

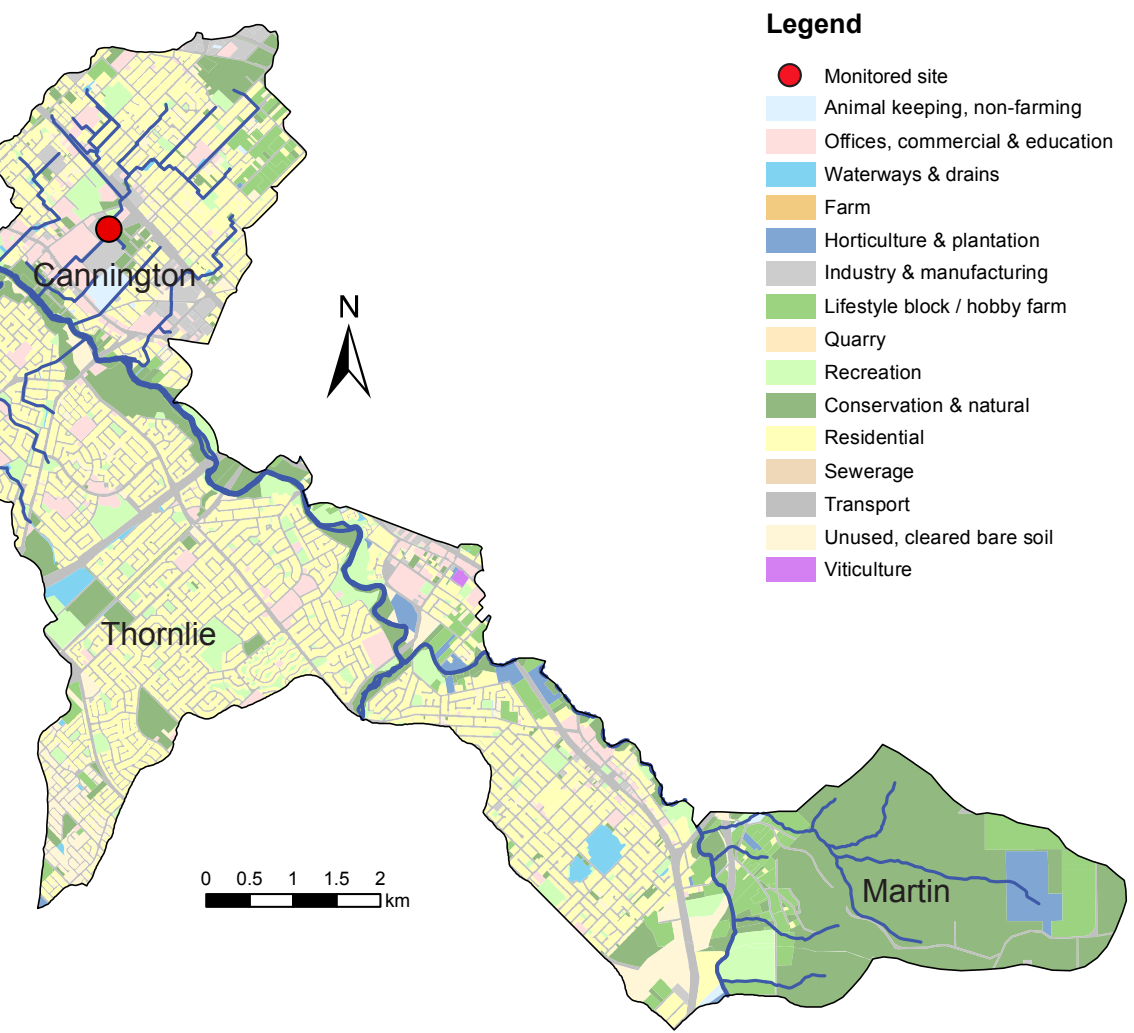
Lower Canning River

Cockram Street Drain is situated in the Lower Canning River catchment. It flows year-round and consists of mostly closed pipe drains with some open sections and a number of compensating basins along its length. There are a number of other drains that discharge to the Canning River which also lie within the Lower Canning River catchment.

