Henley Brook is an ephemeral system which ceases to flow for a few months over summer. In the upper portion of the catchment it has been modified into a piped drain where it flows through urban areas. The bottom section of the brook is more natural though it does have a series of dams where it flows along West Swan Road and Brockman Street. It discharges into the Swan River near the Swan Valley Oasis Resort.

Nyungar people of the Wadjuk tribe have inhabited the region for at least 40,000 years and are the traditional owners of the Swan Valley. Following Captain James Stirling’s exploratory voyage up the Swan River in 1827 European settlement occurred from 1829 with arable and livestock farming. Migrants who came to the valley after WWI, in the 1920s, and WWII included Croatia farmers who were largely responsible for changing the valley from agricultural lands to vineyards.

In the last ten years the central portion of the catchment has been almost entirely converted from pine plantation to urban. The lower section of the catchment consists mainly of lifestyle blocks and hobby farms as well as viticulture along the Swan River.

Soils in most of the catchment are leached Bassendean sands with a smaller area of Pinjarra Zone soils in the eastern portion, close to the Swan River. The Bassendean sands have very poor nutrient-retention capabilities; any nutrients applied to the surface will rapidly leach into the groundwater after water is applied.

Water quality is monitored at a site near the end of Brockman Street, just after the series of dams. The site is positioned to indicate nutrient concentrations leaving the catchment and flowing into the Swan River, so the data may not represent nutrient concentrations in upstream areas.

Henley Brook – facts and figures

<table>
<thead>
<tr>
<th>Henley Brook – facts and figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average rainfall (2010–14)</td>
</tr>
<tr>
<td>~ 686 mm per year (Perth metro)</td>
</tr>
<tr>
<td>Catchment area</td>
</tr>
<tr>
<td>13.5 km²</td>
</tr>
<tr>
<td>Per cent cleared area (2005)</td>
</tr>
<tr>
<td>64%</td>
</tr>
<tr>
<td>River flow</td>
</tr>
<tr>
<td>Ceases to flow in most years for a few months over summer</td>
</tr>
<tr>
<td>Main land uses (2005)</td>
</tr>
<tr>
<td>Conservation and natural and unused, cleared bare soil</td>
</tr>
</tbody>
</table>

Nutrient Summary: concentrations, rainfall and targets

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual rainfall (mm)</td>
<td>009225</td>
<td>703.0</td>
<td>807.8</td>
<td>607.2</td>
<td>503.8</td>
<td>860.8</td>
<td>608.2</td>
<td>782.4</td>
</tr>
<tr>
<td>TN</td>
<td>median (mg/L)</td>
<td>HBBROCK</td>
<td>1.35</td>
<td>1.00</td>
<td>1.00</td>
<td>0.96</td>
<td>0.97</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>median (mg/L)</td>
<td>HBBROCK</td>
<td>0.093</td>
<td>0.050</td>
<td>0.058</td>
<td>0.052</td>
<td>0.072</td>
<td>0.077</td>
<td></td>
</tr>
</tbody>
</table>

- **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

* 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 Henley Brook

**Total nitrogen concentrations over the 2007 to 2014 monitoring period**

**Total phosphorus concentrations over the 2007 to 2014 monitoring period**

### Trend:
- Total nitrogen (TN) concentrations were higher in 2007 and 2008, prior to the break in monitoring. Since monitoring recommenced in 2010, TN concentrations have remained fairly stable. No trend in TN was detected.

### Trend:
- Like with TN, total phosphorus (TP) concentrations appear to have fallen since the break in monitoring. More recently, TP concentrations appear to be increasing slightly. This was confirmed by the presence of an emerging increasing trend of 0.004 mg/L/yr.

### Target:
- Henley Brook is currently passing both the short- and long-term TN targets.

- Henley Brook is currently passing both the short- and long-term TP targets.

