D – Downstream)
SW08	Treated Water Pipeline - South Creek (chainage 1425m)	33.87081°S	150.77605°E	33.87055°S	150.77582°E
SW09	Treated Water Pipeline – Oaky Creek (chainage 6975m)	33.86925°S	150.72136°E	33.86874°S	150.72123°E
SW10	Treated Water Pipeline – Cosgroves Creek (chainage 7300m)	33.86892°S	150.71777°E	33.86814°S	150.71807°E
SW11*	Treated Water Pipeline – Nepean River (chainage 7300m)	33.860897°S	150.631652°E	33.861198°S	150.631137°E

* Monitoring location not required as per SWMoP however additional monitoring has been undertaken due to works occurring at this location for the construction of the discharge structure.

Figure 2: Surface water construction monitoring locations on pipelines

4.2 Surface Water Quality Parameters

4.2.1 In-situ Field Parameters

In-situ field measurements have been taken using a Horiba U-52 Multi-parameter quality meter. The following parameters have been recorded using the water quality meter at each monitoring site:

- Water Temperature (°C);
- pH;
- Electrical Conductivity (µS/cm);
- Dissolved Oxygen (%); and
- Turbidity (NTU).

In addition to the use the water quality meter at each monitoring site, visual and olfactory observations were also recorded including colour, turbidity, odour, sheen, discolouration, free phase liquids, foaming, stressed or dead flora and / or fauna (for example, fish kills). Refer to Section 5 of the SWQ-CMP for sampling methodologies.

4.2.2 Lab Sample Parameters

Representative grab samples have been obtained and submitted to a NATA accredited laboratory for analysis for the following parameters:

- pH;
- Salinity as Electrical Conductivity (µS/cm);
- Turbidity (NTU); and
- Total Suspended Solids (mg/L).

Refer to Section 5 of the SWQ-CMP for sampling methodologies.

4.3 Monitoring events and timing

In accordance with Section 5.4 of the SWMoP, monthly routine surface water monitoring has been completed at locations detailed in Section 4.1 throughout the reporting period.

In additional to routine sampling, event triggered sampling was also undertaken during the reporting periods for rainfall events which exceeded 20mm over a 24 hour period. For pipelines (Treated and brine), it's noted that wet weather sampling was only undertaken when works were being undertaken in or in the vicinity (where there is potential to impact waterway water quality) of relevant waterways. For AWRC, wet weather sampling was undertaken however on some occasions it was not safe to do so and therefore sampling was abandoned or only partially completed.

There were no incidents, events, HES basin discharges or substantiated complaints during the reporting period with the potential to impact surface water quality therefore additional event triggered sampling was not required.

No Project trigger value or acceptable range reporting was undertaken during the reporting period. While there were some exceedances noted, these were not attributable to the Project as detailed in Section 6.

4.4 Project acceptable ranges

In accordance with Section 4.2 of the SWMoP, the project acceptable ranges for each waterway and corresponding monitoring locations are provided in Table 3 below. It's noted that the project acceptable ranges are based on a limited dataset and in some cases ANZECC criteria. As detailed in the SWQ-CMP, following the collection of additional baseline data throughout this reporting period (Tables 4 and 5), project acceptable ranges will be updated to reflect the true level at which harm to the environment may occur.

Table 3 – Project acceptable ranges for each waterway

Parameter	Project Acceptable Range					
	South Creek SW01, SW03, SW04, SW08	Kemps Creek SW02, SW05	Badgery's Creek	Nepean River SW11	Oaky Creek SW09	Cosgroves Creek SW10
pH	6.77 – 8.34	6.79 – 7.83	6.98 – 7.66	6.78 – 8.32	6.5 – 8.0	6.5 – 9.0

Parameter	Project Acceptable Range					
	South Creek SW01, SW03, SW04, SW08	Kemps Creek SW02, SW05	Badgery's Creek	Nepean River SW11	Oaky Creek SW09	Cosgroves Creek SW10
Turbidity (NTU)	<310	<168.5	<577.7	<58.9	<50	<50
Dissolved Oxygen (DO) (%)	47.25 – 131.2	41.88 – 97.31	26.15 – 101.02	79.41 – 114.9	85 – 110	85 – 110
Electrical Conductivity (EC) (uS/cm)	352.95 – 2104.25	346.51 – 4117.8	356.68 – 2777.8	148.95 – 540.8	125 – 2200	125 – 2200
Total Suspended Solids (TSS) (mg/L)	<50	<50	<50	<50	<50	<50

5 Surface Water Quality Sampling Results

The results of the monthly routine and event triggered sampling (rainfall >20mm in 24 hour period) throughout the reporting period are provided for AWRC in Section 5.1, and for pipelines in Section 5.2. Any exceedances of project acceptable ranges as detailed in Table 3, are highlighted red. Appendix 1 shows Bureau of Meteorology rainfall data

5.1 AWRC

The results of the monthly routine and event triggered sampling (rainfall >20mm in 24 hour period) undertaken at AWRC throughout the reporting period are provided in Table 4. Any exceedances of project acceptable ranges as detailed in Table 3, are highlighted red. Some wet weather monitoring events were not undertaken during the reporting period due to safety and access concerns however it's noted that on those occasions there were no planned or unplanned releases of construction water to adjacent waterways.

Table 4 – Surface water monitoring results for AWRC

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen (%)	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
25/08/2023	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
25/08/2023	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
25/08/2023	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
25/08/2023	SW04 – upstream	Routine Monthly	13	8.5	271	1370	115	8.32	1400	24	24	No observable flow, greenish/yellow
25/08/2023	SW05 – downstream	Routine Monthly	15	9.4	55	2360	131	8.15	2270	81	82	No observable flow, bright green algae
01/09/2023	SW06a – downstream	Wet Weather	-	-	-	-	-	-	-	-	-	24mm recorded at Horsley Park (ID: 94760) on 31/08/2023. Construction/bulk earthworks not yet commenced therefore wet weather monitoring not undertaken.
01/09/2023	SW06b – upstream	Wet Weather	-	-	-	-	-	-	-	-	-	24mm recorded at Horsley Park (ID: 94760) on 31/08/2023. Construction/bulk earthworks not yet commenced therefore wet weather monitoring not undertaken.
18/09/2023	SW01 – downstream	Routine Monthly	22	6.80	170	406	95	7.15	462	62	175	Brackish/mangrove odour. Clear with brown tinge