The Cannington area was first subdivided in 1882, with a railway station constructed in the 1880s opposite Station Street in East Cannington. The area was initially semi-rural, with housing restricted to the area near the railway. Between 1860 and 1883 William Lacey Gibbs accumulated most of current day Cannington. His slaughteryard was located in what is now the Westfield complex. Almost the entire area is now urban.

The Cockram Street Drain catchment has a mix of Bassendean Sands and Forrestfield and Guildford soils with a small pocket of Spearwood Sands on the western boundary. The Bassendean sands are leached and have a very poor nutrient-retention capacity.

Water quality is monitored fortnightly at a site on Grose Avenue, on a section of open drain. After this, the drain becomes piped and passes under the Westfield Shopping complex before flowing through the Liege Street Wetland and from there, discharges into the Canning River. This site is positioned to indicate what nutrients are leaving the catchment and flowing into the Liege Street Wetland and subsequently the Canning River, so the data may not represent nutrient concentrations in upstream areas. It will also not represent other drains in the Lower Canning Catchment.



- Legend**
- Monitored site
 - Animal keeping, non-farming
 - Offices, commercial & education
 - Waterways & drains
 - Farm
 - Horticulture & plantation
 - Industry & manufacturing
 - Lifestyle block / hobby farm
 - Quarry
 - Recreation
 - Conservation & natural
 - Residential
 - Sewerage
 - Transport
 - Unused, cleared bare soil
 - Viticulture

Cockram St Drain – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	46 km ²
Per cent cleared area (2005)	74% (total catchment)
River flow	Flows year-round
Main land uses (2005)	Residential and associated transport facilities (roads), conservation and natural (total catchment)

Where the drains pass under roadways, they usually travel through culverts like these on Cockram Street Drain, April 2004. Photo: Angela Filardi.

Nutrient Summary: concentrations, rainfall and targets

Year	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual rainfall (mm)	009225	466.8	703.0	807.8	607.2	503.8	860.8	608.2	782.4	674.4	617.8	715.8
TN median (mg/L)	SCCIS3		1.80			1.55	1.50	1.40 [#]	1.60 [#]	1.60 [#]	1.55 [#]	1.65 [#]
TP median (mg/L)	SCCIS3		0.220			0.270	0.220	0.260	0.260	0.295	0.230	0.200 [#]

TN short term target = 2.0 mg/L

TN long term target = 1.0 mg/L

TP short term target = 0.2 mg/L

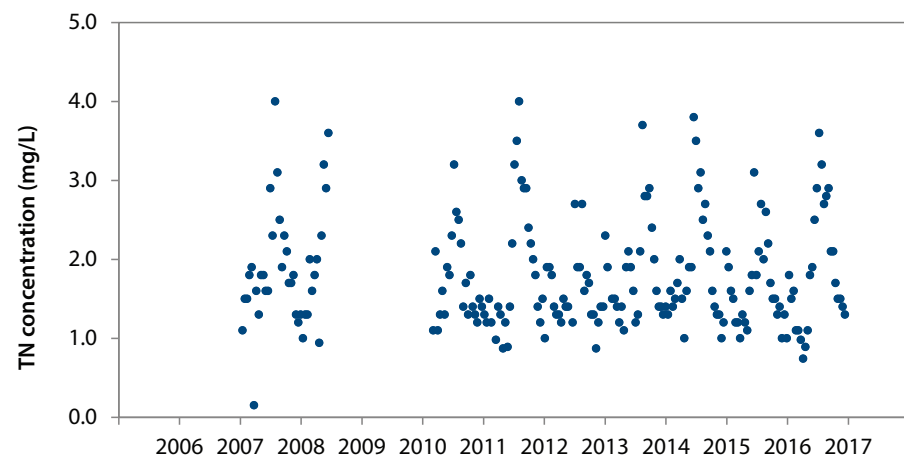
TP long term target = 0.1 mg/L

insufficient data to test target
 failing both short and long-term target
 passing short but failing long-term target
 passing both short and long-term target

* Best estimate using available data. # Statistical tests that account for the number of samples and large data variability are used for testing against targets on three years of winter data. Thus the annual median value can be above the target even when the site passes the target (or below the target when the site fails).

