Government of Western Australia
Department of Water

Whicher surface water allocation limits: methodology

Supporting information for the Whicher area surface water allocation plan

Looking after all our water needs

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Department of Water

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Summary

Allocation limits have been set for surface water management subareas in the Whicher plan area (Figure 1). This report describes the methodology used for determining the allocation limits.

Prior to the release of the *Whicher area surface water management plan – allocation* (DoW 2008a), there were no allocation limits for surface water in the Whicher area. The area supports a large, widely distributed, irrigated agriculture industry that represents approximately 70 per cent of water used in the region, mainly taken from farm dams.

There has been a long history of water resource development in the Whicher area and surface water use is important to the regional economy. Through the *Whicher area surface water allocation plan*, the Department of Water has formally set limits on surface water use by setting allocation limits.

During the process of setting allocation limits the department considered streamflow yields, water use and availability, existing licence-entitlement information and economic benefits compared to environmental and social costs. The department also considered a range of options relevant to the level of resource development, land use in 2007 and objectives for water allocation.

Subareas with a current low level of use generally have some water available for new developments. In subareas with a high level of use – and where the impacts of that use are considered manageable – allocation limits have been set at the estimated current use. No water is available for new developments in these subareas.

Since the release of the draft plan, the department completed an ecological water requirement study for Cowaramup and identified the ecologically sustainable yield. We have used this information to revise the allocation limit for the Cowaramup subarea. We will review (and may revise) the allocation limits for other subareas as we complete other ecological water-requirement studies.

Allocation limits and water availability are shown in the summary table below.

Summary table — Surface water allocation limits and availability

Surface water management area	Surface water management subarea	Allocation limit (ML/yr)	Available water for new developments[1]
Busselton coast (Cape to Cape North)	Biljedup	330	Yes
	Cowaramup	410[2]	Limited
	Ellen	1180	Yes
	Gunyulgup	1090	No
	Naturalist	310	Yes
	Quininup	550	No

[1] See Section 7 or Table 4 for an explanation of water availability.

[2] Was 1190 in draft plan – see Sections 2.3 and 5.1.

Surface water management area	Surface water management subarea	Allocation limit (ML/yr)	Available water for new developments[1]
	Wilyabrup	2480	No
Busselton coast (Cape to Cape South)	Boodijidup	3210	Yes
	Calgardup	2530	Yes
	Turner SW	2140	Yes
Busselton coast (Geographe Bay rivers)	Buayanup	3540	Yes
	Carbunup	4320	Yes
	Dunsborough Coast	3000	Limited
	Vasse Diversion	3340	Yes
	Wonnerup	4240	Yes
Busselton coast (Margaret River)	Upper Margaret	170	No
	10 Mile Brook	1000	No
	Bramley	1810	Yes
	Lower Margaret	1670	Yes
	Margaret Town	910	Yes
	Middle Margaret	3200	Yes
Capel River	Capel River Central	980	No
	Capel River North Branch	4700	No
	Capel River South Branch	2730	Limited
	Capel River West	490	No
	Five Mile Brook	270	Yes
	Gynudup Brook and Tren Creek	1380	Yes
Lower Blackwood River	Lower Blackwood: Hut Reach	260	Yes
	Lower Blackwood: Nannup Reach	2600	Yes
	Lower Blackwood: Estuarine Reach	2840	Yes
	Lower Blackwood: Hardy Estuary	1200	Yes
Lower Blackwood River (tributaries)	Adelaide	0	No
	Ballan	0	No
	McAtee	0	No
	Poison	0	No
	Readia	0	No
	Rosa	0	No
	Ellis	130	Yes
	St John	750	Yes
	Milyeannup	30	Yes
	Red Gully	80	Yes
	Tanjannerup	140	No
	Beenup	290	Yes
	Carlotta	5850	Yes
	Chapman	2100	Yes
	Glenarty	1110	Yes
	McLeod SW	4270	Yes
	Rushy	1050	Yes
	Scott	16010	Yes
	Turnwood	360	Yes
	Upper Chapman	2800	Yes
	West Bay	940	Yes

1 Background

The department sets allocation limits to meet the our responsibilities under the *Rights in Water and Irrigation Act 1914*, which require us to consider the impact of new licences on the river environment, existing users and possible future needs. Until May 2008 there were no allocation limits for surface water resources in the Whicher area.

Prior to September 2007, only Margaret River, Capel River and Tanjannerup Creek were proclaimed under the *Rights in Water and Irrigation Act 1914*, enabling us to regulate water use in these areas. Without allocation limits and regulation (licensing) of water use there is a risk that surface water resources will be over-allocated. If this happens, unacceptable environmental impacts could occur and the rights of existing users to access water could be affected by upstream developments.

