Perth Airport North

The Perth Airport North Main Drain (also known as Limestone Creek) has its headwaters in the Darling Scarp where it is known as Poison Gully Creek. This is the largest waterway in the Perth Airport North catchment though there are other, smaller, drains which also discharge to the Upper Swan Estuary.

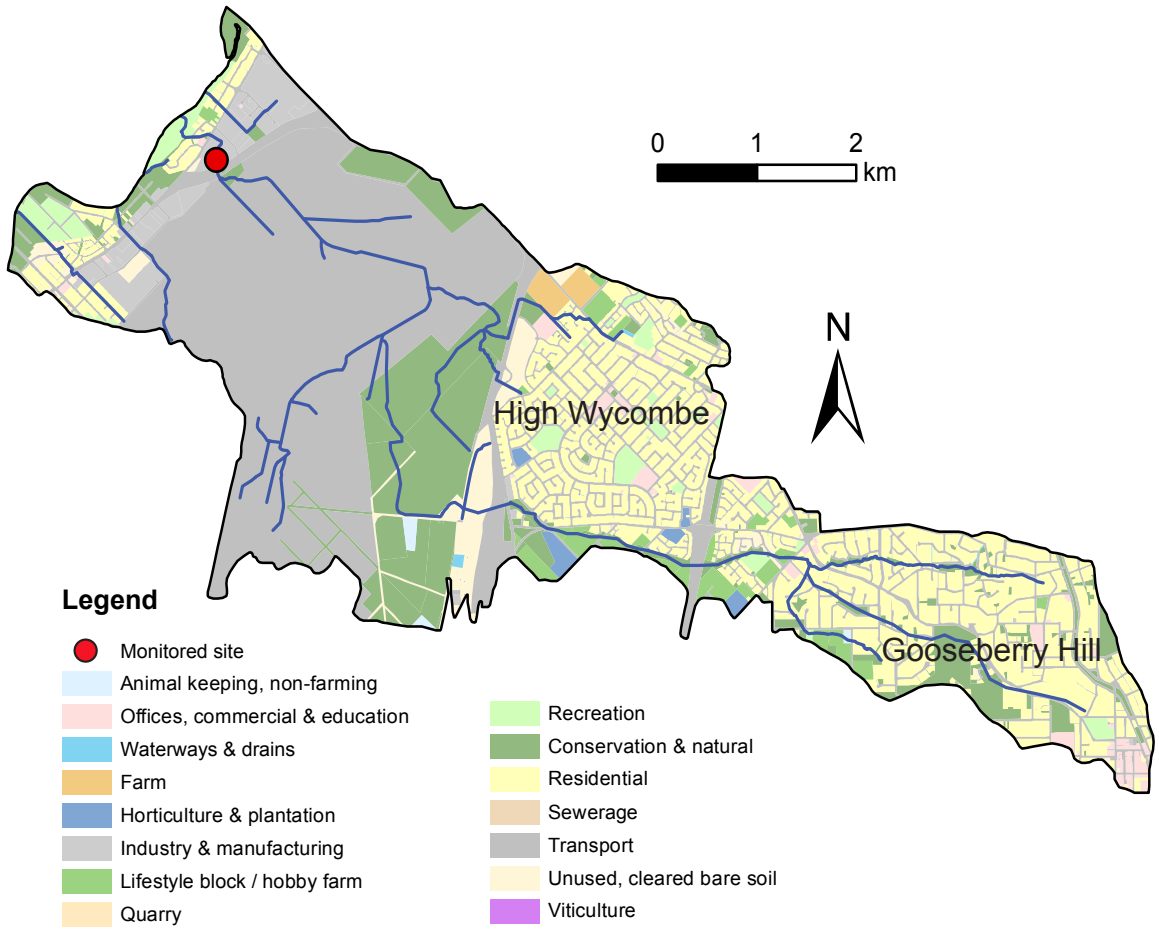
Both Munday Swamp and Poison Gully Creek have been deemed highly significant to Nyungar people and there are numerous archeological sites in the area.

European settlers used the land in the catchment for agricultural activities and stock grazing. The site for the airport itself was selected in 1938 on Dunreath golf course. Construction commenced in 1943 though the airport was initially used for military purposes only. Most of the undeveloped land at the airport is technically a wetland and has been categorised as a conservation category wetland. In 2002 to 2003, Poison Gully Creek was diverted around the Poison Gully wetlands and around Munday Swamp. At the same time, a large new drain was constructed to drain water from the airport, directly into Limestone Creek.