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen (%)	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
18/09/2023	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
18/09/2023	SW03 – downstream	Routine Monthly	21	6.89	102	1370	56	7.33	1240	188	91	No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
18/09/2023	SW04 – upstream	Routine Monthly	16	8.78	75	1680	129	8.29	1620	29	36	No observable flow, greenish/yellow
18/09/2023	SW05 – downstream	Routine Monthly	27	8.62	748	1490	100	8.08	1560	84	87	No observable flow, bright green. Very shallow water became turbid when collecting sample, difficult to collect.
19/10/2023	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
19/10/2023	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
19/10/2023	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
19/10/2023	SW04 – upstream	Routine Monthly	18	7.92	107	1990	84	8.0	1900	44	35	Brownish green water, no visible oil or grease
19/10/2023	SW05 – downstream	Routine Monthly	18	8.55	232	1750	87	8.16	1680	47	20	Brown and cloudy. Very shallow water became turbid when collecting sample, difficult to collect.
22/11/2023	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/11/2023	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/11/2023	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/11/2023	SW04 – upstream	Routine Monthly	24	8.2	126	1450	83	7.7	1320	33	25	Dark brown-yellow, light flow from wind
22/11/2023	SW05 – downstream	Routine Monthly	24	8.9	-	1900	116	8.6	1660	19	16	Access not available for field testing (probe placed on corner of embankment)

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen (%)	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
12/12/2023	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
12/12/2023	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
12/12/2023	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
12/12/2023	SW04 – upstream	Routine Monthly	26	8.0	198	763	107	7.9	734	59	36	Brownish green water, no visible oil or grease, habitat present
12/12/2023	SW05 – downstream	Routine Monthly	24	7.9	N/A	1260	112	7.57	1220	29	38	Access not available for field testing (probe placed on corner of embankment)
22/01/2024	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/01/2024	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/01/2024	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
22/01/2024	SW04 – upstream	Routine Monthly	24	7.9	90	643	124	7.3	620	44	44	Brownish green algae, no flow
22/01/2024	SW05 – downstream	Routine Monthly	24	7.7	293	1050	132	7.7	986	281	381	High grass and vegetation. Very shallow water became turbid when collecting sample, difficult to collect.
22/01/2024	SW06a – downstream	Wet Weather	24	7.7	130	673	127	7.2	653	67	46	55mm recorded at Horsley Park (ID: 94760) between 15/01/2024 and 18/01/2024. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/01/2024	SW06b – upstream	Wet Weather	24	7.7	151	668	128	7.53	652	62	53	55mm recorded at Horsley Park (ID: 94760) between 15/01/2024 and 18/01/2024. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
19/02/2024	SW01 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen (%)	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
19/02/2024	SW02 – upstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
19/02/2024	SW03 – downstream	Routine Monthly	-	-	-	-	-	-	-	-	-	No water at this monitoring location therefore no sample able to be taken
19/02/2024	SW04 – upstream	Routine Monthly	23	8.0	60	772	112	7.63	765	28	15	Brownish green water, no visible oil or grease
19/02/2024	SW05 – downstream	Routine Monthly	24	7.8	138	946	115	7.76	926	74	38	Thick vegetation growing around and in water body
23/02/2024	SW06a – downstream	Wet Weather	23	7.3	56	832	122	7.58	842	42	37	41mm recorded at Horsley Park (ID: 94760) on 20/02/2024 and 21/02/2024.
23/02/2024	SW06b – upstream	Wet Weather	22	7.4	130	839	165	7.23	834	140	171	41mm recorded at Horsley Park (ID: 94760) on 20/02/2024 and 21/02/2024.

Field sampling carried out at AWRC during the reporting period identified exceedances of project acceptable ranges for pH, turbidity, dissolved oxygen and TSS. Analysis of these exceedances are provided in Section 6.

5.2 Pipelines

The results of the monthly routine sampling undertaken on pipelines throughout the reporting period are provided in Table 5. It's noted that there was no construction work occurring within or around any waterways during the reporting period and therefore wet weather sampling (rainfall >20mm in 24 hour period) was not required. Any exceedances of project acceptable ranges as detailed in Table 3, are highlighted red.

Table 5 – Surface water monitoring results for pipelines

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
22/09/2023	SW08 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.19	1880	26	31	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/09/2023	SW08 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	8.06	1910	16	25	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/09/2023	SW09 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.19	3550	29	57	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/09/2023	SW09 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	8.09	3600	7	6	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/09/2023	SW10 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.24	3080	1	<5	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/09/2023	SW10 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	8.4	8330	8	12	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
25/10/2023	SW08 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.01	1510	26	36	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
25/10/2023	SW08 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	7.99	1530	19	22	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
25/10/2023	SW10 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	7.92	4000	2	<5	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
25/10/2023	SW10 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.19	2650	2	<5	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
25/10/2023	SW09 – Upstream	Routine Monthly / Baseline	-	-	-	-	-	8.05	4330	156	225	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
25/10/2023	SW09 – Downstream	Routine Monthly / Baseline	-	-	-	-	-	7.91	4310	14	7	No construction work commenced within/around Creek therefore field sampling not undertaken. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna.
22/11/2023	SW08 – Upstream	Routine Monthly / Baseline	22	7.4	60	1006	120	7.82	998	40	79	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
22/11/2023	SW08 – Downstream	Routine Monthly / Baseline	21	7.2	38	1003	95	7.64	997	27	50	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
22/11/2023	SW10 – Upstream	Routine Monthly / Baseline	21	7.7	0	3040	114	7.82	2810	2	<5	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
22/11/2023	SW10 – Downstream	Routine Monthly / Baseline	21	7.9	266	1780	71	7.74	1560	157	259	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
22/11/2023	SW09 – Upstream	Routine Monthly / Baseline	23	8.2	36	1010	108	7.59	940	12	8	Green/blue colour, expected discharge water from neighbouring projects (not USC), no sheen, murky water. No construction work commenced within/around Creek therefore considered baseline.
22/11/2023	SW09 – Downstream	Routine Monthly / Baseline	24	8.0	127	785	96	7.57	921	21	24	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
21/12/2023	SW08 – Upstream	Routine Monthly / Baseline	22	7.5	66	929	130	8.09	914	21	28	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
21/12/2023	SW08 – Downstream	Routine Monthly / Baseline	22	7.6	43	947	102	7.59	936	19	26	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.
21/12/2023	SW09 – Upstream	Routine Monthly / Baseline	20	7.4	821	2010	77	7.53	1810	157	44	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.
21/12/2023	SW09 – Downstream	Routine Monthly / Baseline	20	7.6	333	2030	69	7.59	1830	155	48	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.
21/12/2023	SW10 – Upstream	Routine Monthly / Baseline	21	7.5	197	1260	14	7.13	1170	77	32	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.
21/12/2023	SW10 – Downstream	Routine Monthly / Baseline	21	7.4	159	1270	72	7.23	1180	79	36	Heavy rainfall during water monitoring. No construction work commenced within/around Creek therefore considered baseline.
22/01/2024	SW08 – Upstream	Routine Monthly / Baseline	23	7.6	91	575	133	7.01	553	53	38	Heavy rainfall the week prior (46mm). No construction work commenced within/around Creek therefore considered baseline. High flow, brown/dirty water.
22/01/2024	SW08 – Downstream	Routine Monthly / Baseline	24	7.4	92	573	71	6.99	551	52	-	Heavy rainfall the week prior (46mm). No construction work commenced within/around Creek therefore considered baseline. High flow, brown/dirty water.
22/01/2024	SW09 – Upstream	Routine Monthly / Baseline	24	7.9	95	681	60	7.16	654	32	22	No construction work commenced within/around Creek therefore considered baseline. Possible discharged water from neighbouring projects, green/blue colour, flow to creek.
22/01/2024	SW09 – Downstream	Routine Monthly / Baseline	24	7.9	69	681	74	6.86	648	28	-	No construction work commenced within/around Creek therefore considered baseline. Possible discharged water from neighbouring projects, green/blue colour, flow to creek
22/01/2024	SW10 – Upstream	Routine Monthly / Baseline	24	7.7	50	972	59	7.3	910	22	8	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
22/01/2024	SW10 – Downstream	Routine Monthly / Baseline	24	7.7	32	972	56	7.1	904	22	-	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna

Date	Location	Type	Field (in-situ) Monitoring					Laboratory Monitoring				Visual/Olfactory and general comments
			Temp	pH	Turbidity (NTU)	EC (uS/cm)	Dissolved Oxygen	pH	EC (uS/cm)	Tubidity (NTU)	TSS (mg/L)	
29/02/2024	SW11 – Upstream	Routine Monthly / Baseline	29	8.9	26	209	*140*	7.84	325	10	6	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, relatively clear, no observation of discolouration, foaming, dead flora/fauna
29/02/2024	SW11 – Downstream	Routine Monthly / Baseline	29	8.8	25	320	*171*	8.08	325	9	8	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, relatively clear, no observation of discolouration, foaming, dead flora/fauna
29/02/2024	SW09 – Upstream	Routine Monthly / Baseline	28	7.2	*93*	609	*74*	6.94	523	41	25	Visually more turbid than usual and compared to Cosgroves Creek. Slight flow, potentially result of upstream discharge from another project. No construction work commenced within/around Creek therefore considered baseline.
29/02/2024	SW09 – Downstream	Routine Monthly / Baseline	28	7.5	*89*	510	*82*	7.21	506	35	22	Visually more turbid than usual and compared to Cosgroves Creek. Slight flow, potentially result of upstream discharge from another project. No construction work commenced within/around Creek therefore considered baseline.
29/02/2024	SW10 – Upstream	Routine Monthly / Baseline	26	7.6	7	1050	*74*	7.85	1030	8	<5	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, relatively clear, no observation of discolouration, foaming, dead flora/fauna
29/02/2024	SW10 – Downstream	Routine Monthly / Baseline	28	7.2	7	697	*77*	7.88	1030	7	<5	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, relatively clear, no observation of discolouration, foaming, dead flora/fauna
19/02/2024	SW08 – Upstream	Routine Monthly / Baseline	23	7.4	57	708	79	7.4	780	22	23	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna
19/02/2024	SW08 – Downstream	Routine Monthly / Baseline	23	7.4	62	783	50	7.5	780	32	36	No construction work commenced within/around Creek therefore considered baseline. No abnormal visual factors, brown/muddy water, no observation of discolouration, foaming, dead flora/fauna

Field sampling carried out during at pipelines during the reporting period identified exceedances of project acceptable ranges for pH, turbidity, electrical conductivity, dissolved oxygen and TSS. Analysis of these exceedances are provided in Section 6.

6 Discussion of exceedances

6.1 AWRC

Exceedances of project acceptable ranges were observed during the reporting period for pH, turbidity, electrical conductivity, dissolved oxygen and TSS/turbidity. An analysis and review of the exceedances was undertaken by ENRS which is summarised below.

- **pH** – several exceedances of pH were recorded throughout the reporting period at SW04 South Creek (upstream) and SW05 Kemps Creek (downstream). All exceedances were above the pH upper limit with the highest pH reading of 9.4 recorded at SW05 on 25/08/2023. It's noted that bulk earthworks in the vicinity of waterways, had not yet commenced. The remaining pH exceedances, which range between 7.9 and 8.9, were marginally above the project acceptable ranges. Baseline surface water monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the pH project acceptable ranges at several monitoring locations.
- **Turbidity/TSS** – three exceedances of turbidity were recorded throughout the reporting period all of which occurred at SW05 Kemps Creek (downstream), the highest being 748 NTU on 18/09/2023. It's noted that during all sampling events where exceedances were recorded, minimal water was observed at SW05 which became extremely turbid when collecting field and lab samples. Several exceedances of TSS were recorded at SW05 and Kemps Creek (downstream) and SW03 billabong drainage line (downstream), the highest being 381mg/L at SW05 on 22/01/2024. It's noted that during this sampling event which recorded an exceedance, minimal water was observed at SW03 which became extremely turbid when collecting field and lab samples. The remaining exceedances ranged between 82mg/L and 171mg/L.
- **Dissolved oxygen (DO)** – Several exceedances of DO were recorded throughout the reporting period at SW04 South Creek (upstream), SW05 Kemps Creek (downstream) and at wet weather monitoring locations SW06a and SW06b. All exceedances were above the upper DO limit with the highest DO reading of 165% recorded at SW06b (upstream) 23/02/2024. Baseline surface water monitoring data collected prior to the commencement of construction (pre-August 2023) also identified exceedances of the DO project acceptable ranges at several monitoring locations. Construction works undertaken during the reporting period would not have an impact on surface water DO levels

Following identification of the above exceedances, an investigation was undertaken in accordance with Section 5.5 of the SWMoP which concluded that they were not attributed to or caused by the Project for the following reasons.

- Baseline and pre-construction surface water monitoring undertaken throughout 2023 prior to the commencement of construction (pre-August 2023) identified exceedances of project acceptable ranges for various parameters, including all of those listed above i.e. pH, DO and TSS
- During the reporting period, there were no planned or unplanned discharges of water offsite, including to waterways, from the Project. There were no offsite discharges of water from the HES basin or other temporary sumps/water storage areas during the reporting further period. Further, there were no breaches or failures of the site perimeter berm which extends around the entire AWRC site.
- Construction activities have not reported any release of contamination or spill of a magnitude with the potential to cause surface water contamination including those parameters which exceeded the project acceptable ranges.
- In some instances, exceedances of turbidity/TSS were recorded due to minimal water being available for collection resulting in highly turbid samples being collected which did not accurately represent the actual turbidity in the waterway.
- There are several external construction projects which occur immediately upstream of the Project which also have the potential to impact surface water quality.
- There was not more than a 10% difference (that resulted in an exceedance) between upstream and downstream water quality parameters at wet weather monitoring locations SW06a and SW06b.

