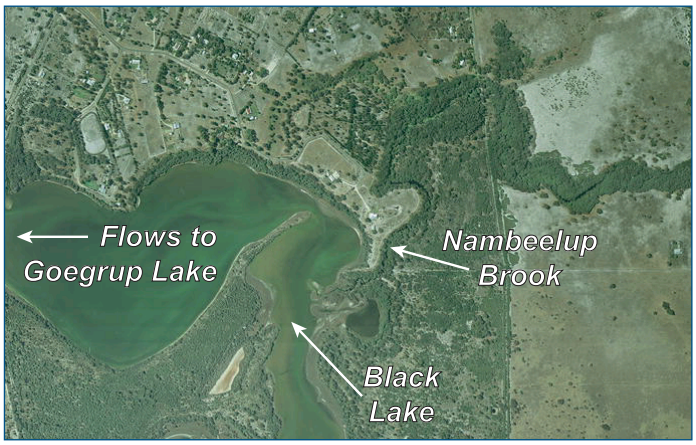
Nambeelup Brook

The entire Nambeelup Brook catchment is on the Swan Coastal Plain. The brook drains into Black Lake which feeds into Goegrup Lake (one of the Serpentine Lakes) and hence the Serpentine River. The *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* lists Black Lake as having high conservation significance.



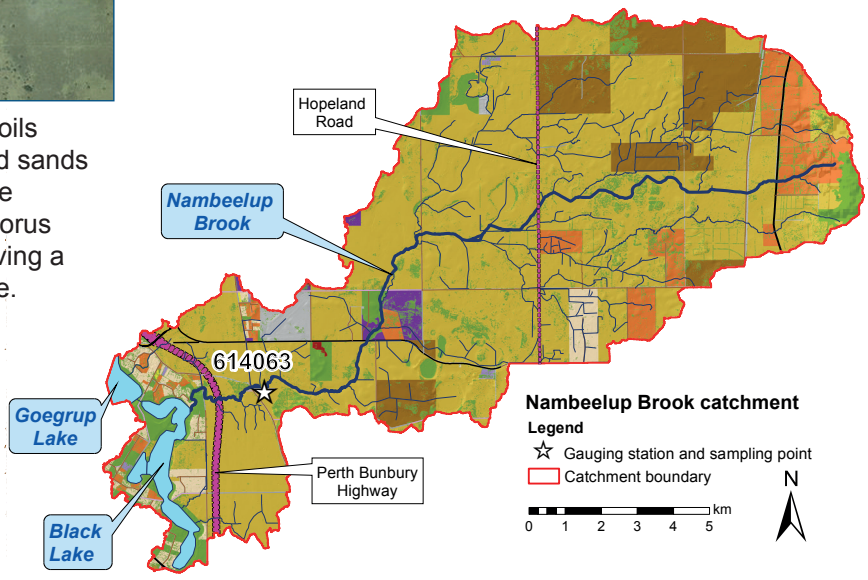
To the west of Hopeland Road the catchment's soils consist of sandy and clayey swamps and leached sands with nearly 20% subject to inundation. Most of the catchment has a high or very high risk of phosphorus loss to waterways with 83% of the catchment having a phosphorus retention index (PRI) of less than five.

Water quality has been monitored near the catchment outlet, at the gauging station at Kielman (614063), to the west of Paterson Road since 1990.

Flow has been monitored since March 2005. Nambeelup Brook was consistently dry each March, although flow can stop from around November to June. The longest period the Brook stopped flowing for was 218 days, between November 2010 and June 2011.

The Nambeelup Brook catchment had the second-highest percentage of agricultural land ('cattle for beef and dairy') of the Peel-Harvey sub-catchments. It had the lowest natural vegetation coverage (km² and %) of the catchments draining to the Serpentine River, and the second-lowest percentage within the Peel-Harvey catchment.