Landuse in the upper half of the catchment is mostly urban, while the lower half consists of bushland and a large portion of the airport, including the terminals.

The most common soil types in the catchment are Forrestfield and Guildford soils with small areas of Bassendean Sands. In the eastern portion of the catchment there is a small area of red gravels and earths and some shallow red and yellow earths along the scarp. The soils in the western portion of the catchment have poor nutrient-retention capabilities so any nutrients applied as fertiliser are quickly transported to groundwater when water is applied.

Water quality is monitored fortnightly in Limestone Creek, where it passes under the Great Eastern Highway Bypass in South Guildford. This site was chosen to give an indication of the nutrient leaving the catchment and discharging into the Upper Swan Estuary. It does not represent nutrients in upstream areas or in other drains in the catchment.



Poison Gully Creek in Maida Vale, March 2016

Limestone Creek – facts and figures

Average rainfall (2012–16)	~ 680 mm per year (Perth metro)
Catchment area	28 km^2
Per cent cleared area (2005)	90% (total catchment)
River flow	Generally flows year-round
Major land use (2005)	Transport (roads and airport) and residential (total catchment)

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)	SCCIS12		0.74			0.57	0.78	0.66	0.65	0.67	0.68	0.68
TP median (mg/L)	SCCIS12		0.024			0.026	0.034	0.030	0.034	0.035	0.038	0.029

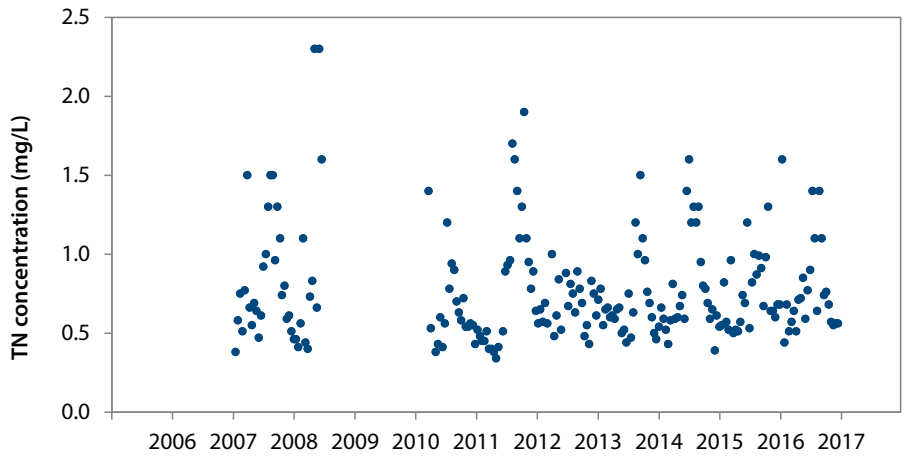
TN short term target = 2.0 mg/L TN long term target = 1.0 mg/L TP short term target = 0.2 mg/L TP long term target = 0.1 mg/L

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

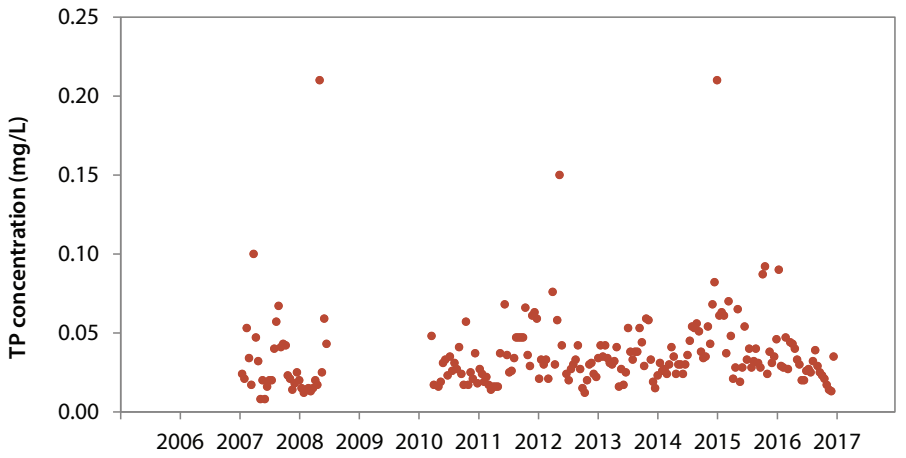
* Best estimate using available data. # Statistical tests that account for the number of samples and large data variability are used for testing against targets on three years of winter data. Thus the annual median value can be above the target even when the site passes the target (or below the target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

Changes in nutrient concentrations over time in Limestone Creek

Total nitrogen concentrations over the 2006 to 2016 monitoring period



Total phosphorus concentrations over the 2006 to 2016 monitoring period



Trend

There appears to have been a step change (increase) in total nitrogen (TN) concentrations in mid 2011. The reason for this change is unknown. Since 2012, TN concentrations appear to be steady. There were no trends in TN concentrations.