Further to the above, it's noted that site specific baseline water quality data was not available when developing project acceptable ranges for inclusion in the SWMoP. In lieu of site-specific data, water quality monitoring data from the broader area was used to develop project acceptable ranges. As a result, none of the Project surface water monitoring locations directly correspond to the baseline sampling locations. It is further noted that that the baseline data was deficient at most locations for TSS which is a key water quality indicator. As additional site specific data sets have now been collected, the project acceptable ranges should be updated to more accurately reflect baseline values, and assess any potential impacts from construction.

6.2 Pipelines

Exceedances of project acceptable ranges were observed during the reporting period for pH, turbidity/TSS, electrical conductivity and dissolved oxygen. An analysis and review of the exceedances was undertaken by ENRS which is summarised below.

- **pH** – four exceedances of pH were recorded throughout the reporting period at SW11 Nepean River (both upstream and downstream) and Oaky Creek (both upstream and downstream). All exceedances were above the pH upper limit and ranged between 8.8 and 9.0 with the highest pH reading of 9.0. It's noted that no construction works has been undertaken within or immediately adjacent to any waterways during the reporting period therefore these results are considered to reflect baseline and potential impacts from upstream projects.
- **Turbidity/TSS** – several exceedances of turbidity were recorded throughout the reporting period at multiple locations, the highest being 821 NTU on 21/12/2023 at SW09 Oaky Creek (upstream). Exceedances of TSS were recorded at all locations which ranged from between 57mg/L to 259mg/L. It's noted that no construction works had been undertaken within or immediately adjacent to any waterways during the reporting period therefore these results are considered to reflect baseline and potential impacts from upstream projects. Further, it's noted that no baseline data was available when developed TSS project acceptable ranges for pipeline locations.
- **Electrical conductivity (EC)** – several exceedances of EC were recorded throughout the reporting period at multiple locations. Exceedances were predominantly above the upper EC limit although two exceedances below the EC lower limit were also recorded following a significant rainfall event. Exceedances of the upper limit ranged from between 2810us/cm to 8330us/cm and both exceedances of the lower limit were 125us/cm. It's noted that no construction works has been undertaken within or immediately adjacent to any waterways during the reporting period therefore these results are considered to reflect baseline and potential impacts from upstream projects.
- **Dissolved oxygen (DO)** – Several exceedances of DO were recorded throughout the reporting period at multiple locations. Exceedances which were above the upper DO limit ranged from between 114% to 171%, while exceedances of the lower DO limit ranged from between 14% to 82%. It's noted that no construction works has been undertaken within or immediately adjacent to any waterways during the reporting period therefore these results are considered to reflect baseline and potential impacts from upstream projects.

Following identification of the above exceedances, an investigation was undertaken in accordance with Section 5.5 of the SWMoP which concluded that they were not attributed to or caused by the Project for the following reasons.

- There were no construction works undertaken within or immediately adjacent to any waterways during the reporting period therefore these results are considered to reflect baseline and potential impacts from upstream projects.
- During the reporting period, there were no planned or unplanned discharges of water offsite, including to waterways, from the Project.
- Construction activities have not reported any release of contamination or spill of a magnitude with the potential to cause surface water contamination including those parameters which exceeded the project acceptable ranges.
- There are several external construction projects which occur immediately upstream of the Project which also have the potential to impact surface water quality.
- While there was a 10% difference of water quality results between some upstream and downstream locations, there were no construction works occurring within or immediately adjacent to the work area therefore it's not considered to be attributed to the project.

Further to the above, it's noted that site specific baseline water quality data was not available when developing project acceptable ranges for inclusion in the SWMoP. In lieu of site-specific data, water quality monitoring data from the broader area and ANZECC criteria was used to develop project acceptable ranges. As a result, none of the Project surface water monitoring locations directly correspond to the baseline sampling locations. It is further noted that that the baseline data was deficient at most locations for TSS which is a key water quality indicator. As additional site specific data sets have now been collected, the project acceptable ranges should be updated to more accurately reflect baseline values, and assess any potential impacts from construction.

Appendix 1 – BoM rainfall data for

Horsley Park, New South Wales
August 2023 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Tu	6.1	22.3	0			S	20	13:10	13.6	56		WNW	6		21.7	26		ESE	6	
2	We	6.5	18.9	0			ENE	20	12:31	14.6	74		SW	6		18.3	59		NE	9	
3	Th	5.9	22.4	0			NNE	22	12:42	11.4	100		W	2		22.2	39		NE	6	
4	Fr	5.8	23.6	0			NNE	17	15:29	12.2	86		NW	2		23.3	33		N	7	
5	Sa	8.9	17.8	0			SSE	15	21:52	12.8	66		WSW	2		16.3	66		NNW	4	
6	Su	11.8	16.7	2.2			SE	20	12:52	13.4	71		SW	11		15.6	62		ESE	9	
7	Mo	9.6	16.3	0			SSW	20	08:12	12.4	68		SW	9		16.0	64		SE	7	
8	Tu	7.7	19.3	0.4			E	22	15:58	13.4	83		Calm			17.4	56		ESE	9	
9	We	6.3	20.7	0			NNE	24	13:54	11.6	95		Calm			19.9	40		N	9	
10	Th	7.2	23.0	0			WNW	52	13:26	15.3	50		N	15		21.9	28		WNW	20	
11	Fr	3.9	19.8	0			SSW	17	09:27	12.6	55		SW	7		18.9	28		NNE	6	
12	Sa	2.7	21.6	0			SSW	17	16:22	10.8	71		WNW	4		21.0	30		SSW	9	
13	Su	10.6	18.6	0			ESE	22	15:39	13.3	66		W	2		15.3	64		SE	11	
14	Mo	10.2	15.6	14.8			SSE	20	14:41	11.8	100		S	4		12.7	89		SSE	7	
15	Tu	7.3	17.5	4.2			SE	31	17:32	11.7	76		SW	9		16.0	59		SE	15	
16	We	7.3	18.2	0			E	19	16:26	10.9	79		WSW	6		16.5	52		NE	9	
17	Th	4.3	21.0	0			E	17	17:13	10.9	81		W	4		20.5	25		ENE	4	
18	Fr	9.2	18.7	6.2			W	44	12:11	13.5	88		NNE	4		16.6	35		W	22	
19	Sa	4.4	19.1	0			SW	39	15:46	12.3	47		WSW	7		18.1	38		WSW	13	
20	Su	4.8	22.0	0			WSW	19	00:07	14.7	63		NNW	6		21.6	34		NNW	7	
21	Mo	8.8	21.9	0			N	20	12:31	13.9	61		SW	4		21.0	35		SW	2	
22	Tu	6.2	25.4	0			N	30	13:24	13.8	74		Calm			23.9	29		N	7	
23	We	8.2	19.0	0.8			S	33	12:09	14.6	57		W	7		17.1	58		S	7	
24	Th	9.5	19.5	1.0			ENE	20	15:01	11.4	95		WSW	7		17.6	54		E	11	
25	Fr	4.6	22.1	0.2			SE	26	15:55	12.4	79		W	4		21.3	30		E	11	
26	Sa	6.5	20.9	0			SE	24	14:30	13.5	79		WSW	6		18.5	57		E	13	
27	Su	7.8	22.1	0			E	24	15:47	14.1	84		W	4		21.0	42		ESE	9	
28	Mo	7.4	22.4	0			E	22	15:31	14.3	81		NNW	4		21.7	39		N	7	
29	Tu	7.3	24.3	12.8			NNE	17	11:15	13.0	90		W	2		23.0	34		NE	6	
30	We	7.7	26.1	0.2			SSW	52	16:01	15.6	66		NNE	6		18.0	65		SSW	7	
31	Th	8.0	20.8	24.0			ESE	24	13:00	15.2	73		SW	11		19.3	53		E	7	
Statistics for August 2023																					
Mean		7.2	20.6							13.1	74			5		19.1	45			8	
Lowest		2.7	15.6	0						10.8	47		Calm			12.7	25		SW	2	
Highest		11.8	26.1	24.0			#	52		15.6	100		N	15		23.9	89		W	22	
Total				66.8																	

