Coliban WATER

Responses to outstanding issues from EPA RFI APP015649

May 2023

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Introduction/Background

On 13 October 2022, EPA issued Coliban Water with a Request for Information (RFI) under Regulation 21(1)(a) of the Environment Protection Regulations 2021, reference No. APP015649.

Coliban Water provided EPA with a response to the RFI on 2 December 2022. On 20 December 2022, EPA advised that Coliban Water's response did not satisfactorily address the RFI, and provided more detailed reasoning for this on 23 January 2023.

In order to help resolve the outstanding issues, Coliban Water and EPA met face-to-face on 3 March 2023. The listed action from that meeting, which were sent out on 20 March 2023, were as follows:

EPA:

1. Work through concerns raised about the 1 µDALY and provide a response to Coliban Water

Coliban Water:

2. Provide process flow diagram of all treatment plant controls and explain how this mitigates the low dilution risks raised by EPA
3. Consider other operating regimes e.g. pumping more reclaimed water when the river is flowing well
4. Explain how risks are managed with signs only 1 km downstream during low dilution periods
5. Clarify maximum contaminate concentrations for at least BOD, nitrates, phosphates and ammonia
6. Coliban Water to undertake further work with James Gourley, from GHD, to articulate how acute risks are managed to an acceptable level, and also azolla and algae issues require further clarification
7. Detail risk mitigations during shoulder periods
8. Provide completed responses to outstanding RFI issues

This document provides additional information that looks to close out the RFI and the actions listed above.

Concerns about pathogens and associated recreational exposure

In response to Coliban Water's request for additional clarification with respect to EPA's concerns regarding pathogens and associated recreational exposure, arising from people potentially swimming or recreating in the Campaspe River downstream of the release point for the Kyneton WRP, EPA's Senior Health Advisor – Microbial, Muriel Lepesteur – Thompson, provided the following clarification on 30 March 2023:

> *We agree that the 1%/0.3% risk thresholds of GI/AFRI per event in the recreational guidelines are very high compared to potable water and recycled water health-based targets of 1 µDALY. The recreational water targets are based on observed effect levels. Those other targets are based on achieving a very low tolerable risk level derived from QMRA, or on eliminating reasonable foreseeability of outbreaks.*
>
> *It could be argued that we should align those risk targets. In natural water bodies, it is very likely that the risk won't be low. Such waters are full of natural pathogens from wildlife even in the absence of human activity. Splashes, aerosols, and, for those entering the water, direct ingestion, will result in illness. On top of that you have the opportunistic pathogens.*
>
> *So, once we accept that, our starting principles of 1 µDALY becomes as much about 'risk communication' to allow people to make an informed choice (assuming they understand the risk) as about promoting 'risk mitigation'.*
>
> *Simply said, the risk assessment showed risk levels above the very low tolerable risk level of 1 µDALY so this must be communicated. The risk must also be mitigated as much as possible but we are aware that achieving the health-based target of 1 µDALY will not happen tomorrow.*

Coliban Water has interpreted this response to mean that for the purposes of the current licence amendment application, Coliban Water's primary obligations are:

- To only discharge tertiary treated water that has passed through the upgraded UV treatment process
- To advise EPA of any significant change in the risk profile for downstream recreational users

As was detailed in the May 2022 Summary Document that accompanied the original licence application, as part of any amended licence, Coliban Water has committed to signage being erected at the closest publicly-accessible points to 500m and 1km downstream of the discharge point, in order to ensure the public is aware of the upstream discharge.

Based on the further feedback provided above, and in order minimise risks to recreational users, Coliban Water is happy to commit to:

- To avoid, to the greatest extent possible, releasing treated water to the Campaspe River between 1 December and 1 March (the most likely period when recreational activity would occur), except in accordance with the licensed dilution ratio
- If a release became necessary outside the licensed dilution ratio during this time, to promptly advise EPA so that suitable communications can be issued to advise recreational users of the elevated risk

Dilution ratio

As was discussed at the 3 March meeting held with EPA, Coliban Water are not seeking to always release treated water at a ratio of 1-part river: 2-part release (described as 66.7%), but rather have the option to release up to that ratio. Additionally, Coliban Water does not need to release treated water to the river every day, but only on days when releases are necessary to manage lagoon levels (approximately 50% of days in any 12-month period).

As has been detailed in previous documentation/feedback provided to EPA, the measured flow at the Kyneton gauging station is approximately 10% of that measured at the Redesdale gauging station.