Target

Limestone Creek has been passing the short- and long-term TN targets since monitoring commenced.

Sampling in the Perth Airport North catchment as part of a different project, April 2004. Photo: Zoe Goss.

Trend

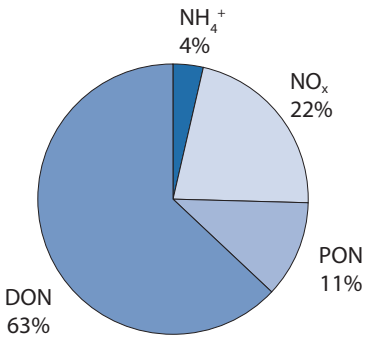
Total phosphorus (TP) concentrations appear to have fluctuated over the reporting period, with 2014–15 having higher concentrations than surrounding years. The reason for these higher concentrations is unknown. There were no trends in TP concentrations.

Target

Limestone Creek has been passing the short- and long-term TP targets since monitoring commenced.

Nutrient fractions in Limestone Creek

Average composition of nitrogen (N) in Limestone Creek over the 2012 to 2016 monitoring period

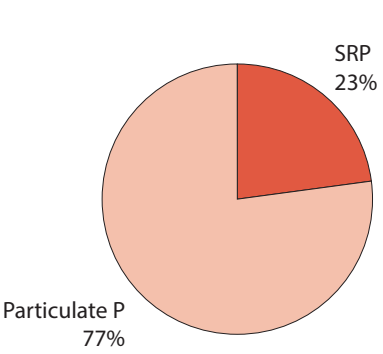


Nitrogen

Three-quarters of the nitrogen (N) was present in the form of organic N which consists of dissolved (DON) and particulate (PON) fractions. DON largely comprises organic compounds leached from peaty sub-soils and degrading plant and animal matter. It 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 from fertilisers, animal waste and septic tank leachate. These forms of N are readily available for plant and algal uptake.

There were no flow data for Limestone Creek so loads have not been calculated.

Average composition of phosphorus (P) in Limestone Creek over the 2012 to 2016 monitoring period



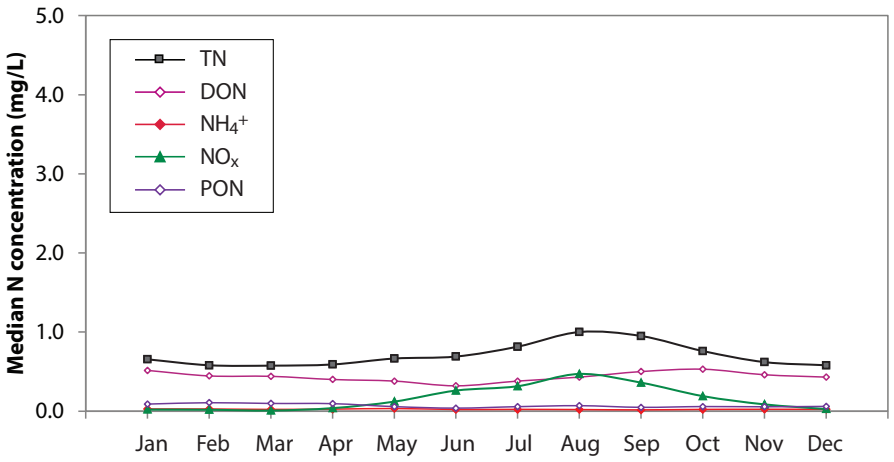
Phosphorus

More than three-quarters of the phosphorus (P) was present as particulate P, commonly associated with soil erosion and suspended sediments in the water column (this site is often very turbid) as well as in the form of algae. Plants and algae do not readily absorb particulate P, however some of it will become available over time as particles decompose or release bound phosphate. The remainder of the P was present as highly bioavailable soluble reactive phosphorus (SRP). Likely sources of SRP include animal waste and fertiliser. SRP is readily used by plants and algae.