To protect the environment and provide security to existing surface water users, the department proclaimed four new surface water areas in the Whicher area in September 2007. The newly proclaimed surface water areas are: Cape to Cape North, Cape to Cape South, Geographe Bay Rivers and Lower Blackwood River. This means that most freehold land in the Whicher area is now proclaimed (Figure 1), and commercial water use in these areas is subject to licensing.

Therefore, to support surface water licensing in the Whicher area, setting allocation limits and developing a water allocation plan became a priority for the department. In June 2008, the Department of Water released the draft *Whicher area surface water management plan – allocation* (Whicher plan) (DoW 2008a) for public comment. In June 2009 the department released the final *Whicher area surface water allocation plan* (DoW 2009). The plan includes allocation limits and policies that guide how the department will allocate, license and manage surface water will be in the Whicher area.

This report describes the decision-making process the department used to set the allocation limits for the Whicher plan. The intent in setting allocation limits for surface water in the Whicher area was to allow licensing in the newly proclaimed subareas, while avoiding over-allocating surface water resources, and to provide a high level of security to existing water users.

Figure 1 Whicher surface water management subareas and proclaimed areas

2 Information we considered to set allocation limits

Allocation decisions consider:

- ecologically sustainable level of diversion
- current consumptive demands on the resource
- impact of current abstractions on the riverine environment
- impact of additional allocations on supply to existing users and on the riverine environment.

To set allocation limits that would protect security of water for the river environment and current users, the department used the best scientific information available as of May 2008. This information is outlined in Sections 2 and 3. How the department used this information in the decision-making process is discussed in Sections 4 and 5.

The scientific information used to set allocation limits was estimates of the ecological sustainable level of diversion and current use. The ecological sustainable level of diversion was estimated through hydrological calculations (Section 2.3).

Water-use information was collected from a number of sources (Section 3). The main sources were estimates of use from mapping of land use and farm dams (Section 3.1). Limited information was available on environmental impacts of current use and how increases in allocation may affect existing users and the environment.

The department is carrying out studies to provide better information for resource planning and will regularly review allocation limits as better information becomes available. Ongoing work supporting surface water management in the Whicher plan area is described in Section 8.

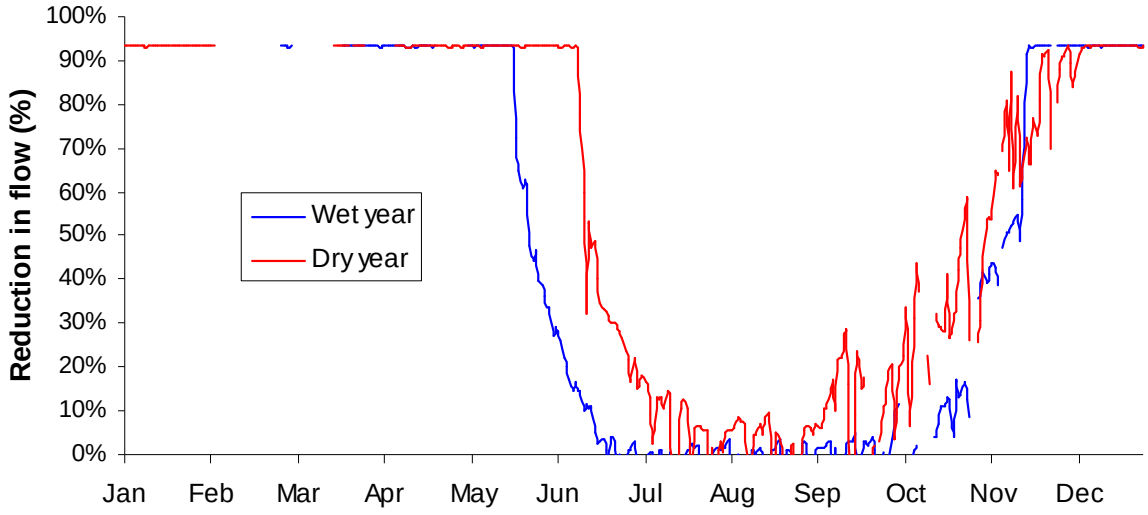
2.1 The need for caution in allocating Whicher surface water resources

Surface water in the south west is a renewable but extremely limited resource. Rivers in the region are characteristically small and flow from year to year is highly variable. Climate forecasts predict decreases in flow volumes and more variability in rainfall in the future. The department was aware of the influence of allocation decisions on the reliability of supply to irrigators and other users and on the long-term sustainability of the irrigation industry.

The irrigation industry is characterised by self-supply from small to medium-sized dams and few of the dams store much more water than is needed for the coming irrigation season. These dams tend to be (but are not always) located on the stream channel and are filled naturally by winter flows. The supply of water to irrigators is therefore dependant on flow in the preceding winter and is affected by factors that affect winter flow such as natural variability and longer-term changes due to climate change.