Based on the commitment to move from the Redesdale gauging station to the Kyneton gauging station as the point that the dilution ratio is measured, and noting the available land at the Kyneton WRP, water balance calculations and reuse opportunities, the environmental risk assessment was prepared, based on the 66.7% figure.

EPA has asked for capital costings for different dilution ratios. As was discussed at the 3 March meeting, whilst specific capital costings have not been provided, it is estimated that these costs would be significant, being in the order of several million dollars. This is because, depending on the scenario chosen, additional lagoon capacity, of up to 140 ML, would be required. To achieve this, Coliban Water would need to purchase/acquire suitable nearby additional land, and then construct the additional lagoons, and the infrastructure to get treated water to these new lagoons, and all this may take 3-5 years to complete, during which time, Coliban Water may need to undertake further periodic blended BNR-treated water and lagoon water releases.

It is accepted that whilst Coliban Water has often cited that most releases to the Campaspe River represent no more than 10% of the flow, even as measured at the Kyneton gauging station, detailed data to support this statement has not been provided.

Accompanying this report is two years' worth of data that shows the relative contribution of the releases to river flow. It is accepted that the past two years have been wetter than normal, but the data shows that Coliban Water's contribution to river flow is typically well below 10%.

As has been mentioned previously, Coliban Water's releases to the river are capped at 10 ML per day, by virtue of the capacity of the pump station to the river; Coliban Water has no intention of upgrading the capacity of this pump station.

As was discussed at the meeting, the rationale for seeking the up to 66.7% figure is that it would allow Coliban Water to release tertiary-treated water on "shoulder" days, as the river rises and falls during a flow event. This would help to mitigate, to the fullest extent possible, the need to undertake a blended release.

The ongoing challenge that Coliban Water faces is that the Campaspe River is an ephemeral waterway, and with a decreasing base flow over time, the number of days when there is no or minimal flow are increasing.

It is also important to flag that the October/November 2022 floods scoured out the Campaspe River at the point where the Kyneton gauging station is located. Coliban Water is now looking at ways to ensure flow measurements that are measured at that point are accurate. This will either involve installing a structural weir, or creating a new rating table for the site, with the installation of a weir being the favoured solution. Coliban Water is in the process of engaging a contractor to undertake these works.

Risks associated with excessive Azolla and algal growth

To address EPA's concerns with respect to excessive Azolla and algal growth in the Campaspe River resulting from treated water releases from the Kyneton WRP, we sought the advice of AQUEST, who have been undertaking the river health studies associated with our environmental offsets project.

The text of the Summary Note that AQUEST provided to Coliban Water appears below:

Summary Note regarding nutrients and Azolla blooms in Campaspe River

This Summary Note outlines observations the AQUEST research group has made about nutrient concentrations in the Campaspe River and around the occurrence of Azolla and algal blooms.

Our study area includes eight sites along the Campaspe River from Cobb and Co Road, Carlsruhe, to Redesdale. Five sites are located upstream and three downstream of the Kyneton WRP release point.

Observations have been summarised based on collation of data for the five sites upstream of the discharge, and then downstream of the discharge at Old School Rd Kyneton and at Boundary Rd Bridge, Metcalfe.

Nutrients

Nutrient concentrations (total phosphorus and orthophosphate, total nitrogen, oxidised nitrogen (NOx) and ammonia) are elevated at all sites on the Campaspe River (Table 1).

Nutrient concentrations slightly increase directly downstream of the Kyneton WRP discharge, however, by Boundary Road, have in most instances returned to levels observed above the Kyneton WRP discharge. Nitrogen concentrations quickly fall below background concentrations downstream of the discharge, but phosphorus concentrations are still elevated at Boundary Road.

Table 1: Nutrient concentrations (mg/L) upstream of the Kyneton RWP discharge to the Campaspe^, and downstream of the discharge at Old School Road, Kyneton and at the bridge on Boundary Road, Metcalfe. Concentrations in bold exceed or equal ERS standards (Total Nitrogen = 1.05 mg/L and Total phosphorus = 0.55 mg/L). N = 20 sample events over 4 years (2019-2022).