Land use classification (2006)[1]	Area (km²)	Area (%)
Animal keeping – non-farming (horses)	9.0	6.3
Cattle for beef (predominantly)	89	62
Cattle for dairy	14	10
Conservation and natural	21	15
Horticulture	0.2	0.1
Industry, manufacturing and transport	4.2	2.9
Intensive animal use	0.1	0.1
Lifestyle block	4.1	2.8
Mixed grazing	1.3	0.9
Offices, commercial and education	0.01	<0.01
Recreation	0.01	<0.01
Residential	0.04	0.03
Total	**143**	**100**



In 2014 Nambeelup Brook had the second-highest median TN and TP concentrations of the 13 sites sampled in the Peel-Harvey catchment.

It was also one of two sites to have an emerging increasing TP trend[2] detected (2010–14).

Nutrient summary: median concentrations, loads and status classification at 614063

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Annual flow (GL)	-	-	-	-	20*	3.5	11	13	15	1.5	9.2	6.1	9.8	9.7
TN median (mg/L)	2.6	2.6	2.8	2.8	2.7	2.4	3.1	3.0	3.1	3.0	3.4	3.4	3.8	3.7
TP median (mg/L)	0.66	0.63	0.73	0.69	0.60	0.61	0.59	0.58	0.46	0.49	0.61	0.51	0.65	0.60
TN load (t/yr)	-	-	-	-	55*	10	35	35	38	4.8	27	19	30	30
TP load (t/yr)	-	-	-	-	12*	2.1	7.2	7.9	8.6	0.87	5.7	3.8	6.1	5.9

Status classification[2] Low Moderate High Very high

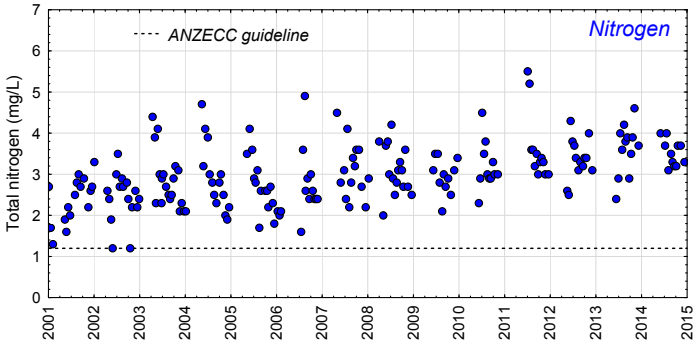
Status reported for three-year period end (i.e. 2012–14 reported in 2014)

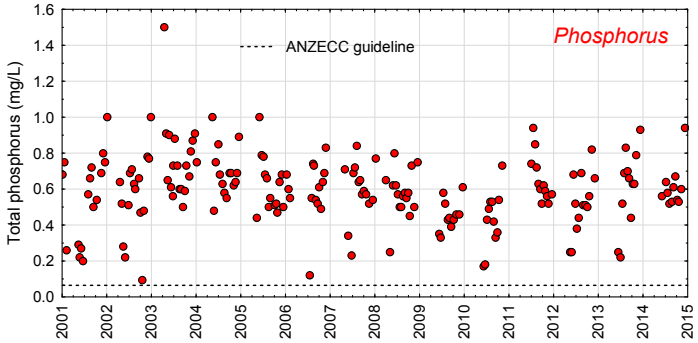
TN = total nitrogen TP = total phosphorus

* Best estimate using available data

(- not applicable)

Total nitrogen (TN) and total phosphorus (TP) concentrations (2001–14) at 614063





TN concentration:

Between 2001 and 2014 all but two TN samples (2002) exceeded the ANZECC[3] guideline for lowland rivers (1.2 mg/L).

During the same period 18% of TN samples exceeded 3.6 mg/L, three times the ANZECC[3] guideline. The percentage of samples greater than 3.6 mg/L ranged from 0% (2001, 2002 and 2009) to 58% (2013).

The percentage of samples that exceeded 3.6 mg/L increased from 12% (2005–09) to 34% (2010–14).

TN trend:

Trend analysis[2] used data from 2010 to 2014 inclusive.

No trend was detected.

TP concentration:

Between 2001 and 2014 all TP concentrations exceeded the ANZECC[3] guideline for lowland rivers (0.065 mg/L).