Modelling has shown that in years of high or even average flow, on-stream farm dams fill quickly and begin to overflow very quickly after the start of the winter rains. In the wet years therefore, on-stream dams have relatively little effect on river flow, or on the supply of water to irrigators downstream.

However in dry years with added climate-change factors, on-stream farm dams may begin to affect supply to downstream irrigators and adversely affect river ecology. In the dry years, on-stream dams intercept a larger proportion of flow and have a greater effect on flow rates downstream, especially during the early part of the winter flow season (Figure 2).



Note: The plot shows the impact of dams in a wet year (1999) compared to a dry year (1987). Note that dams reduced flows in a dry year by more and for a larger part of the year than in the wet year. Data is based on modelling by SKM (2007).

Figure 2 Reduction in flow caused by the interception of surface water by on-stream farm dams in Wilyabrup Brook.

At the time of planning there was little data available to the department on the actual impact of current use on the reliability of supply to users and the environment. Because of this uncertainty, and because of the way water is abstracted, stored and used (that is, interception of flow by on-stream dams), there was a need for caution in setting allocation limits.

2.2 A precautionary approach

As discussed above the need for caution in setting allocations limits in the Whicher area is especially important given the variability in flows, climate change and the relatively small storage available to self-supply irrigators. These characteristics mean that there is a high risk of over-allocating the limited surface water resources.

In an environment of uncertainty, the most cautious position would be to cap all consumptive use at the current level, preventing further growth in use until more reliable information is available on the impacts of increasing allocations on existing users and the river environment. However, results from water-use surveys indicate

that current use in many subareas of the Whicher area is relatively low. Further allocations could be made in these low-use subareas without risking supply to existing users or causing flow-related impacts to river ecology.

In some catchments there has been a long history of irrigated agriculture. In these areas water use is high and there are pressures for further increases in water use. Any increase to current use in high-use subareas may have adverse impacts on existing users and the river environment, especially in low flow years. This could worsen if rainfall decreases further as a result of climate change.

The department therefore made the decision to cap allocation in the high-use subareas, where this level of use represents a manageable risk to river ecology. In these subareas, the department will license historical (pre-proclamation) use. In low-use subareas, the department set precautionary allocation limits. This will enable the department to license existing use and provide a level of sustainable growth in these subareas.

This precautionary approach for low-use subareas is consistent with the department's *Statewide policy no. 5 - Environmental water provisions policy for Western Australia* (WRC 2000b). This policy is consistent with the nationally recognised 'precautionary principle', which applies precaution where there is lack of scientific certainty.

2.3 Estimating the sustainable level of diversion

The department used the best scientific information available to estimate the sustainable level of diversion for the Whicher water resources. At the time of the release of the draft Whicher plan, we used sustainable diversion limit (SDL) volumes for all subareas,

During the finalisation of the Whicher plan, the department completed the ecological water requirements study for Cowaramup and identified the ecologically sustainable yield. We have used this information to revise the allocation limit for Cowaramup (Section 5.5).

Sustainable Diversion Limits

In 2007 the department started a project with the aim of determining precautionary streamflow diversion limits that would maintain an acceptable reliability of supply to users and protect river ecology in most years. The sustainable diversion limit (SDL) project was completed in April 2008 (SKM 2008a & b) for the south west of Western Australia (from Geraldton to Esperance). The study used the most up-to-date information on flow in the region and provides the latest hydrological understanding of sustainable yields. Where flow information was not available, regional relationships were developed and used to provide an estimate of the sustainable level of diversion. The SDL approach is appropriate for areas with low levels of water use.

With the SDL approach, the volume of water that can be sustainably extracted is defined by a set of rules that specify when and how water can be taken from a river. SDL estimates are based on a:

- winterfill period over which diversions can occur (15 June to 15 October)
- minimum flow threshold below which diversions should cease
- maximum daily rate of extraction (for pumped extractions)
- annual licensed volume associated with a specified reliability of supply.

SKM (2008a, 2008b) provides further detail on the SDL approach. SKM 2008b (Section 5) describes how SKM calculated the SDL volumes for the SDL catchments. To obtain SDL volumes for the subareas in the Whicher plan area, the department summed the SDL volumes for catchments within the subarea boundaries.

For the assessment process that determined allocation limits for the Whicher plan, the department adopted the SDL volume as the precautionary allocation limit for all low-use subareas (except Cowaramup). This restricts licensed entitlements to a level that provides high security-of-supply to water users and a low level of risk of environmental impacts on river systems.

At this stage, the department has not adopted the rules outlined above, although we intend to move towards a rules-based approach to managing surface water interception and extraction in the future.

Ecologically sustainable yields - Cowaramup

The ecological water requirement (EWR) of a river is the water regime needed to maintain the ecological values of the river at a low level of risk. EWR assessments consider the ecosystem as a whole, including biodiversity, food-web interdependencies and water-dependent ecological processes that support food webs. The department uses EWR studies to determine ecologically sustainable yields, which can then be used to set allocation limits that maximise water resource development, while maintaining the environmental and social value of water.