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Horsley Park, New South Wales
September 2023 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Fr	6.8	19.8	0			SE	37	14:47	14.7	58		SSW	13		15.8	44		SE	22	
2	Sa	7.4	19.4	0			SSW	22	09:14	13.0	58		WSW	13		17.7	50		SE	13	
3	Su	7.1	20.3	0			E	26	15:51	14.8	65		W	4		19.6	46		ESE	9	
4	Mo	7.1	22.5	0			E	24	14:29	14.7	73		NW	6		21.4	55		E	13	
5	Tu	11.2	24.3	0			WNW	35	16:14	19.5	44		WSW	11		23.9	16		WNW	9	
6	We	5.5	23.9	0			NE	28	15:44	15.3	49		ENE	2		23.4	17		NNE	15	
7	Th	5.5	28.6	0			NNW	70	22:07	13.9	65		NNW	6		27.7	30		N	19	
8	Fr	13.0	18.6	3.2			WNW	52	15:49	13.1	78		WNW	9		18.1	26		WNW	22	
9	Sa	3.8	18.9	2.2			SSE	28	14:58	12.8	43		W	7		18.0	20		SSE	19	
10	Su	2.4	19.1	0			ESE	28	16:24	11.4	53		WSW	9		18.4	28		ENE	6	
11	Mo	6.1	20.4	0			ESE	24	16:42	12.7	61		WSW	6		19.5	34		ESE	7	
12	Tu	6.2	21.0	0			SE	17	12:58	13.9	71		NW	2		19.7	40		Calm		
13	We	6.7	23.8	0			SE	24	15:51	15.3	62		W	4		22.8	33		ESE	15	
14	Th	6.9	26.7	0			ESE	17	12:53	16.7	56		W	6		26.1	22		ESE	4	
15	Fr	8.9	30.7	0			NNW	26	16:12	16.8	60		NW	4		30.2	15		N	11	
16	Sa	11.4	32.5	0			WNW	41	14:09	21.0	43		N	6		32.1	14		NW	17	
17	Su	12.0	32.5	0			SW	30	15:46	23.5	30		NNW	4		32.0	10		W	6	
18	Mo	11.5	35.1	0			NNW	22	14:44	20.6	37		NNW	4		34.4	10		NNW	13	
19	Tu	13.7	34.1	0			NNW	35	12:08	24.6	30		N	6		33.6	12		WNW	13	
20	We	19.5	34.1	0			WNW	52	15:18	27.4	21		N	15		33.8	11		WNW	22	
21	Th	12.2	23.9	0			ESE	39	15:20	19.7	30		SW	15		19.0	52		SE	24	
22	Fr	10.2	19.4	0			SSE	28	11:14	15.8	57		S	9		18.0	47		ESE	19	
23	Sa	8.5	20.3	0			SE	26	12:33	17.4	58		W	2		19.5	42		E	11	
24	Su	8.0	21.3	0			ESE	28	16:32	16.0	59		NW	2		19.9	42		E	13	
25	Mo	7.4	27.7	0			NE	20	16:45	16.2	61		N	6		27.3	25		ENE	7	
26	Tu	12.2	22.6	0			E	28	13:21	20.0	53		SSE	11		20.2	58		ESE	15	
27	We	14.1	25.3	0			ESE	31	15:34	18.8	72		N	6		23.9	51		E	15	
28	Th	13.7	22.3	8.4			SE	28	04:46	15.9	88		WSW	6		21.6	59		N	7	
29	Fr	10.1	31.2	0.2			SE	35	15:17	18.4	74		NNW	2		30.8	16		SE	4	
30	Sa	9.7	30.6	0			E	22	16:40	19.5	70		NNE	6		29.9	25		NE	7	
Statistics for September 2023																					
Mean		9.3	25.0							17.1	55			6		23.9	31			12	
Lowest		2.4	18.6	0						11.4	21		#	2		15.8	10		Calm		
Highest		19.5	35.1	8.4			NNW	70		27.4	88		#	15		34.4	59		SE	24	
Total				14.0																	