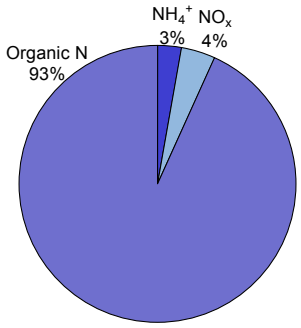
During the same period 36% of TP samples exceeded 0.65 mg/L, 10 times the ANZECC[3] guideline. The percentage of samples that exceeded 0.65 mg/L ranged from 0% (2009) to 61% (2003).

TP trend:

Trend analysis[2] used data from 2010 to 2014 inclusive.

An emerging increasing trend (0.031 mg/L/year) was detected.

Nutrient fractions (2010–14) at 614063



Nitrogen:

Most of the nitrogen (N) was organic in nature. Organic N consists of both dissolved organic and particulate N. It is derived from degrading plant and animal matter and fertilisers. It often needs to be further broken down before it can be used by plants and algae.

The remaining N was present as dissolved inorganic N (DIN) such as ammonium (NH_4^+) and N oxides (NO_x).

DIN is also derived from animal wastes and fertilisers but is readily available to plants and algae.

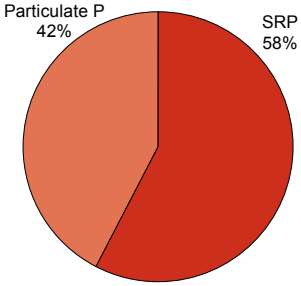
Nambeelup Brook had the second-highest percentage of organic N of all the routine sampling sites in the Peel-Harvey catchment. This was most likely due to animal-dominated land uses (cattle, sheep and pigs).

Nambeelup Brook – June 2005

Phosphorus:

More than half the phosphorus (P) was present as soluble reactive phosphorus (SRP). SRP is derived from fertilisers and animal wastes and is readily available for uptake by plants and algae.

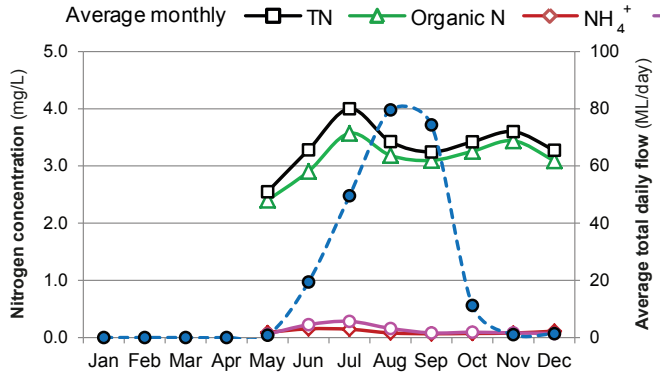
The remaining P was present as particulate P, which consists of sediment-bound forms of P and organic waste materials.

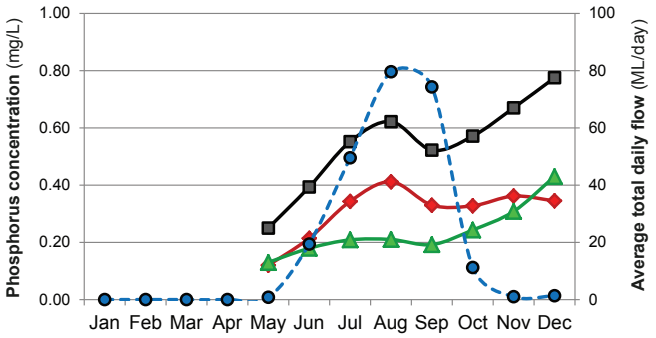


Particulate P is not readily available for uptake by plants and algae, but may become available over time as organic matter decomposes or soil particles release bound P.

Nambeelup Brook was one of four routine sampling sites in the Peel-Harvey catchment that had more than half the P present as SRP. All four sites were in catchments where more than half the catchment area had a high or very high risk of phosphorus leaching into waterways.

Seasonal variations in nutrient concentrations and riverine flow (2010–14) at 614063





Nitrogen:

Nitrogen concentrations increased with flow and the highest average monthly concentrations occurred in July.