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Nutrient fractions in Henley Brook

**Average composition of nitrogen (N) in Henley Brook over the 2010 to 2014 monitoring period**

Three-quarters of the nitrogen (N) is present as organic N which consists of both dissolved organic N (DON) and particulate N (PON). DON largely 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 remainder of the N is present in the form of dissolved inorganic N (DIN, consisting of ammonium – \( \text{NH}_4^+ \) and N oxides – \( \text{NO}_x \)). These forms of N are readily available to plants and algae. Likely sources of DIN are fertilisers from urban areas, hobby farms and viticulture, animal waste and septic tank leachate.

**Average composition of phosphorus (P) in Henley Brook over the 2010 to 2014 monitoring period**

Nearly two-thirds of the phosphorus (P) is present in the form of particulate P which is derived from organic material and sediment-bound forms of P. This form of P is not readily available for use by plants or algae, but may be broken down over time. The remainder of the P is present as soluble reactive phosphorus (SRP) which is readily available for plant and algal uptake. Likely sources of this form of P are fertilisers from urban areas, hobby farms and viticulture, animal waste and septic tank leachate.

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Henley Brook: Nutrient report 2014
Seasonal variation in nutrient concentrations in Henley Brook

**Nitrogen seasonal variation over the 2010 to 2014 monitoring period**

TN and NO$_3^-$ concentrations show a seasonal pattern, rising with the onset of winter rains and falling again as water levels drop. This indicates that groundwater, surface and subsurface flows are all contributing N to the brook during the winter months when increased runoff flushes N from the soil. On the other hand, DON, PON and NH$_4^+$ do not show a clear seasonal response. The brook does not generally flow year-round so the high median organic N concentrations in January to March are due to only a few data points. The rainfall driving the flow at this time will have flushed organic N into the brook from the surrounding catchment.

**Phosphorus seasonal variation over the 2010 to 2014 monitoring period**

P concentrations did not show a strong seasonal pattern, being relatively stable throughout the year. The peak in April is due to the first flush event which will be flushing particulate P into the brook from the surrounding catchment. The peak in February is due to unseasonal flow in the brook and comes from only a few data points. In December, particulate P concentrations increase again. This may be due to algal growth in the brook, triggered by warmer water temperatures.

**Nitrogen**

**Phosphorus**

Photographs of Henley Brook: (Top left) Aerial view of the confluence of Henley Brook with the Swan River, February 2006. (Bottom left) One of the series of small dams located on Henley Brook upstream of the sampling site, April 2015. (Right) Downstream of the Henley Brook sampling site, July 2015.

Water feature in urban wetland in Ellen Brook subdivision, December 2008.

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Henley Brook: Nutrient report 2014
Local nutrient reduction strategies for Henley Brook

Nutrient reduction strategies being undertaken or recently completed in the Henley Brook catchment include but are not limited to:

- Water Sensitive Urban Design (WSUD). The City of Swan is ensuring wide-spread use of WSUD features in new urban estates in the catchment.

- The 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 a ‘catchment to coast’ approach and by engaging in partnerships that focus the effort of local governments, sub-regional groups, the community and other organisations in water quality improvement activities.

- Ongoing sub-regional projects. Coordination and support of community led projects to reduce nutrient inputs into the Swan River in the north sub-region led by the City of Swan and funded by the Department of Parks and Wildlife.

- The Phosphorus Awareness Project 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 Henley Brook

<table>
<thead>
<tr>
<th></th>
<th>Max. acceptable load (t/yr)</th>
<th>Concentration target (mg/L)</th>
<th>% reduction required</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN</td>
<td>0.6</td>
<td>1.0</td>
<td>25%</td>
</tr>
<tr>
<td>TP</td>
<td>0.05</td>
<td>0.1</td>
<td>0%</td>
</tr>
</tbody>
</table>

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

Summary: Henley Brook

- Henley Brook is currently passing both the short- and long-term TN and TP targets.
- TN concentrations are stable however there was an emerging increasing trend of 0.004 mg/L/yr in TP concentrations.
- TP concentrations are currently considered to be acceptable and no reduction is required for the Brook to meet its SCWQIP target.
- A 25 percent reduction in TN is required for Henley Brook to meet its SCWQIP target.