Where the department has completed an ecological water requirement study for a specific area and has identified an ecologically sustainable yield, we use this improved scientific information to set allocation limits.

The department completed a study designed to identify the ecologically sustainable yield (ESY) of Cowaramup Brook in November 2008. This study used a methodology specifically developed by the department for the relatively small and variable rivers found in the Whicher region. We are currently preparing a report on the results of the Cowaramup Brook study which will be published late 2009 (Donohue et. al., in prep).

The study determined the annual ESY in Cowaramup Brook for the period 1975 to 2003, which varied between a minimum of 411 ML/year and a maximum of 897 ML/year with an average of 673 ML/year (Table 1).

Table 1 ESY for Cowaramup Brook

Year	Flow	ESY
1975	4127	707
1976	1807	423
1977	2523	613
1978	4485	825
1979	3386	739
1980	5565	856
1981	3520	708
1982	2898	643
1983	4285	682
1984	2861	633
1985	2568	580
1986	4910	768
1987	1637	411
1988	5242	851
1989	2666	616
1990	3808	737
1991	5307	850
1992	4601	713
1993	2319	565
1994	2502	515
1995	3758	648
1996	5047	857
1997	3552	664
1998	4382	805
1999	5563	897
2000	3175	600
2001	2059	556
2002	1781	460
2003	2376	586
Minimum	1637	411
Maximum	5565	897
Average	3542	673

3 Estimating current surface water use

To assess existing water use in the Whicher subareas, the department the first considered licensed surface water entitlements for those systems already proclaimed (that is, Capel River, Margaret River and Tanjannerup Creek systems). However, even in these subareas not all commercial use had been licensed and therefore licensed entitlements did not necessarily provide an accurate record of current use.

Other information we considered in quantifying existing use was: water-use survey data, storage estimates from farm dam mapping in fifteen Whicher subareas, land-use mapping and known crop demand and licensed groundwater use. We found land-use data was the best method of estimating current water use, due to the consistency of data collection, data availability and confidence in the data collected. However, where storage estimates were larger than water-use estimates obtained from land-use mapping, we used the estimated storage for the existing water use volume.

3.1 Irrigated agriculture

The department knew that irrigated agriculture may be responsible for up to 70 per cent of total water use in the region. In 2007 land use in the Whicher region was mapped by the Department of Agriculture and Food WA. Using this information, we calculated total water demand by multiplying the areal water demand for each crop type (megalitres per hectare of wine grapes or olives for example) by the total area of land growing each particular crop. Water demand for each crop type depends on variables such as soil type, rainfall zone, and evaporation and irrigation method. The report DoW (2008b) details these demand calculations and figures and will be published in 2009.

We estimated water demand for crop types from the crop irrigation requirement calculator (DAFWA 2004), available on the Department of Agriculture and Food WA website (www.agric.wa.gov.au). We also considered water demand estimates for horticulture and agriculture where this information was available.

3.2 Stock

The department used carrying capacities and drinking rates (kL/head/yr) to calculate water demand for stock drinking needs or animals in grazing pastures (DoW 2008b). We calculated carrying capacities using survey data for Wilyabrup and then applying it to all subareas. We used drinking rates per animal from the department's *General Water Applications* document, which the South West region use as a guide for licensing.

3.3 Mining and domestic use

The department has not included water use for mining and industry, and water supply to households in the land-use mapping method of estimating water use. The

department usually licenses large abstractions for these purposes, so we searched the department's licensing database and added licensed entitlements for these purposes to the estimates of agricultural and horticultural use.

3.4 Water sources for irrigated agriculture

The land-use mapping method estimates total water use and does not distinguish between surface water and groundwater. In those subareas where estimated water use was *above* the SDL volume, the department investigated further to determine the proportion of use from surface water and groundwater by considering all water-use information and advice from regional staff. It is only for these subareas that we estimated the proportion of surface water use from the total water use for the Whicher plan.

In subareas where estimated total water use was *below* the SDL volume, the department did not estimate the proportion of surface water use. This is because we could safely assume that surface water use was less than the SDL volume, and so water use would not affect our assessment of the allocation limit options. However it does affect the volume of water available for new licences and increases to existing licence entitlements. We will refine current use information through licensing (and the methods outlined in this section for unproclaimed subareas) and use it to review allocation limits and revise them where required (DoW 2008a).

4 Categorising subareas

There are 52 subareas within the Whicher region (Figure 1). To assist us in deciding if the SDL volume was the appropriate allocation limit, we categorised all subareas according to use and water supply development and grouped them (Table 2). We then compared the use estimates to the SDL volumes. We found that water use in many subareas was low compared to the SDL volumes (proposed for allocation limits). In other subareas, current use was either very close to or was higher than the SDL volumes.