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Horsley Park, New South Wales
October 2023 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Su	13.0	35.8	0			WNW	59	12:40	23.4	41		NNW	9		35.6	10		WNW	26	
2	Mo	13.1	25.6	0			E	30	15:04	19.0	59		ESE	4		24.5	46		E	15	
3	Tu	14.1	35.8	0			N	46	11:32	20.9	65		NNW	6		35.3	12		N	22	
4	We	20.6	26.1	0			N	37	10:53	24.4	30		N	11		22.9	52		N	13	
5	Th	11.6	21.6	12.6			WNW	43	08:37	15.7	36		WNW	20		20.8	21		WSW	19	
6	Fr	6.2	22.6	0			SE	33	14:11	15.5	51		SW	13		18.2	65		SE	15	
7	Sa	10.9	19.8	2.4			ESE	30	14:47	13.6	59		S	13		19.0	48		ESE	17	
8	Su	10.1	22.6	0			ESE	30	15:11	14.3	71		WSW	6		20.3	37		SSE	9	
9	Mo	7.4	27.7	0			SE	24	17:26	15.3	70		NW	2		26.1	22		W	7	
10	Tu	12.5	23.9	0			SE	41	15:29	16.9	73		SW	7		22.9	50		E	17	
11	We	13.4	27.7	0			E	26	15:41	18.8	70		NNW	6		27.2	32		N	4	
12	Th	11.4	33.6	0			SW	54	20:51	18.1	77		N	4		33.0	14		WNW	19	
13	Fr	11.0	25.2	0.8			SW	41	14:55	15.8	45		WSW	9		24.6	22		SW	17	
14	Sa	8.9	28.8	0			SW	39	14:01	18.1	46		NNW	6		28.7	23		WSW	13	
15	Su	10.6	28.1	0			SW	35	23:38	18.6	43		WSW	4		26.5	27		SW	4	
16	Mo	10.8	25.4	0			WNW	57	14:13	16.4	61		WNW	4		21.0	34		WSW	22	
17	Tu	9.4	18.9	0.8			S	43	13:20	14.1	58		SSW	17		16.7	75		S	15	
18	We	10.7	21.9	2.2			E	28	15:32	14.5	80		S	11		21.6	44		E	15	
19	Th	11.1	23.0	0			E	28	17:01	15.8	75		W	4		21.6	41		NE	9	
20	Fr	10.3	29.1	0			ESE	31	15:26	17.3	68		NNW	4		28.0	36		E	15	
21	Sa	13.5	29.3	0			E	31	13:29	17.1	97		SW	2		27.9	43		ESE	20	
22	Su	14.2	30.4	0			WNW	54	12:49	22.3	50		SW	11		28.8	9		WNW	28	
23	Mo	9.3	29.7	0			SE	30	17:31	19.3	40		SW	9		27.6	19		N	7	
24	Tu	11.4	34.0	0			ESE	30	15:09	19.4	59		W	6		32.7	11		N	9	
25	We	16.3	26.1	0			S	39	07:46	23.2	30		S	15		24.4	49		ESE	20	
26	Th	11.5	16.3	0			SE	41	12:03	14.4	58		SSW	11		14.2	50		SSE	19	
27	Fr	10.3	19.0	3.6			SE	44	14:10	14.5	69		SSW	17		17.4	55		SE	26	
28	Sa	10.1	21.4	0.6			E	28	17:12	15.3	63		WSW	6		18.8	42		E	11	
29	Su	8.0	28.6	0			NE	30	15:29	15.7	64		NW	6		27.3	18		NNE	9	
30	Mo	9.8	34.5	0			NW	52	17:21	20.3	49		N	6		32.9	11		WNW	13	
31	Tu	20.2	28.9	0			WNW	94	03:12	26.2	20		W	17		27.6	7		SSW	24	
Statistics for October 2023																					
	Mean	11.7	26.5							17.9	57			8		25.0	33			15	
	Lowest	6.2	16.3	0						13.6	20		#	2		14.2	7		#	4	
	Highest	20.6	35.8	12.6			WNW	94		26.2	97		WNW	20		35.6	75		WNW	28	
	Total			23.0																	

IDCJDW2062.202310 Prepared at 13:00 UTC on Tuesday 9 July 2024

Horsley Park, New South Wales
November 2023 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	We	10.2	23.4	0			SE	37	14:00	18.7	60		ESE	6		21.2	45		ESE	22	
2	Th	12.0	24.2	0			ESE	35	15:58	19.1	51		SW	7		22.5	42		ENE	11	
3	Fr	14.3	25.4	0						18.9	71		Calm			22.6	55		ESE	20	
4	Sa	15.5	22.2				SE	35	14:54	18.7	79		SSE	6		18.4	72		SSE	19	
5	Su	14.8	19.2	35.2			SE	33	11:35	15.4	100		ESE	13		17.6	60		ESE	20	
6	Mo	13.1	22.9	4.0			E	26	17:15	16.7	69		NW	2		20.2	52		E	15	
7	Tu	11.1	26.9	0			ENE	30	14:38	17.9	68		NNW	6		25.5	46		E	17	
8	We	12.8	29.2	0			ESE	33	14:06	19.8	70		NNE	2		27.9	39		E	19	
9	Th	14.1	29.3	0			WNW	44	13:59	21.4	71		N	2		23.2	55		W	28	
10	Fr	14.6	27.6	4.6			ESE	37	15:47	18.5	82		Calm			26.5	53		ESE	26	
11	Sa	14.3	33.7	0.2			SSW	46	22:26	18.3	95		W	4		32.4	40		ESE	15	
12	Su	14.8	28.8	0			ESE	37	14:05	22.1	64		ENE	7		25.9	58		ESE	24	
13	Mo	15.6	24.1	0			ESE	37	13:21	19.6	67		SE	15		21.5	54		E	15	
14	Tu	13.6	29.2	0			SE	31	15:32	20.2	62		N	9		27.2	46		ESE	17	
15	We	17.6	26.7	0			SE	35	14:13	21.7	79		NE	4		23.6	64		SE	20	
16	Th	18.7	29.9	0			SE	44	13:42	22.9	65		NW	6		24.8	60		SE	28	
17	Fr	15.0	23.0	3.6			SE	39	16:10	17.4	61		SSE	15		22.3	44		SE	13	
18	Sa	11.7	26.1	0			NE	33	15:55	19.5	60		N	9		25.0	39		NE	13	
19	Su	12.6	30.7	0			ESE	33	14:56	20.6	57		NNE	7		28.7	41		ESE	22	
20	Mo	16.5	27.3	0			N	39	15:54	20.6	77		WNW	4		26.5	48		NE	11	
21	Tu	15.3	26.4	0.6			ESE	28	13:07	19.5	91		SW	4		24.8	62		E	11	
22	We	15.7	28.2	0.2			E	33	14:21	22.2	63		SSW	11		25.6	50		SE	17	
23	Th	17.3	24.7	0			SE	48	15:03	19.4	84		S	7		22.9	66		S	17	
24	Fr	17.3	23.9	4.0			ENE	20	14:25	19.6	91		SSW	2		22.6	73		E	7	
25	Sa	17.6	23.7	8.0			NE	22	15:29	18.7	97		NE	7		21.2	84		N	7	
26	Su	17.1	31.2	2.4			W	37	16:09	23.6	69		NNW	4		30.4	32		WSW	7	
27	Mo	17.9	26.8	5.4			SE	37	15:25	23.6	70		SSE	11		26.3	57		ESE	19	
28	Tu	19.5	21.2	0.2			ENE	28	16:56	20.9	76		E	11		20.3	85		ENE	9	
29	We	18.9	27.9	6.8			NNW	46	14:53	21.1	87		N	7		24.5	69		ENE	13	
30	Th	15.1	28.1	12.6			NW	43	14:38	21.3	79		NW	4		25.9	47		WNW	15	
Statistics for November 2023																					
Mean		15.2	26.4							19.9	73			6		24.3	54			16	
Lowest		10.2	19.2	0						15.4	51		Calm			17.6	32		#	7	
Highest		19.5	33.7	35.2			SE	48		23.6	100		#	15		32.4	85		#	28	
Total				87.8																	