All monthly TN averages exceeded ANZECC[3] guidelines. Average monthly concentrations of NH_4^+ and NO_x exceeded the guidelines through winter. NH_4^+ concentrations also exceeded guidelines during December before the brook stoped flowing.

	ANZECC 2000[3]	Months exceeded
TN	1.2 mg/L	All*
NH_4^+	0.08 mg/L	May– Aug, Dec
NO_x	0.15 mg/L	Jun–Aug
TP	0.065 mg/L	All*
SRP	0.04 mg/L	All*
* Except Jan–Apr as no data. (May had fewer than three samples)		

Phosphorus:

SRP concentrations were greater than particulate P between June and November during winter flows. This suggests that excess soluble phosphorus from fertiliser use or animal waste are being flushed into the brook.

Increases in particulate P during the drier months may be attributed to stock access destabilising banks and mobilising sediments or algal growth converting the available SRP.

All average monthly TP and SRP concentrations exceeded ANZECC[3] guideline values.

Nambeelup Brook 614063 – May 2008

Stock exclusion

In 2003 landholders within the catchment were approached to install fencing as part of a Coastal Catchments Initiative stock exclusion project. Fencing on several properties was completed in 2005.

Nambeelup District Water Management Strategy

The Department of Planning is preparing a district structure plan for the Nambeelup Industrial Area to support growth in the Peel region. As part of this process a district water management strategy is being developed by JDA in consultation with the Department of Water, Water Corporation and the Office of Environmental Protection Authority.

