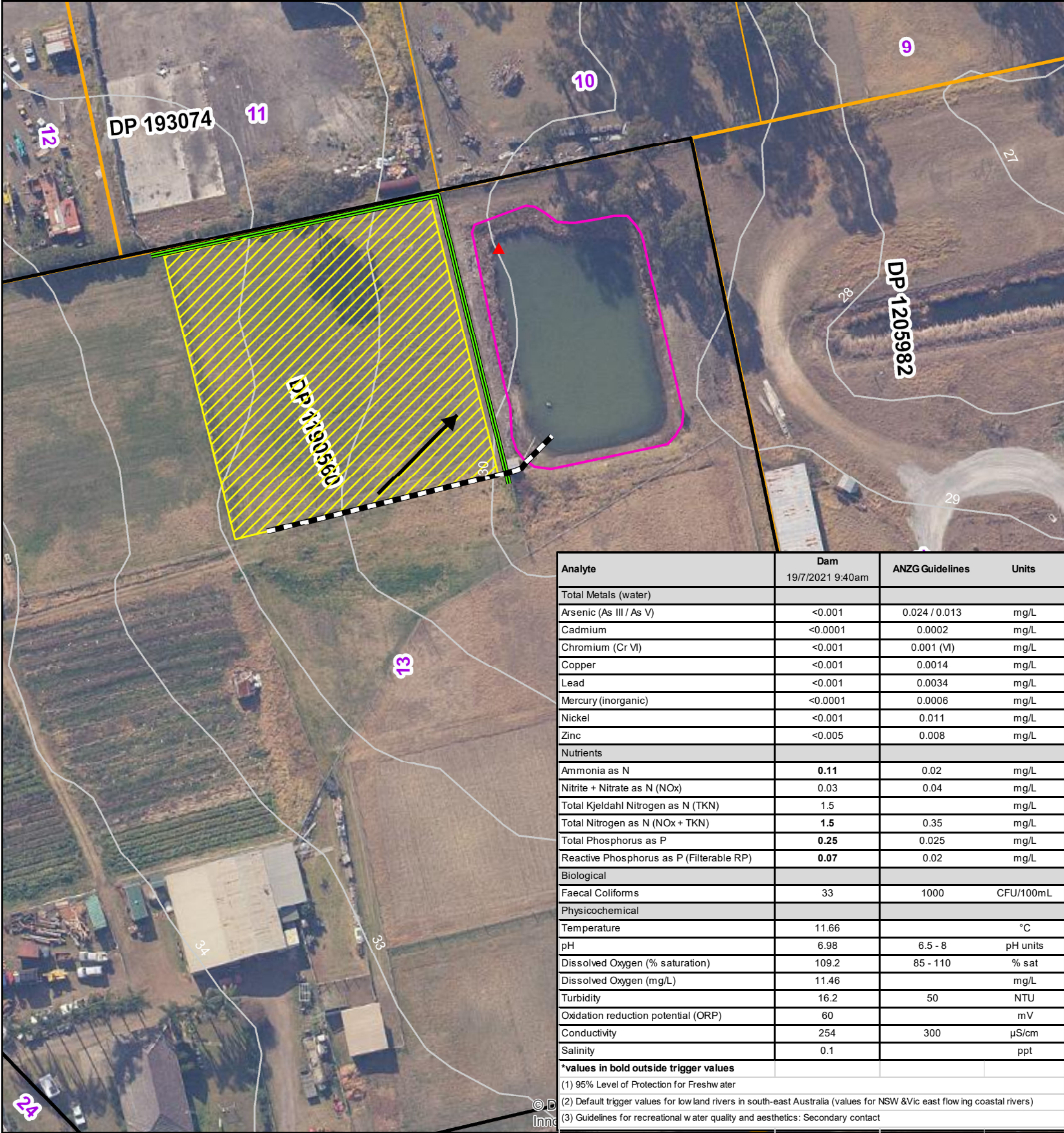


Dam Dewatering Plan: 971 Richmond Rd, Marsden Park (Lot 13 DP 1190560)