Total Nitrogen					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	2.50	0.05	0.83	0.60	1.00
Old School Road	2.40	0.50	1.15	0.88	**1.35**
Boundary Rd, Metcalfe	3.90	0.10	1.05	0.78	**1.05**
Oxidised Nitrogen (NOx)					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	0.39	0.01	0.05	0.01	0.04
Old School Road	0.60	0.01	0.15	0.03	0.21
Boundary Rd, Metcalfe	0.42	0.01	0.08	0.01	0.08
Total Kjeldahl Nitrogen (TKN)					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	2.50	0.05	0.80	0.60	1.00

Old School Road	2.40	0.40	1.01	0.68	1.13
Boundary Rd, Metcalfe	3.90	0.05	0.98	0.68	1.00
Ammonia					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	0.39	0.01	0.07	0.01	0.09
Old School Road	0.39	0.01	0.10	0.04	0.13
Boundary Rd, Metcalfe	0.36	0.01	0.08	0.02	0.09
Total Phosphorus					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	1.31	0.01	0.11	0.04	0.11
Old School Road	0.91	0.05	0.27	0.18	0.30
Boundary Rd, Metcalfe	0.79	0.06	0.25	0.15	0.32
Orthophosphate					
	max	**min**	**mean**	**25th percentile**	**75th percentile**
Upstream of discharge	0.12	0.01	0.02	0.01	0.02
Old School Road	0.91	0.02	0.16	0.07	0.18
Boundary Rd, Metcalf	0.49	0.02	0.16	0.08	0.20

^ upstream concentrations determined based on sampling at five locations between Cobb and Co Road, Carlsruhe and Burton Ave, Kyneton.

Instream Plant Growth

Aquatic macrophytes and algae are important structural and biological components of rivers, supporting ecosystem health by processing instream nutrients and providing habitat and food resources for aquatic biota, however, excessive growth can lead to choking of the channel, reduced light, low oxygen, and poor habitat and food resources. In the Campaspe, there are floating plants (Azolla) and rooted plants that grow on the stream bed.

Azolla is a floating aquatic fern typically found in waterways across Australia. Under optimum conditions, Azolla can double its leaf area in seven days leading to dense cover across the water surface. It occurs at several sites in the Campaspe, especially at sites downstream of the Kyneton WRP discharge.

Water temperature and flow likely play a greater role than nutrients in the development of dense Azolla mats within the river. While elevated nutrient levels occur throughout the Campaspe River from Carlsruhe to Redesdale, Azolla is not dominant across this entire reach. Where Azolla occurs, it becomes abundant when water temperatures increase, and flows decrease to a point where there is little or no flows in pools.

Willows can exasperate the problem. The Old School Rd study site, which is immediately downstream of the Kyneton WRP discharge, is dominated by Azolla which is retained even in flowing conditions due to the pools created by the willows that are choking the channel (Figure 2).

Unshaded sites upstream of the Kyneton WRP discharge are choked with a variety of aquatic plants throughout the year (Figure 1). Occasionally Azolla has been observed at two sites around Carlsruhe when flows begin to cease.

Figure 1: Macrophyte cover at Clowes St end of the botanical gardens (TOP) and at Cobb and Co Road Carlsruhe (BOTTOM). Photos from Left to Right are Years 1 to 4.

Figure 2: TOP Azolla cover at Old School Road study site situated directly downstream of the Kyneton WRP discharge. BOTTOM Macrophyte cover at Boundary Road study site, which is downstream of the Kyneton WRP discharge. In Year 2 there was a significant increase in Azolla cover at this site. Left to Right monitoring Years 1 to 4.

Conclusion

Nutrients and excessive plant growth are high throughout the Upper Campaspe. Some areas have dense stands of rooted plants whereas other areas are affected by Azolla when flows cease to occur in the river. Willow that choke the channel also encourage longer term growth of Azolla.

Coliban Water's interpretation of the summary information provided by AQUEST is that the presence of willows and the occurrence of cease-to-flow events play as much a role as nutrient inputs in creating excessive instream plant growth, noting that there is also nutrient enrichment across the entire Upper Campaspe.

This risk will be managed by the release of only tertiary-treated water from the Kyneton WRP, combined with Coliban Water's investment in upstream environmental offsets.

Issues with Environmental Risk Assessment

Lack of a likelihood rating in the risk assessment

Based on feedback provided by EPA, with respect to the absence of a likelihood rating in the risk assessment, GHD has updated Chapter 6 of the Environmental Risk Assessment (ERA) to include both consequence and likelihood ratings. An updated copy of the ERA accompanies this document.

Risks associated with excessive ammonia and BOD in releases

In response to concerns raised by EPA with respect to the potential risk posed by excessive ammonia and BOD in the treated water released to the river, GHD has updated Chapter 6 of the ERA. An updated copy of the ERA accompanies this document.