Downstream view – February 2007

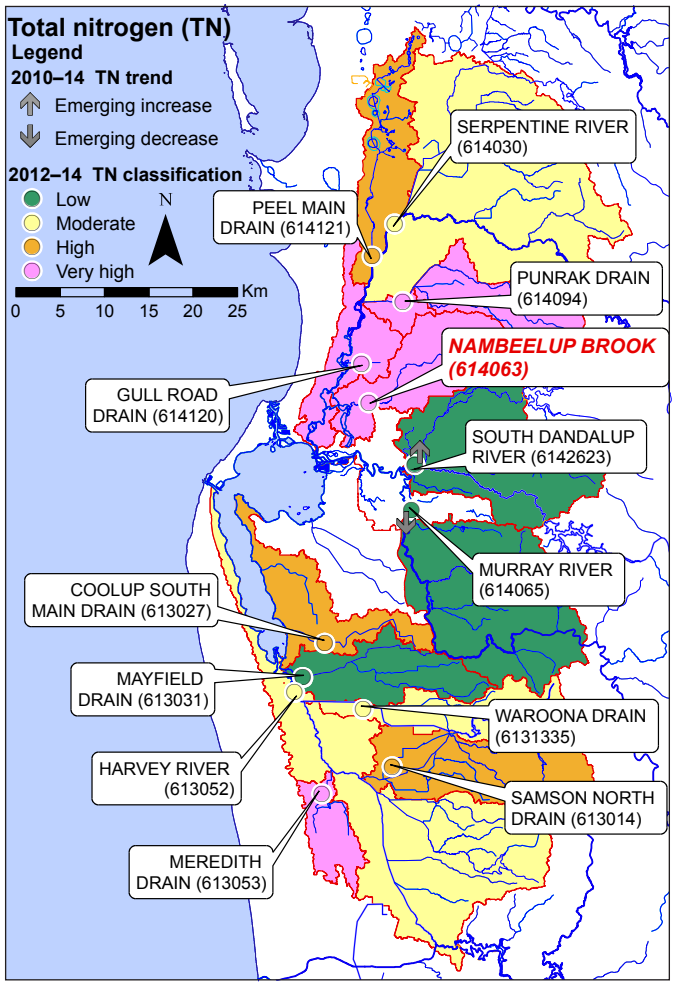
614063 – March 2005

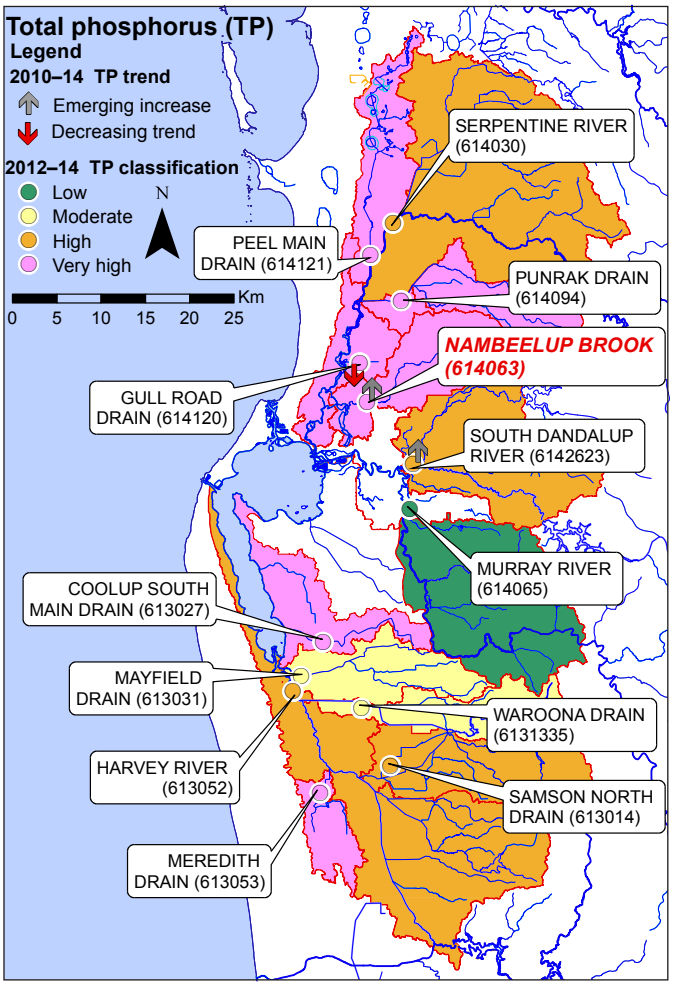
February 2006

Inlet pipes and staff gauge – March 2005

How Nambeelup Brook fits within the Peel-Harvey catchment: location and statistics

Catchment	Receiving waterbody	Sample site (AWRC)	Area (km^2)	2014 Flow (GL)	2014 TN median (mg/L)	2014 TP median (mg/L)
Peel Main Drain	Serpentine River	614121	120	5.0	1.7	0.19
Upper Serpentine River	Serpentine River	614030	502	28	0.79	0.13
Dirk Brook – Punrak Drain	Serpentine River	614094	134	9.6	1.9	0.21
Nambeelup Brook	**Serpentine River**	**614063**	**143**	**9.7**	**3.7**	**0.60**
Lower Serpentine River - Gull Road Drain	Peel Inlet	614120	94	-	4.4	0.93
South Dandalup River	Murray River	6142623	243	-	1.1	0.11
Mid Murray River	Murray River	614065	293	153	0.57	0.01
Coolup South Main Drain	Harvey Estuary	613027	113	2.1	2.1	0.31
Mayfield Drain	Harvey Estuary	613031	119	15	0.73	0.03
Harvey River	Harvey Estuary	613052	408	98	1.4	0.15
Drakes Brook – Waroona Drain	Harvey River	6131335	107	-	0.99	0.07
Samson North Drain	Harvey River	613014	195	-	1.5	0.18
Meredith Drain	Harvey River	613053	56	-	2.8	0.38





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[1] Kelsey, P, Hall, J, Kretschmer, P, Quinton, B & Shakya, D 2010, *Hydrological and nutrient modelling of the Peel-Harvey catchment*, Water Science Technical Series, Report no. 33, Department of Water, Western Australia.

[2] Department of Water 2015, *Catchment nutrient reports* (methods for the analysis of status classification, loads and trends), <http://www.water.wa.gov.au/water-topics/waterways/assessing-waterway-health/catchment-nutirent-reports>.

[3] ANZECC & ARMCANZ 2000, *Australian guidelines for water quality monitoring and reporting,* National Water Quality Management Strategy, Paper no. 7, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

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