For each subarea, we considered the objective for natural resource management when making decisions regarding the allocation objective (planning position) for each category. The objectives in Table 2 are the general allocation objective for each category.

Table 2 General allocation objective for each category

Category	Allocation objective
1. Irrigated agriculture – low use	Provide for current irrigation demand while allowing for sustainable growth within a manageable risk to river ecology.
2. Irrigated agriculture – high use	Provide for current irrigation demand where current use represents a manageable risk to river ecology.
3. Public water supply catchment (PWS)	Provide for existing public water supply.
4. Predominantly nature reserves or state forest with some irrigated agriculture.	Provide for existing irrigation demand where water resource development does not conflict with existing land management arrangements (environmental protection, forestry)
5. National park or state forest	Maintain existing land management arrangements.

By grouping the 52 subareas in the Whicher region according to resource objective and current water demands compared to the SDL volumes, the number of subareas in each category was as follows:

- Irrigated agriculture – low use (use <SDL volume): 34 subareas
- Irrigated agriculture – high use (use >SDL volume): 3 subareas
- Existing public water supply (PWS): 2 subareas
- National park or state forest/some irrigated agriculture: 4 subareas
- National park or state forest: 9 subareas.

Of the nine subareas which are currently managed as nature reserves or state forest, three were previously identified as potential public water supply dam sites in the 1970s and 1980s (WRC, 2000a). However, recent land use changes mean the department does not consider these sites to be compatible with public water supply use. However, we have sets limits to ensure that private water use in forested catchments remains low.

Therefore, while the department has not reserved water for future use in these subareas, the allocation limits do not preclude future development for public water supply or other uses. In the future, if certain subareas are identified as being suitable for potential public water supply sites or irrigated agriculture, we may change the management objective and allocation of water to reflect new management arrangements.

5 Setting allocation limits

The department considered the following information when setting allocation limits:

- streamflow yields
- environmental information
- licensed and estimated unlicensed use
- farm dam storage
- future demand
- land use information]
- regional knowledge.

We compared current use to the best estimates of sustainable diversion and considered the water-use category and allocation objective to set allocation limits for each subarea. This decision-making process is summarised in Figure 3.

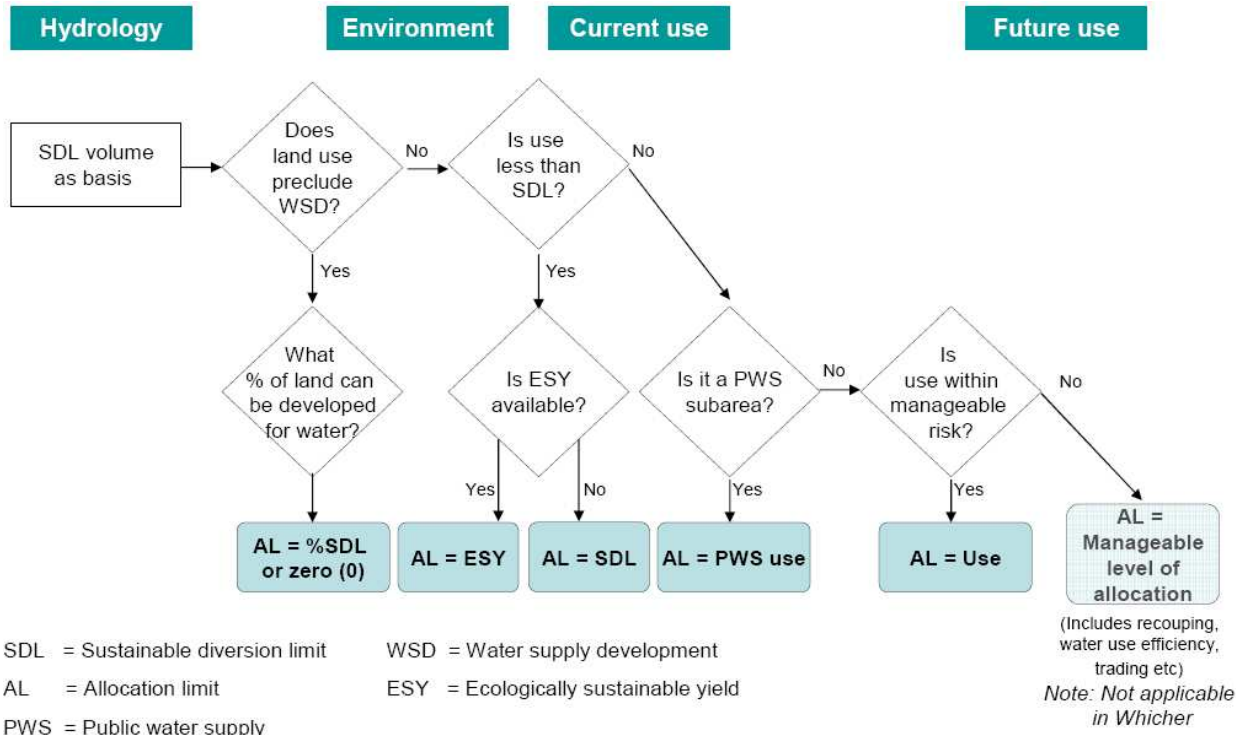


Figure 3 Whicher surface water allocation limit decision-making process

5.1 Low-use subareas

Allocation limit = SDL volume

Where estimated current use was less than the SDL volume for the subarea, we proposed that the allocation limit be set at the SDL volume calculated for the subarea (SKM 2008b). This was appropriate for subareas where freehold land was the major landuse.