Analyte	Dam 19/7/2021 9:40am	ANZG Guidelines	Units
Total Metals (water)			
Arsenic (As III / As V)	<0.001	0.024 / 0.013	mg/L
Cadmium	<0.0001	0.0002	mg/L
Chromium (Cr VI)	<0.001	0.001 (VI)	mg/L
Copper	<0.001	0.0014	mg/L
Lead	<0.001	0.0034	mg/L
Mercury (inorganic)	<0.0001	0.0006	mg/L
Nickel	<0.001	0.011	mg/L
Zinc	<0.005	0.008	mg/L
Nutrients			
Ammonia as N	<b>0.11</b>	0.02	mg/L
Nitrite + Nitrate as N (NOx)	0.03	0.04	mg/L
Total Kjeldahl Nitrogen as N (TKN)	<b>1.5</b>		mg/L
Total Nitrogen as N (NOx + TKN)	<b>1.5</b>	0.35	mg/L
Total Phosphorus as P	<b>0.25</b>	0.025	mg/L
Reactive Phosphorus as P (Filterable RP)	<b>0.07</b>	0.02	mg/L
Biological			
Faecal Coliforms	33	1000	CFU/100mL
Physicochemical			
Temperature	11.66		°C
pH	6.98	6.5 - 8	pH units
Dissolved Oxygen (% saturation)	109.2	85 - 110	% sat
Dissolved Oxygen (mg/L)	11.46		mg/L
Turbidity	16.2	50	NTU
Oxidation reduction potential (ORP)	60		mV
Conductivity	254	300	µS/cm
Salinity	0.1		ppt
*values in bold outside trigger values			
(1) 95% Level of Protection for Freshw ater			
(2) Default trigger values for low land rivers in south-east Australia (values for NSW &Vic east flow ing coastal rivers)			
(3) Guidelines for recreational water quality and aesthetics: Secondary contact			

Legend

- Site

Dam

1:25,000 waterway mapping (DPI Water)

Key Fish Habitat (DPI Fisheries)

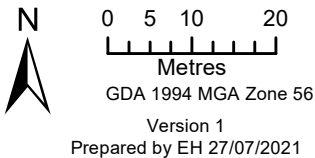
Contours (2 m)
- Water quality sample point

Recommended pump position

Recommended irrigation area

Direction of slope

Recommended erosion control



Dam size, volume and catchment

Surface area = 1,030 m². Max depth estimated as 2 m. Volume = 0.8 ML (0.4 x Surface Area x Depth / 1000). Surrounding land is rural residential. Catchment size of dam is 2.16 ha. Land slopes from east to west at 1.40° downslope. Nearest receiving creek is Bells Creek, 155 m downslope to the east which then flows to Eastern Creek (mapped as Key Fish Habitat by NSW Fisheries). Water testing occurred in the dam.

Likely contamination issues

All metals were below ANZG guidelines in the dam. Ammonia, Total Nitrogen, Total Phosphorous and Reactive Phosphorous exceeded ANZG trigger values. NOx was below the ANZG guideline level. All physicochemical parameters were within guideline values, including pH, Dissolved Oxygen, Turbidity and Conductivity. The dam water had low Faecal Coliform concentration and is therefore suitable for irrigation and secondary human contact.

Method of dewatering and fate of water

The dam is offline and collects surface runoff from a small cleared catchment. Dewatering of the dam is recommended prior to site earthworks to allow irrigation over vegetated land. The works could be completed at any time of the year, provided that daytime temperatures do not exceed 36°C. It is recommended that water be used to irrigate the vegetated area on the western side of the dam before the removal of any vegetation or disturbance of the land. The intake pipe should be caged to minimise injury to aquatic fauna. Pumped water should be released at the highest ground and allowed to infiltrate the soil with minimal overland flow (estimated irrigation rate of 36 mm/hr, however, this can vary with soil conditions). If soil becomes saturated, irrigation should be adjusted accordingly. Sediment controls (e.g. silt fence or hay bales) are recommended to filter sediments from any excess overland flow and prevent water flowing back into the dam or across neighbouring properties. The bottom sludge material and any remaining turbid water should be excavated and dried on-site.