Changes in nutrient concentrations over time in Cockram Street Drain

Total nitrogen concentrations over the 2006 to 2016 monitoring period



Trend

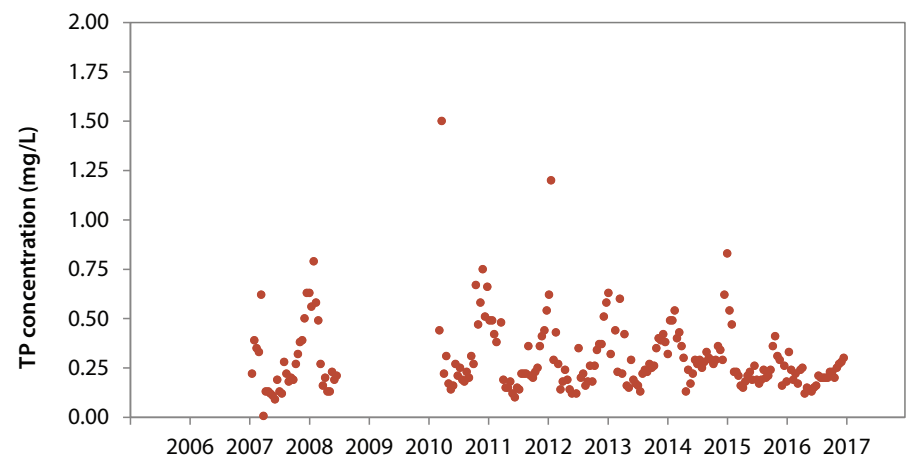
Total nitrogen (TN) concentrations appeared stable over the reporting period with no trend detected.

Target

Cockram St Drain, which discharges into the Lower Canning River, has been failing the short- and long-term TN targets since monitoring commenced.



Total phosphorus concentrations over the 2006 to 2016 monitoring period



Trend

Total phosphorus (TP) concentrations appear to have decreased since 2010, especially in winter. Trend analysis detected an emerging decreasing trend of 0.02 mg/L/yr over the 2012–16 period.

Target

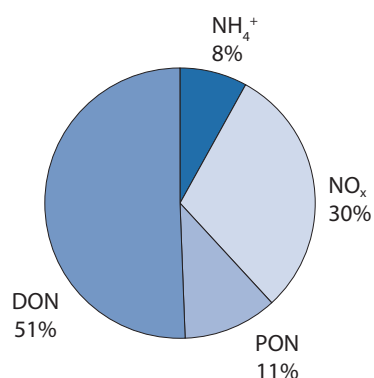
Cockram St Drain, which discharges into the Lower Canning River, has been failing the short- and long-term TP targets since monitoring commenced.



Compensating basin in Lower Canning catchment, November 2005.

Nutrient fractions in Cockram Street Drain

Average composition of nitrogen (N) in Cockram Street Drain over the 2012 to 2016 monitoring period



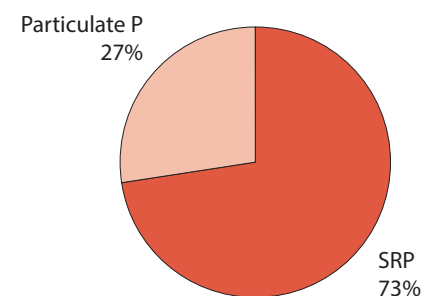
Nitrogen

Just over 60% of the nitrogen (N) was organic N which consists of both dissolved (DON) and particulate (PON) fractions. DON comprises organic compounds leached from peaty subsoils and degrading plant and animal matter and is available for uptake by plants, algae and bacteria. PON is

composed of plant and animal debris and needs to be further broken down to become available to plants and algae. The remaining N was present as dissolved inorganic N (DIN, consisting of ammonium – NH_4^+ and N oxides – NO_x) which is mostly derived from fertilisers, industrial discharge and animal waste. These forms of N are readily available for plant and algal uptake.