Some subareas support large areas of native forest, which are managed as either state forest or nature reserves. Within some of these subareas there are small cleared areas of freehold land that have been developed for irrigated agriculture.

In these subareas, where use is relatively low, the allocation limit was set with the aim of providing a sustainable level of growth in the existing freehold land. To set an allocation limit for the small area of cleared land only, we multiplied the SDL volume for the subarea by the proportion of the subarea that is freehold land. That is: Allocation limit = %freehold x SDL volume. Using this formula the SDL volume is proportional to the amount of freehold land.

Allocation Limit = Minimum ESY

The department used the minimum ecologically sustainable yield (ESY) for Cowaramup Brook to revise the allocation limit for the Cowaramup subarea for the final Whicher plan (DoW 2009).

The allocation limit in the draft plan was the SDL volume for the subarea (1190 ML/yr). At the time the SDL work was done, there was no streamflow data available for Cowaramup Brook from the gauging station installed in 2004.

The ecological water requirement study for Cowaramup Brook completed in November 2008 provided a detailed local assessment, using available streamflow data. Taking a precautionary position, the department decided to set the revised allocation limit for Cowaramup at the minimum ESY of 410 ML/yr (see Section 2.3).

The ESY in Cowaramup Brook varies depending on rainfall and annual flow and varied between 411 ML/yr to 897 ML/yr (Table 1). However most of this water is only available during high flows. In the future, we will aim to develop a set of abstraction rules approaches to resource management that consider the inter-annual variability in water yield so that this water may be accessed (Action 4 and Action 6 in the Whicher plan). As ESY for other Whicher rivers are determined, the department will also review and may revise allocation limits for associated subareas (Action 23).

5.2 High-use subareas: allocation limit = current use

For subareas where current use (pre-proclamation) was greater than the SDL volume, and where this level of use was considered to be a manageable risk to the river environment and existing users, the allocation limit was set at the estimated current use (Section 3).

For those subareas that were largely forested with small areas of developed land, in which use was greater than the proportional SDL volume (Section 5.1), we set the allocation limit equal current use.

5.3 Public water supply: allocation limit = existing allocation

For subareas with existing public water supply the aim was to provide for the existing licensed allocation without allowing water resource development activities that are inconsistent with public water supply. We set the allocation limit in these subareas at the current licensed entitlements for public water supply.

5.4 State forest or nature reserve: allocation limit = zero (0)

As discussed earlier, some subareas contain large areas of native forest that are managed as either nature reserves or as state forest. In subareas completely covered by native forest, activities such as irrigated agriculture would conflict with the existing resource management objective. Therefore, as commercial use would conflict with the existing management objective, we set the allocation limit in these subareas at zero.

6 Management implications

In general, the same allocation-limit decision was made for each category (Section 4). The general allocation limit decision for each category and the responding implications for management are shown in Table 3.

Table 3 General allocation limit decision for each category and its management implication

Category	Allocation limit decision	Management implication
1. Irrigated agriculture – low use a) no ESY b) ESY	SDL volume Min ESY	Current use is met with some water available for new developments.
2. Irrigated agriculture – high use	Current use	Current use is met; however no water is available for new developments.
3. Public water supply	Current licensed entitlements	Current licensed entitlements are met; however no water is available for new developments.
4. National park or state forest/some irrigated agriculture	%SDL volume	Current environmental values are protected with some surface water still available for private land owners.
5. National park or state forest	Zero (0)	Current environmental values are protected as no water is available for activities that conflict with current management arrangements.

7 Water availability for new development

Table 4 shows the department's allocation limit decision for each subarea, the final allocation limit (ML/yr) and whether water is available for new developments. Water availability in each subarea is also presented in Figure 4. Water available for new development is equal to the allocation limit minus estimated current use.

As Figure 4 shows, in several subareas there is no additional water available. This is because estimates of current use equal the allocation limit or the subareas are crown land and predominantly or completely covered in forest. In subareas that are only native forest the allocation limit is set low or at zero to protect current ecological values.

The water availability status of subareas in Table 4 and Figure 4 were correct at the time allocation limits were set. Water availability will change in the Whicher area as water is allocated to new developments, existing licences expire and estimates for water use are refined. Current use is based on the best estimates available at the time. As licensing progresses, the actual use figures will change. We will review and may need to revise allocation limits based on updated information.