Timeline

Day 1	Day 2 - 6 (or longer)	Day 7	Day 8-9	Ongoing
Install bunds to divert surface flow. Install erosion controls (e.g. silt fence, hay bales and/or geotextile fabric) and prepare pump pad. The pump intake head is best positioned on a floating device above the deepest part of dam, held in position with ropes spanning the dam. It is difficult to move the pipe when the water is low, so it's easiest to install when dam is full. Test discharge and diversion to ensure no erosion/sedimentation occurs downstream. Avoid disturbing vegetation where water will travel. Notify <b>Aquatic Ecologist</b> .	Pump water into adjacent ephemeral creek at a slow rate that does not cause erosion or transport of large amounts of woody debris in that channel.  Update <b>Aquatic Ecologist</b> .	During final 0.3 - 0.5 m of dewatering allow <b>Aquatic Ecologist</b> to rescue fauna in one day.  Water will become turbid as levels drop and when ecologists wade over muddy bottom. This water should be discharged away from the drainage line and onto dry open land where mud can settle. To allow rapid fauna rescue, pump inlet needs to be large enough to suck sediment (e.g. 4 - 6 inch). Earthworks machinery can push sediment across the dam to assist final fish capture (adjusted to suit conditions and ecologist's instructions).  Grade escape ramp for fauna hidden in bottom sediment overnight.	Clear surrounding vegetation if part of works plan.  Leave escape ramp for fauna trapped overnight (two nights).	Remove sediment and commence reconstruction

Dam Decommissioning Work Method Procedure; and Sediment and Erosion Control

See Contractor's/Proponent's specifications plus recommendation on this map.

Appropriate permit applications

This dam removal is part of DA. If the dam is licensed with Water NSW, they require notification of dam decommissioning to remove it from the register. Website: [www.water.nsw.gov.au/Water-licensing/Applications/default.aspx](http://www.water.nsw.gov.au/Water-licensing/Applications/default.aspx); Email: [Customer.Helpdesk@waternsw.com.au](mailto:Customer.Helpdesk@waternsw.com.au); Phone: 1300 662 077.

Presence of fauna (terrestrial and aquatic) and action plan for any species detected.

Observations during a brief field survey (19/7/2021) found there were bird species using the dam but it is unlikely that there is a permanent bird population occupying or nesting in the dam. *Chenonetta jubata* (Australian Wood Duck) and *Anas castanea* (Chestnut Teal) were observed on the dam. Pest species may occur, such as *Carassius auratus* (Wild Goldfish), *Gambusia holbrooki* (Plague Minnow) and *Cyprinus carpio* (European Carp). No native fish or aquatic reptiles were observed, although based on dewatering activities nearby, it is predicted the following native aquatic fauna could inhabit the dam: *Anguilla australis* (Shortfin Eel), *Anguilla reinhardtii* (Longfin Eel), *Chelodina longicollis* (Eastern Long-necked Turtle) and *Phillypnodon grandiceps* (Flathead Gudgeon). Aquatic species detected in, on or immediately surrounding the dam included *Jucus usitatus*, *Persicaria decipiens*, *Typha orientalis*, *Callitriche stagnalis* and *Azolla* sp..

During dewatering, an aquatic ecologist should be on site to handle aquatic fauna. This will only be performed by a person with the following licenses/approvals: Section 37 *Fisheries Management Act 1994* (for fish); Biodiversity Conservation Licence – *Biodiversity Conservation Act 2016* (for turtles, frogs, wetland birds) (may not be required if the DA Conditions specify an Aquatic Ecologist is to be involved); and an Animal Research Authority (issued by the Secretary's Animal Care & Ethic Committee). The likely **aquatic fauna handling procedures** are:

- NOTICE:** The Aquatic Ecologist is to notify NSW Fisheries of the activity 48 hours prior to fish relocation (unless an agreement is in place), including locations of dewatered and relocation sites (see regional office contacts <https://www.dpi.nsw.gov.au/contact-us/local-office>). Fisheries require permits to be carried by the licensed ecologist, who should also display a sign clearly showing licence number (if working in public areas, especially when releasing fauna to local creek).
- PLANNING:** The dewatering schedule should allow time for fish rescue, especially during the final 0.3 - 1 m water depth (to be advised by Aquatic Ecologist). Fauna should be captured in one day, so pumps need to be of an adequate size and placed in an area free from mud and debris (e.g. inside excavator bucket or screened sump pit). If wetland birds are observed nesting, or young birds (chicks) are using the dam, advise the Aquatic Ecologist immediately for advice. Depending on species and age, birds may be able to relocate themselves. Chicks will need temporary refuge during dewatering, or works may need to be postponed.
- CAPTURE:** Fish are to be collected by hand nets during the final day of dewatering. This is most effective when the water is <0.3 m deep. Dissolved oxygen concentration will drop rapidly as water volume decreases, especially in warm water or if lots of fish are present. Larger bodied fish should be targeted first. Wetland birds will scavenge for small fish in the shallows (e.g. *Gambusia*). Most small fauna will likely remain uncaptured in the dam until the water becomes very shallow (especially eels and turtles). Eels are best captured by large hand nets in water <30 cm deep, although they burrow into mud. When the water is extremely low, turtles and fish may head towards the intake pump (placed in deepest part). This area should be monitored to intercept fauna (e.g. stand in water next to intake). Turtles will burrow into mud and may require observation and rescue the following morning but can also move themselves to suitable nearby habitat if an escape ramp is graded. For safety, at least two people are required when wading and handling heavy tubs of water/fish up banks (excavator can dig access steps/ramp).
- RELOCATE:** Native fish healthy enough for relocation are to be contained and transported in an aerated tub/bucket/tank to an appropriate dam/lake/waterhole/creek. NSW Fisheries advise that the host location should be large enough to accommodate additional fish, especially predatory eels. Additional release sites may be needed. Do not overstock tubs or leave in direct sun for extended periods. Aeration can be provided by battery aquarium pumps or manual turbulence if only stored for a short period. Turtles can be transported in a shaded tub with a wet hessian bag placed inside for moisture and support during transport. Tadpoles can be transported in small buckets.
- RELEASE:** Water from the receiving waterbody should be mixed slowly over 5 - 10 minutes with the tank water to allow fish to acclimatise to the new water quality. Care should be taken when releasing fauna not to also transfer weeds or invasive species (e.g. Carp eggs and *Gambusia*). Transfer animals via hand nets, rather than tipping the tub with water. Eels can be released on land a few metres from edge and pointed towards the water.
- PESTS:** Exotic fish (e.g. Carp, *Gambusia*, Goldfish, Redfin Perch, Spotted Livebearer) are to be intercepted, euthanised and disposed of in accordance with the ecologist's Animal Research Authority (issued by the Secretary's Animal Care & Ethic Committee). Exotic *Trachemys scripta elegans* (Red-eared Slider Turtle) are to be contained humanly and DPI immediately notified (Biosecurity Line - 1800 680 244). They will collect the live turtle from the ecologist.
- POST-DEWATERING:** An escape ramp should be graded to allow trapped fauna to escape overnight. Sediment should be left up to two nights to allow hidden fauna to emerge, unless the ecologist confirms there are no fauna remaining (site specific assessment). Earthworks staff should notify the appointed aquatic ecologist if stranded fish or turtles are observed post-dewatering.
- REPORTING:** The Aquatic Ecologist should prepare a summary report suitable for submission to Council within 7 days of completing the aquatic fauna relocation works. The report would detail that the works have been completed according to this Dam Dewatering Plan and would include information relating to the location of the dam decommissioning works, the licences held by the staff involved in the works, the number and type of native species relocated, location of release point/s for native fauna and the number and type of exotic species dispatched.