There were no flow data for Cockram Street Drain so loads have not been calculated.

Average composition of phosphorus (P) in Cockram Street Drain over the 2012 to 2016 monitoring period



Phosphorus

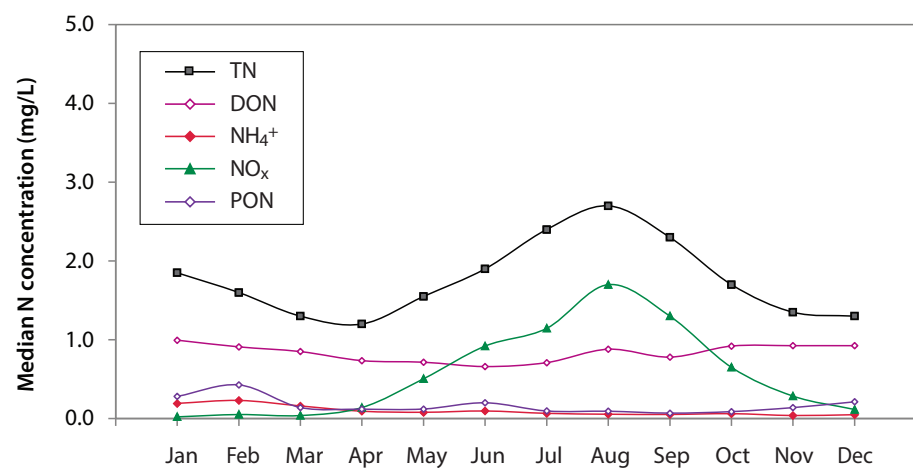
There were no flow data for Cockram Street Drain so loads have not been calculated.

Soluble reactive P (SRP) made up nearly three-quarters of the P present. This form of P is readily used by plants and algae. Likely sources for this kind of P include fertilisers used on home gardens and parks, industrial discharges, animal waste and septic tank leachate. The remainder of the P was in the form of particulate P. This form of P is derived from organic material, algae and sediment-bound forms of P. Particulate P is not readily available for plant and algal uptake, though some may become available as particles decompose or bound phosphate is released.

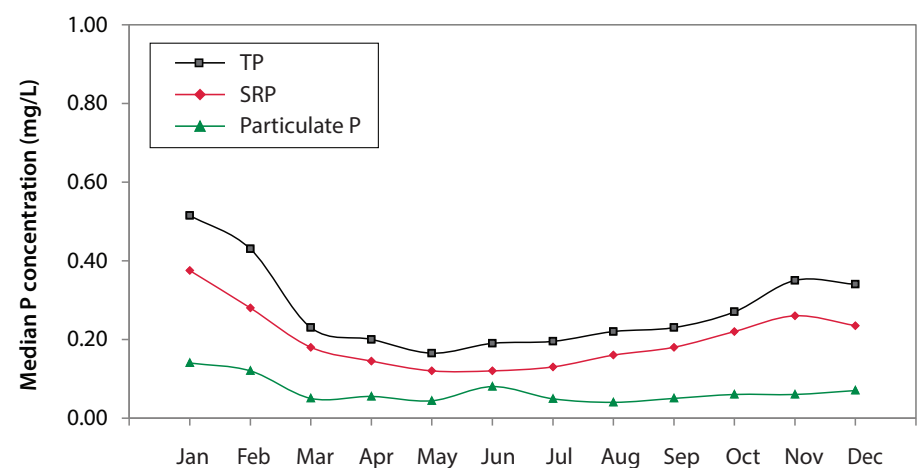


Seasonal variation in nutrient concentrations in Cockram Street Drain

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

A strong seasonal pattern in NO_x concentration was observed which caused a corresponding pattern in TN. All other types of N remained fairly constant throughout the year. NO_x is probably being washed into the drain by surface flows which increase as rainfall increases. The other forms of N are likely coming from both surface and groundwater flows as well as from instream sources such as algae (which is detected as PON).