In subareas where current use is close to the allocation limit (limited water available) the department will consider carefully how remaining water will be allocated (DoW 2009).

Table 4 Whicher surface water allocation limit decisions and water availability

Surface Water Management Area	Surface Water Management Subarea	Area (km²)	SDL volume (ML/yr)	Estimated current use[1] (ML/yr)	Allocation limit decision	Allocation limit (ML/yr)	Available water[2] for new developments
Busselton Coast (Cape to Cape North)	Biljedup	21	330	38	SDL volume	330	Yes
	Cowaramup	30	1190	300	*Minimum ESY*[3]	*410*	*Limited*
	Ellen	28	1180	360	SDL volume	1180	Yes
	Gunyulgup	66	1090	*1280*	SDL volume	1090	*No*
	Naturalist	64	310	150	SDL volume	310	Yes
	Quininup	30	550	*560*	SDL volume	550	*No*
	Wilyabrup	89	2480	*3070*	SDL volume	2480	*No*
Busselton Coast (Cape to Cape South)	Boodijidup	62	3210	840	SDL volume	3210	Yes
	Calgardup	72	2530	150	SDL volume	2530	Yes
	Turner SW	96	2140	260	SDL volume	2140	Yes
Busselton Coast (Geographe Bay Rivers)	Buayanup	201	3540	440	SDL volume	3540	Yes
	Carbunup	165	4320	1430	SDL volume	4320	Yes
	Dunsborough Coast	158	3000	2140	SDL volume	3000	*Limited*
	Vasse Diversion	283	3340	310	SDL volume	3340	Yes
	Wonnerup	477	4240	970	SDL volume	4240	Yes
Busselton Coast (Margaret River)	Upper Margaret	273	2940	*190*	Current use	170	No
	10 Mile Brook	5	86	1000	Current licensed entitlements	1000	No

Surface Water Management Area	Surface Water Management Subarea	Area (km²)	SDL volume (ML/yr)	Estimated current use[1] (ML/yr)	Allocation limit decision	Allocation limit (ML/yr)	Available water[2] for new developments
	Bramley	47	1810	770	SDL volume	1810	Yes
	Lower Margaret	45	1670	530	SDL volume	1670	Yes
	Margaret Town	32	910	64	SDL volume	910	Yes
	Middle Margaret	86	3200	1880	SDL volume	3200	Yes
Capel River	Capel River Central	111	850	980	Current use	980	No
	Capel River North Branch	88	1780	4700	Current use	4700	No
	Capel River South Branch	168	2730	2540	SDL volume	2730	Limited
	Capel River West	81	440	*550*	Current use	490	No
	Five Mile Brook	87	270	0	SDL volume	270	Yes
	Gynudup Brook and Tren Creek	188	1380	760	SDL volume	1380	Yes
Lower Blackwood River[4]	Lower Blackwood: Hut Reach	251	5240	40	%SDL volume	260	Yes
	Lower Blackwood: Nannup Reach	328	8280	880	%SDL volume	2600	Yes
	Lower Blackwood: Estuarine Reach	184	2840	450	SDL volume	2840	Yes
	Lower Blackwood: Hardy Estuary	100	1200	200	SDL volume	1200	Yes
Lower Blackwood River (tributaries)	Adelaide	64	1910	0	Current use	0	No
	Ballan	54	1460	0	Current use	0	No
	McAtee	113	3220	0	Current use	0	No
	Poison	50	1550	0	Current use	0	No
	Readia	20	410	0	Current use	0	No
	Rosa	227	7180	0	Current use	0	No

Surface Water Management Area	Surface Water Management Subarea	Area (km²)	SDL volume (ML/yr)	Estimated current use[1] (ML/yr)	Allocation limit decision	Allocation limit (ML/yr)	Available water[2] for new developments
	Ellis	44	1020	0	%SDL volume	130	Yes
	St John	575	6810	440	%SDL volume	750	Yes
	Milyeannup	107	4160	5	%SDL volume	30	Yes
	Red Gully	133	4220	40	%SDL volume	80	Yes
	Tanjannerup	21	520	140	Current *licensed entitlements*	140	No
	Beenup	17	290	0	SDL volume	290	Yes
	Carlotta	160	5850	510	SDL volume	5850	Yes
	Chapman	65	2100	1100	SDL volume	2100	Yes
	Glenarty	32	1110	400	SDL volume	1110	Yes
	McLeod SW	95	4270	440	SDL volume	4270	Yes
	Rushy	23	1050	590	SDL volume	1050	Yes
	Scott	702	16 010	6010	SDL volume	16 010	Yes
	Turnwood	12	360	24	SDL volume	360	Yes
	Upper Chapman	118	2800	1110	SDL volume	2800	Yes
	West Bay	31	940	420	SDL volume	940	Yes

[1] Estimated current use is the estimated volume of surface water used before proclamation in September 2007.