Managing out-of-specification water to avoid the release of excess ammonia, nitrogen, phosphorous and BOD to the Campaspe River

At the meeting held on 3 March 2023, Coliban Water mentioned that it has online sensors at the Kyneton WRP for following parameters:

- Phosphate (alarms at a value of 0.5 mg/L)
- Nitrate (alarms at a value of 10 mg/L)
- Ammonia (alarms at a value of 1.4 mg/L)

Since the 3 March meeting, Coliban Water has been investigating their operation, and how they could be used to avoid potentially out-of-specification water being discharged to the river.

Currently, all three meters are alarmed and these alarms send automated alerts to operational staff via SCADA. Operational staff can then respond onsite, or remotely, to the alarms, and take appropriate action. The current process flow diagram for the WRP accompanies this document.

At the moment, the system is not configured in a way that would allow a high alarm to automatically shut down the pump station to the river and divert out-of-specification water to the onsite lagoon system. This would require additional programming to be undertaken.

A review of readings from these three sensors for the period 1 January to 31 December 2022 indicates that if they automatically diverted releases to the onsite lagoons upon alarming out, the tripping of:

- the phosphate alarm would have resulted in 72 ML of flow being sent to the onsite lagoons
- the ammonia alarm would have resulted in 11.5 ML of flow being sent to the onsite lagoons

The nitrate alarm was not triggered during 2022.

A couple of other issues that need to be noted are that:

- phosphate is not an equivalent measure to total phosphorous, which is the currently proposed licence parameter
- nitrate is not an equivalent measure to total nitrogen, which is the currently proposed licence parameter
- the time scales of measurement between licence parameters (weekly measurement, based on 24 composite samples (except for *E. coli*, which is a grab sample)) and online parameters (close to continuous, but based on a composite sample) are different

On the basis of risk, of the three parameters for which online measurement is undertaken, only ammonia presents an acute toxicity risk.

Therefore, Coliban Water will commit to reconfiguring the alarm system, so that when the ammonia alarm is triggered, it automatically sends out-of-specification water to the onsite lagoon system. An updated process flow diagram can be provided when the programming works have been completed.

With respect to phosphate and nitrate, these parameters will continue to be alarmed, and appropriate actions will be taken to minimise the volume of potentially out-of-specification water that is released to the Campaspe River.

With respect to BOD, given that the actual measure is BOD_5, which measures he biological oxygen demand that arises over a period of five days, there are no applicable online sensors that can measure this.

Nonetheless, dissolved oxygen (DO) concentrations are measured within the BNR process, and if they were to show excessively low values of DO, remedial actions will be taken to minimise the volume of potentially out-of-specification water that is released to the Campaspe River.

Maximum values for Total Nitrogen and Total Phosphorous

It is acknowledged that EPA are seeking maximum licence values for both Total Nitrogen and Total Phosphorus.

Based on Coliban Water's commitment to only release tertiary-treated water to the Campaspe River, which will see a substantial decrease in the loads of nitrogen and phosphorus that will be released to the river (modelled as being at least a 50% reduction in the annual load of total nitrogen, and at least a 95% reduction in the annual load of total phosphorus, going to the river), the nutrient reductions that can be attributable to Kyneton environmental offsets work, which Coliban Water assumes are now part of the application, based on our 3 March meeting with EPA, and the statement of the risk of excess Azolla and algal growth in the river, we are confident that the amended licence will avoid eutrophication of the river outside the nominated mixing zone detailed in the ERA.

Nonetheless, Coliban Water will commit to the following maximum values in the licence, based on the results of 24-hour composite samples:

Total Phosphorous **1 mg/L**
Total Nitrogen **15 mg/L**

Therefore, the table of licence parameters would be:

Parameter	Measurement	Licence limit
BOD_5	Rolling Annual Median	5 mg/L
Total Suspended Solids	Rolling Annual Median	10 mg/L
Total Dissolved Solids	Rolling Annual Median	1,000 mg/L
pH	Within the range	pH 6 to 9
Ammonia	Rolling 90th percentile	1.4 mg/L
Total Phosphorus	Maximum	1 mg/L
	Rolling Annual Median	0.5 mg/L
Total Nitrogen	Maximum	15 mg/L
	Rolling Annual Median	10 mg/L
E. coli	Maximum	400 orgs/100 mL
	Rolling Annual Median	100 orgs/100 mL
Helminths	Maximum	1 *Taenia* egg/L

As was stated, the proposed licence limits in the table above set the upper limit of what is considered acceptable, and Coliban Water does not consider these values as representing the limit that you discharge up to, more that these values set a quality envelop that must not be exceeded, based on the work that underpins the supporting ERA.