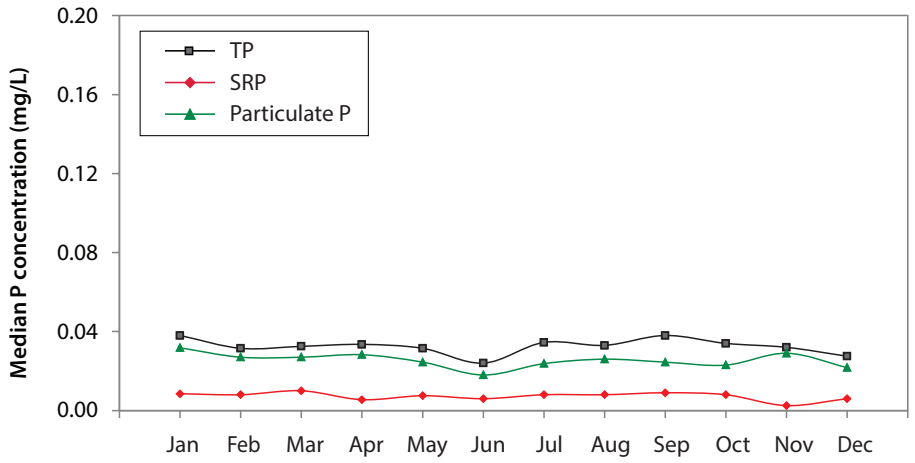
There were no flow data for Limestone Creek so loads have not been calculated.

Seasonal variation in nutrient concentrations in Limestone Creek

Nitrogen seasonal variation over the 2012 to 2016 monitoring period



Phosphorus seasonal variation over the 2012 to 2016 monitoring period



Nitrogen

NO_x and TN showed a clear seasonal pattern, being highest during the high rainfall and hence high flow months. This suggests that most of the NO_x is entering the creek via surface and sub-surface flows. DON, PON and NH_4^+ did not show a clear seasonal response indicating that they are being delivered via a number of pathways including groundwater, surface and sub-surface flows as well as instream sources.

Photo: Emma van Looij

Phosphorus

Phosphorus concentrations showed no clear seasonal pattern, being fairly constant throughout the year. This indicates that P is probably entering the brook via a variety of pathways such as groundwater and surface and sub-surface flows, as well as being present in the brook in the form of algae and macrophytes.

Photo: Emma van Looij

Photo: Emma van Looij

Photo: Water Science Branch

Photo: Emma van Looij

Photographs of Perth Airport North: (Top left) Limestone Creek, downstream of Great Eastern Highway. Note the abundance of grasses growing in the channel and along the banks, March 2016. (Bottom left) Culverts in the Perth Airport North catchment, note the abundance of grass and other exotic species growing in the channel, April 2015. (Right) Looking downstream at the sampling site, August 2016.

Local nutrient reduction strategies for Perth Airport North

Nutrient reduction strategies being undertaken or recently completed in the Perth Airport North catchment include but are not limited to:

- Perth Airport Environment Strategy was a five-year action plan implemented from 2009–14 and included actions directed towards maintaining and protecting the quality of soil and water within the airport estate; identifying degraded sites and facilitating their remediation and minimising the potential for adverse impacts to groundwater and ecological water flows from the airport and tenant activities.
- Department of Biodiversity, Conservation and Attractions (DBCA) Riverbank Program which has funded numerous projects across three key foreshore sites in the Perth Airport North catchment. Projects have included construction of erosion control treatments such as rock revetments and bioengineering as well as restoration techniques using weed control and revegetation. Examples include projects such as Garvey Park and Loder Way.
- 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.
- Phosphorus Awareness Project which aims to assist 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 Perth Airport North

	Max. acceptable load (t/yr)	Concentration target (mg/L)	% reduction required
TN	1.3	0.75	34%
TP	0.21	0.075	0%

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

Poison Gully Creek in Maida Vale, dry in March 2016. Photo: Emma van Looij

Summary: Perth Airport North

- TN and TP concentrations in Limestone Creek are currently passing both the short- and long-term targets.
- Of the 33 sites sampled, Limestone Creek has one of the lowest median TN concentrations.
- Of the 33 sites sampled, Limestone Creek has the second-lowest percentage of P present as bioavailable SRP.
- TP loads are currently acceptable and the Perth Airport North catchment is passing its SCWQIP TP target.
- A 34% reduction in TN is required for Perth Airport North to pass the SCWQIP TN target.

www.dwer.wa.gov.au
www.dbca.wa.gov.au

For further information please contact the
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