[2] Available water is considered to be limited if estimated current use is greater than 70 per cent of the allocation limit. No water available means that either the allocation limit has been reached or the allocation limit has been set at zero or current use to protect the environment.

[3] Numbers or text in *italics* indicate that these have changed from the draft plan (DoW 2008a) to the final plan (DoW 2009).

[4] Water quality from the lower Blackwood River is low (brackish–moderately saline)

Figure 4 Surface water availability in the Whicher area

8 Review of allocation limits

As new information becomes available, the department will review allocation limits for surface water resources in the Whicher area and revise them where justified (DoW 2009 Action 24).

8.1 Assumptions of current allocation limits

We set allocation limits in this report on the basis that each subarea is managed independently. This results in allocation limits for subareas such as middle and lower Margaret River, and other similar 'cross-subarea' river systems, being set as though the subareas do not interact and do not receive water flows from upstream. The department may review this approach in the future.

8.2 Ecologically sustainable yields

When the department finalised the allocation limits for the final Whicher plan, the only ecological water requirement (EWR) study that was complete for any of the rivers in the Whicher subareas was Cowaramup Brook. However, EWR studies are underway for another four river systems in the Whicher plan area (Capel and Margaret rivers and Chapman and Wilyabrup brooks) and we have planned more work. When these studies are completed, we will use this information to identify the ecologically sustainable yields of other rivers in the Whicher area and review and possibly revise allocation limits for the Whicher subareas.

8.3 Current use

As Section 3 describes, the department estimated the current level of water use in most subareas based on land-use mapping and published crop demands. Being estimates, the water use figures are subject to uncertainty. This uncertainty is caused by a number of factors. These could be, for example, variation in crop requirements due to local conditions, advances made in water use and better understanding of crop needs.

Also, as we license existing surface water, our knowledge of current use will improve As commercial use is licensed in the newly proclaimed subareas more accurate data on use and available water in the subareas will become available. The department will review use information regularly, which may result in us changing the allocation objective and reviewing and revising allocation limits as needed. We will also review the use figures as total use approaches or reaches the allocation limit.

8.4 Other information

We may also review and possibly revise allocation limits when information becomes available from social, cultural or economic studies.

Glossary[3]

Allocation limit	Annual volume of water set aside for use from a water resource.
Available water	Allocation limit minus current use.
Current water use*	Total amount of water that is taken from surface water resources including licensed and unlicensed use.
Ecological values	Natural ecological processes occurring within water-dependent ecosystems and the biodiversity of these systems.
Ecological water requirement	Water regime needed to maintain the ecological values (including assets, functions and processes) of water-dependent ecosystems at a low level of risk.
Environment	Living things, their physical, biological and social surroundings, and the interactions between them.
Licensed use*	Total (annual) volume of surface water that has been allocated to licensees as entitlements. This may include what is taken for public and private purposes and what can be taken to be stored in a dam.
Self-supply	Water diverted from a source by a private individual, company or public body for their own individual requirements.
Social water requirement	Elements of the water regime that are needed to maintain social and cultural values.
Subarea	A subdivision within a surface water or groundwater area, defined for the purpose of managing the allocation of water resources. Subareas are not proclaimed and can therefore be changed internally without being gazetted.
Surface water	Water flowing or held in streams, rivers and other wetlands on the surface of the landscape.
Unlicensed use*	Total (annual) volume of surface water that is estimated to be taken for commercial use. This may include water taken for commercial purposes, water taken to be stored in a dam and may include water taken from springs. Unlicensed commercial use occurs in areas that are not proclaimed, where spring use is

[3] Terms in this glossary marked with an * have definitions specific to Whicher allocation planning

	not controlled or where licences have not yet been issued for pre-proclamation use.
Use*	Water taken for private-benefit consumptive purposes including irrigation, industry, urban, stock and domestic, aesthetics, lifestyle and storage.
Water entitlement	Quantity of water that a person is entitled to take annually in accordance with the *Rights in Water and Irrigation Act 1914* or a licence.
Water reserve	An area proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or *Country Areas Water Supply Act 1947* to allow the protection and use of water on or under the land for public water supplies.

Volumes of Water

One litre	1 litre	1 litre	(L)
One thousand litres	1000 litres	1 kilolitre	(kL)
One million litres	1 000 000 litres	1 Megalitre	(ML)
One thousand million litres	1 000 000 000 litres	1 Gigalitre	(GL)

Shortened forms

DAFWA	Department of Agriculture and Food Western Australia
DoW	Department of Water
ESY	Ecologically sustainable yield
EWR	Ecological water requirement
PWS	Public water supply
SDL	Sustainable diversion limit
SKM	Sinclair Knight Merz
WRC	Water and Rivers Commission

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