Drain in Lower Canning catchment, April 2004.
Photo: Angela Filardi

Phosphorus

A seasonal pattern was evident in SRP, with higher concentrations in summer months than during winter. This suggests that the majority of SRP was entering the drain from a combination of groundwater, runoff from reticulated gardens and industrial discharges. Particulate P showed a similar (though not as pronounced) pattern (probably driven by instream sources such as algae) and also had a small

peak in June, perhaps linked to increasing rainfall and flow at this time.



Geese swimming through Azolla in a compensating basin in the Lower Canning Catchment, April 2004.
Photo: Angela Filardi



Photo: Water Science Branch



Photo: Angela Filardi



Photo: Katherine Bennett

Photographs of the Lower Canning catchment: (Top left) Looking at the outlet of the Liege Street Wetlands, October 2014. (Bottom left) Cockram Street Drain April 2004. (Right) Collecting a water sample at the catchment sampling site, August 2017

Local nutrient reduction strategies for the Lower Canning

Nutrient reduction strategies being conducted or recently completed in the Lower Canning catchment include but are not limited to:

- The South East Regional Centre for Urban Landcare (SERCUL) which has conducted major on ground restoration projects within the Canning River Regional Park via various external funding sources including State NRM, Department of Biodiversity, Conservation and Attractions (DBCA) and the Swan Alcoa Landcare Program.
- The DBCA's Drainage and Nutrient Intervention Program has implemented several nutrient intervention projects through the Lower Canning catchment in partnership with the City of Canning, SERCUL and other government agencies including the Liege Street Wetland, the Manley Street bio-retention trench and the Wharf Street Wetland to reduce nutrients entering the Canning River.
- Canning River Regional Park Volunteers who are a small, dedicated group that work within the Canning River Regional Park to conduct weeding and planting restoration activities.
- The DBCA's Riverbank Program which has funded numerous projects across three key foreshore sites in the Lower Canning catchment. Projects have included restoration using weed control and revegetation. Examples of this include John Okey Davis Park, Homestead Park and Corriedale Springs.
- The DBCA's Healthy Catchments Program aims to protect the environmental health and community benefit of the Swan Canning river system by improving water quality in the catchments. This is achieved through engaging partners and focusing the effort of local governments, sub-regional groups, the community and other organisations in water quality improvement activities.

- Coordination and support of community led projects to reduce nutrient inputs into the Canning River in the south sub-region led by SERCUL and funded by DBCA.
- The Phosphorus Awareness Project which assists the community in reducing their nutrient outputs through education, promotion and behaviour change programs.

Swan Canning water quality improvement plan

The *Swan Canning water quality improvement plan* (SCWQIP) complements the delivery of other major programs and presents a roadmap for reducing nutrient inputs into the river system. It uses sophisticated modelling to identify nutrient sources and provides nutrient-reduction targets for each of the subcatchments.

SCWQIP load and concentration targets for Lower Canning

	Max. acceptable load (t/yr)	Concentration target (mg/L)	% reduction required
TN	2.5	0.75	68%
TP	0.4	0.075	59%

For further information on the SCWQIP contact: rivers.info@dbca.wa.gov.au



Liege Street Wetland, October 2014

Summary: Lower Canning River

- Cockram Street Drain is currently failing both the short- and long-term TN and TP targets.
- Of the 33 sites sampled, this site has the sixth-highest median TN concentration and the fourth-highest median TP concentration.
- Of the 33 sites sampled, Cockram St Drain has the highest percentage of P present as bioavailable SRP.
- A 68% reduction in TN and a 59% reduction in TP is required for this catchment to meet its SCWQIP targets.
- An emerging decreasing short-term trend in TP concentrations was detected.