IDCJDW2062.202311 Prepared at 13:00 UTC on Monday 8 July 2024

Horsley Park, New South Wales
December 2023 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Fr	15.4	29.0	0.4			ESE	35	15:10	22.7	59		SSW	7		26.3	54		ESE	15	
2	Sa	17.7	26.9	0			SSE	44	19:47	20.7	72		Calm			26.0	54		ENE	2	
3	Su	13.6	28.2	15.4			SE	39	13:06	21.6	61		S	6		25.6	52		ESE	22	
4	Mo	16.6	26.1	1.8			E	31	16:45	19.8	74		ESE	2		24.2	49		E	11	
5	Tu	14.4	37.1	0			SSW	17	16:35	21.7	65		NNW	4		35.3	24		NW	2	
6	We	21.2	27.2	0			E	33	09:48	25.4	48		SE	6		26.1	50		ESE	17	
7	Th	15.8	31.3	0			SE	37	14:08	22.2	70		N	7		27.8	53		SE	22	
8	Fr	17.9	38.3	0			E	33	15:02	26.9	56		Calm			37.6	24		NE	9	
9	Sa	21.5	42.6	0.2			SE	46	18:59	29.8	50		N	6		41.6	14		WNW	13	
10	Su	20.8	29.4	0			S	37	23:13	21.7	80		SSW	9		28.1	59		NE	7	
11	Mo	19.7	32.5	0			SE	39	16:38	23.6	70		W	6		30.3	54		ESE	20	
12	Tu	20.8	31.6	0			SE	33	15:04	25.0	70		W	4		30.3	41		ESE	15	
13	We	18.0	33.6	0			ESE	30	15:57	23.9	70		NNE	7		33.0	46		ENE	11	
14	Th	21.3	38.6	5.8			WNW	56	12:30	26.8	71		NNE	4		37.5	17		WNW	26	
15	Fr	20.5	29.2	0			E	37	14:04	25.5	54		E	6		28.2	49		E	19	
16	Sa	16.3	35.5	0			NW	44	11:10	24.5	58		WNW	4		34.8	9		WNW	20	
17	Su	18.5	28.2	0			E	37	16:03	22.3	67		ESE	6		26.2	49		E	20	
18	Mo	17.9	31.4	0			ENE	33	14:31	21.9	78		SSW	2		30.5	49		E	11	
19	Tu	21.9	35.3	0			SSE	43	19:48	23.7	86		NW	6		33.8	34		NNW	15	
20	We	17.3	19.6	31.0			S	28	07:52	17.4	91		S	15		17.3	92		SSW	11	
21	Th	16.4	23.3	22.6			S	44	12:15	19.4	75		S	20		22.3	56		S	20	
22	Fr	15.6	25.6	0.2			SE	33	16:06	20.0	56		SSW	11		23.7	43		ESE	19	
23	Sa	15.0	26.8	0			ESE	31	14:35	20.8	62		WSW	4		26.0	51		E	17	
24	Su	17.7	23.1	1.0			SE	31	14:03	20.3	85		SSW	6		21.1	79		ESE	20	
25	Mo	16.6	28.3	25.6			E	33	16:42	22.0	80		SSE	6		26.1	55		E	15	
26	Tu	18.4	29.8	0.4			ESE	37	15:01	22.3	83		SW	4		27.2	68		ESE	19	
27	We	19.1	27.0	0.2			WSW	39	12:55	22.8	71		S	6		18.2	81		SE	9	
28	Th	15.1	31.9	4.6			SE	35	13:43	21.7	76		Calm			28.4	48		SE	22	
29	Fr	16.8	26.5	0			NW	24	21:02	22.7	76		SE	7		24.9	70		ESE	15	
30	Sa	16.9	29.4	0			SE	43	15:25	22.7	57		NW	2		26.3	48		SE	24	
31	Su	16.0	20.7	8.2			SE	28	11:21	17.5	82		SSW	9		20.3	65		ESE	11	
Statistics for December 2023																					
Mean		17.8	29.8							22.6	69			5		27.9	49			15	
Lowest		13.6	19.6	0						17.4	48		Calm			17.3	9		#	2	
Highest		21.9	42.6	31.0			WNW	56		29.8	91		S	20		41.6	92		WNW	26	
Total				117.4																	