In addition, Coliban Water will commit to providing to EPA, on a 6-monthly basis, all monitoring results, which will be collected in line with the sampling and monitoring sections detailed on page 20 of the Summary document that accompanied the licence application, in order to demonstrate the level of performance actually being achieved.

Whilst understanding the need to set limits on what can be acceptably released to the river, Coliban Water would prefer to be judged against what is actually released to the river, not what the licence limits allow.

Risks associated with metals and toxicants

The ERA notes that, based on a very limited data set, that a number of metals (aluminium, chromium, zinc, copper and silver) have been found to be present at elevated concentrations.

The first thing to note is that the presence of elevated concentrations of three of these metals (chromium, zinc and copper) is relatively common in domestic wastewater, as these metals are commonly used in plumbing fixtures and roofing materials, and, as such, they leach into domestic sewage. Aluminium is used as part of the treatment process, as a coagulant, which would explain its presence.

As the ERA notes, *the Campaspe River has elevated concentrations of these identified metals downstream of the discharge point, even on non-discharge days. As such, the risks associated with these metals within the BNR discharge on the Campaspe River are considered to be low.*

It is accepted that the data set is small, so may be either over-estimating or under-estimating risk levels, but if metals were an issue in the discharge, they should also be present in elevated concentrations in waterway sediments at sites downstream of the release point. Therefore, a potentially more relevant measure of metal toxicity within the Campaspe River is the concentration of heavy metals in sediment samples.

As part of its waterway health study associated with the Kyneton Environmental Offsets project, AQUEST has undertaken sediment sampling over a four-year period. The summarised results for this four years of monitoring are presented in Table 8 of their Year 4 report (report attached for ease of reference, but it has been previously supplied).

Those results do not indicate any excess accumulation of metals in the sediments immediately below the release point. Elevated levels of nickel were found at all river sites, and elevated levels of mercury and chromium were found at Boundary Road, Langley, which seems to suggest a local source, but also noting that this site is downstream of where Snipes Creek joins the Campaspe River.

Noting the concerns that EPA has raised with respect to metals, and the lack of data, Coliban Water will commit to collecting quarterly metals samples, as part of any updated licence, in order to better characterise any risks associated with the presence of metals.

With respect to toxicants, the AQUEST work also uses multiple lines of ecotoxicological evidence to look for signs of excess toxicity along the Campaspe River. After four years of results, the conclusion that can be drawn is that there is no strong evidence that the releases from the Kyneton WRP are creating excess toxicity in the Campaspe River.

Whilst this work does not represent the direct measurement of toxicants, it would be expected that if toxicants were present, that they would be showing up in the ecotoxicological work.

Whilst the AQUEST reports sit outside the ERA prepared by GHD, they should be considered addenda to that work, in that they represent four years of direct water quality measurement that complement the risk assessment work undertaken within the ERA.

Addressing concerns raised by the Department of Health

With respect to the issues raised by the Department of Health in its response to EPA, dated 31 October 2022, Reference BAC-BR-16327, Coliban Water would like to provide additional information to the response provided to EPA in December 2022.

- The licence amendment being put forward is proposing a higher quality release to the Campaspe River than is currently being undertaken, in combination with a lower annual volume being released to the river
- Releases from the Kyneton WRP to the Campaspe River at the Wards Lane have been occurring for at least 15 years, under licence by the EPA, and whilst the Department of Health's advice on the release representing a form of potable reuse are noted, the releases predate any such considerations. It is considered that the state's current policy position on potable reuse is not applicable to such releases
- The Department of Health's concerns with respect to downstream drinking water supplies are noted, and the releases from the Kyneton WRP have been taken into consideration in the drinking water quality risk management plan that Coliban Water is required to prepare and implement under the state's *Safe Drinking Water Act 2003* (the Act)
- The drinking water quality risk management plan prepared under the Act takes into consideration the range of hazards and risks raised by the Department of Health in relation to the supply of safe drinking water from potentially raw water sources
- Coliban Water is of the view that GHD have staff members who are capable of undertaking human health risk assessments, such that the ERA that has been prepared adequately addresses downstream risks to human health
- Coliban Water has already consulted widely on the proposed licence amendment, such that the views of the community on the proposed amendment are well known
- Coliban Water is of the view that the ERA adequately addresses issues that may be of interest or relevance to the Chief Veterinary Officer, but we would welcome receiving any additional feedback that they may have

In summary, Coliban Water would be happy to discuss any residual concerns directly with the Department of Health, if the above dots points do not adequately address the concerns and issues that they have raised.