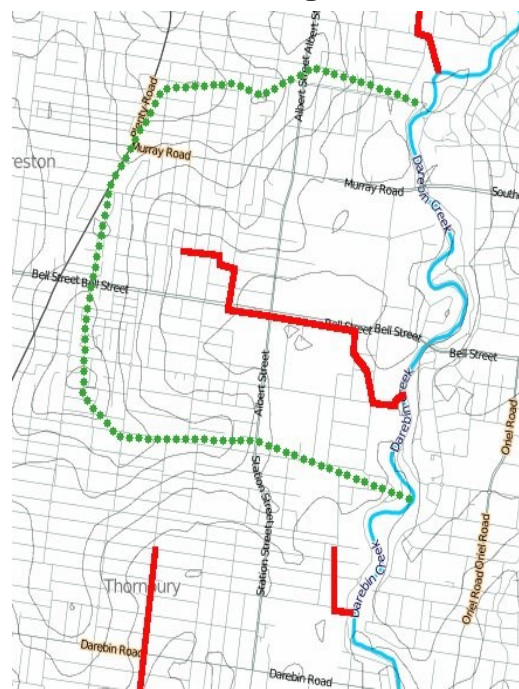


Ammonia-Nitrogen Loads in Bell St Main Drain by Michael Sephton (msephton81@hotmail.com , 0403 238 525)

The Bell St Main Drain drains a catchment of around 6.6 square kilometers(see green-dotted line below) between Chifley Drive and Plenty Road in Preston. The underground section of the drain opens up into a rocky gorge through which the stormwater flows along about 40 meters before running through two large pipes and into Darebin Creek.

Anticlockwise from top left: Outlet for underground section, Rocky gorge

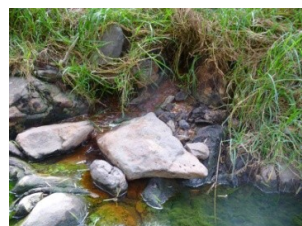


section, Final outlet into Darebin Ck, Map of Bell St Main Drain catchment.

We've been monitoring water quality of Darebin Creek at the Bell St Main Drain since May 2008. We measure pH, EC (electrical conductivity), Dissolved Oxygen (DO), Phosphate as phosphorus (PO4-P) and Total Ammonia-Nitrogen (NH3-N). The table below shows typical values that we get (medians).

Site	pH	EC (uS/cm)	DO (mg/L)	PO4-P (mg/L)	NH3-N (mg/L)
Upstream	7.5	705	9.5	0.06	0.27
Drain	7.4	1035	5.9	0.16	7.11
Downstream	7.6	735	9.5	0.07	0.41

In most respects the impact of the drain on the creek appears to be small. However for total ammonia, the median concentration downstream is about 50% greater than the median concentration upstream, and the in-drain concentration is over 20 times higher than the concentration in the creek. Most of the ammonium in the drain seems to come from two seeps within the rocky gorge (see photos below, left: seep a, right: seep b).



The levels of ammonia-nitrogen in these seeps are very high. Whereas the relevant State Environment Protection Policy suggests an objective of only 1mg/L total nitrogen, Melbourne Water tested seep a and b in May 2010 and found total ammonia of 53 mg/L and 23 mg/L respectively, Phosphorus marginally higher than in the creek at 0.23mg/L and 0.16mg/L respectively, and E coli concentrations of <10 organisms/100mL. An interesting point for comparison is that landfill leachate pumped out of the ground at Darebin Parklands has total ammonia in the range 130-670 mg/L.

Using the data we've collected over these few years, it's possible to estimate the nitrogen load by estimating the flow in the Bell St Main drain as follows:

$$Q_d * C_d = Q_u * C_u + Q_{drain} * C_{drain}$$

$$Q_u = Q_d - Q_{drain}$$

$$\therefore Q_d * C_d = Q_d * C_u - Q_{drain} * C_u + Q_{drain} * C_{drain}$$

$$\therefore Q_{drain} = Q_d \frac{(C_d - C_u)}{(C_{drain} - C_u)}$$

Where: Qd, Qu and Qdrain are flows downstream, upstream and in drain respectively, and Cd, Cu and Cdrain are concentrations of total ammonia-nitrogen downstream, upstream and in drain respectively.

In this way we estimate the drain contributes about somewhere around 1.9- 4.0 tonnes per year of nitrogen in the form of total ammonia.

Source	Median Nitrogen (mg/L)	Mean flow (ML/day)	Approximate Nitrogen Load (tonnes/year)
Bell St Main Drain (NH3-N)	7.11	0.76- 2.48	1.9-4.0
Darebin Creek (2010)	1.5	69	37
Yarra River (2010)	2.9	1500	1587

Note:Flow data for September 2010- September 2011, N concentration data for 2010. Both from Melbourne Water.

By these ball-park calculations the Bell St MD appears to contribute somewhere between 5-10% of the total Nitrogen load of the Darebin Creek catchment. So far the source of the seeps has not been found. Aerial photographs from 1945 and geological maps indicate there were quarries right where the seeps are (see photo: below left), but we haven't yet discovered if these quarries were used as rubbish tips and if so what might have been buried in them.



Macroinvertebrate surveys: We've done two macroinvertebrates survey each year at Bell St over the last few years. We've found aquatic worms and snails, leeches, glass shrimps, water boatmen and backswimmers in pool sections, damselfly nymphs, stick case and bandit caddisflies, false spider crabs and the occasional dragonfly nymph (see photo: above right), yabby (see photo: above middle), needle bug or water penny. Although this list might seem quite diverse, our samples sometimes rate quite poorly due to low abundance, low diversity of sensitive taxa or both.

If you would like to help us monitor the creek, can offer any insights or would like any more information , feel free to contact me.