IDCJDW2062.202312 Prepared at 16:00 UTC on Sunday 7 July 2024

Horsley Park, New South Wales
January 2024 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Mo	16.6	23.8	2.0			ENE	22	12:12	20.6	86		S	2		21.6	79		ENE	9	
2	Tu	18.3	28.9	0.2			ENE	33	18:08	23.7	70		NNE	6		27.0	61		ENE	11	
3	We	18.3	31.1	0			ESE	31	13:16	24.1	69		NE	4		27.4	56		E	17	
4	Th	18.7	28.2	0.4			SE	41	12:27	24.3	77		WNW	4		21.7	81		SE	13	
5	Fr	18.6	24.3	7.6			SE	33	16:08	21.1	74		SSW	7		23.0	57		ESE	17	
6	Sa	15.3	26.6	0			E	28	16:29	22.0	60		SE	6		25.2	50		ENE	9	
7	Su	15.6	28.9	0			NE	31	17:50	22.0	68		NE	4		27.5	58		NE	11	
8	Mo	19.5	25.5	0			N	30	16:15	22.7	71		N	2		22.5	88		NNE	11	
9	Tu	19.2	29.1	6.8			E	33	13:57	24.9	67		SE	11		24.4	67		ESE	22	
10	We	20.3	31.7	0			E	26	16:10	23.0	76		NNE	4		31.4	54		ENE	9	
11	Th	20.0	30.6	0			ESE	35	14:33	24.9	84		S	6		29.9	61		E	17	
12	Fr	21.4	29.4	10.0			E	30	15:25	24.1	82		NE	6		28.3	55		ENE	19	
13	Sa	18.7	32.9	0.4			ESE	30	14:30	23.4	78		N	2		32.6	36		SSE	6	
14	Su	20.3	26.6	0			SSE	41	13:54	23.5	67		SSW	7		24.1	79		SSE	22	
15	Mo	18.2	23.2	32.2			SE	35	14:17	18.3	96		S	13		23.0	63		ESE	19	
16	Tu	17.6	24.4	8.6			NE	28	13:12	20.7	88		WSW	2		21.3	89		ESE	6	
17	We	20.1	28.6	3.6			N	20	10:19	22.9	81		N	6		26.9	65		NNW	6	
18	Th	20.8	31.9	10.2			W	35	12:48	24.3	80		NNW	2		30.8	36		WNW	19	
19	Fr	17.6	30.7	0			ESE	35	13:49	23.0	39		W	4		28.9	34		SE	19	
20	Sa	20.1	27.0	0			NE	30	14:45	22.7	68		NE	11		26.3	65		ENE	13	
21	Su	18.2	38.4	0			SE	46	21:38	23.9	73		Calm			37.0	23		NNW	11	
22	Mo	19.6	24.0	0			SSE	30	23:03	21.0	69		SE	13		22.4	61		SE	13	
23	Tu	17.2	26.2	0			E	30	17:19	20.7	77		ESE	9		24.5	54		ENE	17	
24	We	15.5	31.1	0			N	19	10:03	21.7	68		N	9		30.2	45		N	2	
25	Th	21.7	31.9	0			ESE	26	14:44	27.2	65		Calm			27.9	61		E	17	
26	Fr	21.5	37.8	0			WNW	48	09:55	31.8	44		NNW	6		31.2	46		SE	15	
27	Sa	18.6	23.1	1.4			E	19	15:08	19.8	90		Calm			21.4	87		NE	4	
28	Su	16.7	27.8	2.2			ESE	33	14:16	21.6	79		SW	6		25.3	60		ESE	20	
29	Mo	19.1	32.7	0			ESE	31	15:46	24.1	70		NNE	2		31.8	53		ESE	13	
30	Tu	22.6	27.2	0.8			E	24	16:01	23.3	92		SSE	7		26.7	65		SE	11	
31	We	20.8	27.1	0.4			SE	30	16:14	23.4	83		SE	11		26.3	69		SE	13	
Statistics for January 2024																					
Mean		18.9	28.7							23.1	73			5		26.7	59			13	
Lowest		15.3	23.1	0						18.3	39		Calm			21.3	23		N	2	
Highest		22.6	38.4	32.2			WNW	48		31.8	96		#	13		37.0	89		#	22	
Total				86.8																	

IDCJDW2062.202401 Prepared at 13:00 UTC on Saturday 20 July 2024

Horsley Park, New South Wales
February 2024 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Th	19.2	31.1	0.6			N	26	11:37	21.0	78		W	4		29.1	58		N	11	
2	Fr	20.4	31.5	0			SE	37	14:58	25.1	79		ESE	6		30.8	46		ESE	15	
3	Sa	21.1	28.8	0			ENE	24	13:00	22.5	65		N	6		27.4	52		NE	11	
4	Su	18.4	37.7	0			E	28	15:50	23.7	73		NNE	4		36.3	36		NE	6	
5	Mo	23.7	33.6	0			ESE	35	16:42	30.8	54		SE	4		31.2	54		ESE	17	
6	Tu	20.8	24.6	37.6			S	43	17:15	22.4	92		SSW	9		22.5	73		SSE	19	
7	We	15.9	25.9	3.2			SE	35	14:13	19.4	63		SSW	11		23.3	61		SSE	17	
8	Th	17.2	24.9	0			ESE	30	13:20	19.5	67		SW	9		22.6	56		SE	17	
9	Fr	15.9	26.2	0			SSE	26	16:25	20.1	61		SW	11		25.2	57		SSE	7	
10	Sa	19.5	25.8	0			SE	43	11:01	21.5	63		SSW	15		24.8	46		SE	24	
11	Su	15.9	25.4	0			NE	20	18:51	21.2	68		WSW	6		23.9	57		E	9	
12	Mo	17.3	32.1	0			E	28	15:55	23.1	65		N	11		30.9	42		NW	9	
13	Tu	18.8	34.8	0			W	48	14:54	24.0	79		Calm			33.8	36		NNE	7	
14	We	19.8	31.6	0.2			SE	41	14:34	24.6	69		NNW	9		27.4	61		ESE	22	
15	Th	16.7	21.3	7.8			SW	20	01:40	17.7	95		SW	7		18.7	95		S	9	
16	Fr	17.6	28.7	2.4			ENE	26	19:01	21.2	89		Calm			28.4	64		NNW	6	
17	Sa	21.2	32.6	1.0			SE	31	14:41	24.0	84		NW	6		31.1	47		ESE	11	
18	Su	18.8	31.3	0			SSW	26	18:08	21.2	99		Calm			28.8	54		Calm		
19	Mo	20.4	26.1	0.4			E	35	12:27	22.6	78		SSW	7		19.2	95		SSE	4	
20	Tu	17.6	24.1	28.6			NNE	28	11:18	21.2	82		SSW	4		20.4	94		SSW	9	
21	We	18.0	26.6	12.6			SE	20	17:13	20.5	93		SW	6		25.5	69		ESE	6	
22	Th	17.6	32.7	0			ENE	20	17:07	21.0	95		N	2		30.4	49		NE	2	
23	Fr	19.0	37.2	0			SSE	39	21:37	24.8	79		NNW	2		35.8	32		WNW	7	
24	Sa	18.1	20.3	5.6			S	31	01:18	18.1	95		SSE	9		20.0	71		SSE	13	
25	Su	15.1	28.9	0.4			E	22	16:42	19.7	72		WSW	6		27.1	47		NW	4	
26	Mo	16.7	29.2	0			SE	41	15:48	21.9	80		W	4		25.6	59		SE	19	
27	Tu	19.3	23.2	0			SSE	22	23:32	20.3	78		SSW	6		21.9	81		ESE	7	
28	We	19.9	29.8	0.4			E	22	18:09	23.1	83		N	7		28.7	63		ENE	6	
29	Th	20.3	39.6	0			SW	35	14:57	25.4	82		NNW	6		39.1	32		WNW	4	
Statistics for February 2024																					
Mean		18.6	29.2							22.1	77			6		27.2	58			10	
Lowest		15.1	20.3	0						17.7	54		Calm			18.7	32		Calm		
Highest		23.7	39.6	37.6			W	48		30.8	99		SSW	15		39.1	95		SE	24	
Total				100.8																	

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