Environmentally Friendly Tennis Clubs Guidelines

Tennis Victoria

16 December 2008

This document was produced by Tennis Victoria as part of the *"Drought Proofing Tennis in Victoria"* initiative funded by the Smart Water Fund.

Contents

1. Introduction

Tennis Victoria has produced these Environmentally Friendly Tennis Clubs Guidelines to assist tennis clubs to work towards being environmentally sustainable in relation to water and energy use, as well as waste management.

Within Victoria, the continued operation of many sporting clubs is under threat due to the current water restrictions. With the continued drought and the likely impact of climate change, it is possible that the availability of water for all users, including recreational clubs, will further support the move to a more environmentally friendly operation.

Red porous and lawn tennis courts comprise almost 50% of total tennis courts in Victoria. These court types are widely recognised at all participation levels within the sport (community and elite) and have been anecdotally the preferred court surface within Victoria due to the tradition attached to them and their playing qualities.

Tennis Victoria recognises red porous and lawn courts as being important tennis court surfaces for two key reasons:

1. Both surfaces are recognised as exhibiting the required characteristics for player development and nurturing young talent due to their status as Grand Slam surfaces in Britain and Europe.

2. Both surfaces are perceived by participants as “softer under foot” than hard court surfaces which has been attributed to players’ “longevity” in the sport (i.e. 5 years – 85 years).

Tennis Victoria acknowledges that there is a clear need to retain these surfaces and has invested significant time and resources into researching, trialling and evaluating options to reduce the environmental impact (in particular water use) of these surfaces.

This document aims to:

- Acknowledge that there is a need to retain red porous tennis courts in Victoria for reasons of player development, member preference and tradition.
- Review the outcomes and highlight the results from a number of recent trials to improve water efficiency at tennis clubs.
- Provide a range of options and tools for clubs to implement in order to become more water, energy and waste efficient.
- Assist clubs and land owners (often Councils) in making decisions in relation to court surfaces.

This document was produced by Tennis Victoria as part of the Smart Water Fund and as part of the initiative known as *“Drought-Proofing Tennis in Victoria”*.

2. Background

2.1 Tennis Australia

Tennis Australia is the peak body for tennis within Australia and is the federal body representing each of the member states and Territories.

Tennis Australia has a preference for the following types of playing surfaces for elite competition play (in order of preference):

1 Hard court (cushioned and non-cushioned) - does not require watering

2 Porous/Clay - requires watering

3 Natural Grass - requires watering

There are also a large number of non-competition courts which are made of a range of surfaces, including Sand Filled Artificial Grass (SFAG), carpet, synthetic clay and floorboard.

While Tennis Australia's preference is for Grand Slam surfaces (slow hard courts or porous/clay), they recognise that tennis clubs need to decide on court surface type that best suits their situation.

2.2 Tennis Victoria

Tennis Victoria is the representative body for the Victorian based clubs, centres and members.

Tennis Victoria aims to make tennis part of every Victorian's life, advancing tennis as Victoria's preferred sport. In achieving this aim Tennis Victoria promotes tennis as social and fun year-round sporting option. With over 900 clubs and 105 associations, Tennis Victoria provides information, support and advocacy to member clubs and promotes participation in tennis based activities.

Red porous courts comprise 59% of tennis courts in metropolitan Melbourne and have been a surface of choice for many of these clubs for many years.

Red porous courts are considered as a high quality, low capital cost playing surface option for clubs and are mooted as being "easier on the body" than hard courts. In addition, the playing characteristics of red porous courts are similar to the "European Clay" courts, due to their sliding capacity. To ensure Australia's competitiveness on the world tennis stage, efforts must be made to maintain red porous courts and grass courts so that current and future professional players have access to them. Red porous courts require watering throughout play to ensure the stability of the court surface, reduce the sliding properties making it safe to play on.

Water restrictions are having a negative impact on Tennis Victoria's and local tennis clubs' ability to promote participation in tennis, and in particular to provide access to red porous courts. This is because red porous courts must be regularly watered and damp when played on. Many clubs with the financial ability are converting their red porous courts to hard court surfaces.

Tennis Victoria acknowledges the important role of hard courts (cushioned and non-cushioned), Sand Filled Artificial Grass (SFAG) and artificial clay surfaces in the current environment. The desire of many players for an alternative (waterless) surface which provides similar "softness" properties as the traditional clay surface must be considered when discussing court conversion options. This desire has been demonstrated at many community based clubs where members have taken the decision to convert red porous courts to SFAG or artificial clay.

In addition to maintaining red porous and grass courts in Victoria, Tennis Victoria is encouraging clubs to become more environmentally friendly and participate in programs to reduce water and energy

consumption and to adopt good waste management techniques. A number of trials into water saving technologies have been undertaken at clubs, and the current “Sustainaball” program is an example of a current recycling initiative being run by Tennis Victoria.

2.3 Local Governments

Many tennis clubs are located on land owned or operated by Local Government Authorities (LGA) or Councils. Councils therefore have a role to play in ensuring that tennis facilities are operated and maintained in an appropriate manner.

In general, Councils can provide a level of support, technical advice and expertise via their planning and engineering divisions to assist the clubs with efficient operation and maintenance. Many planned physical changes to the clubs facilities (such as erecting a rainwater tank) require planning approval from Council. Clubs must follow the correct statutory process in applying for planning permits and ensure that the works are consistent with any reserve management protocols (particularly important when the tennis clubs are on Crown Land operated by Council). Council engineering departments can provide support and advice on technical matters.

In general, a good relationship with Council will be beneficial to both the tennis club (as lease holder or operator of the land) and Council (as the asset owner).

3. Existing Situation

3.1 Tennis Courts

At an international tennis level, there are three types of competition courts - grass courts (Wimbledon), hard courts (Australian and US Opens) and clay courts (French Open).

Red porous courts are generally made of crushed clay, stone or brick, laid over several layers of porous crushed scoria. Red porous courts are also known as clay or en-tous-cas courts.

While cheaper to construct from a greenfield site than the other competition courts, red porous courts require a greater level of maintenance as they:

- must be watered regularly and kept damp to maintain optimal playing performance, to prevent courts from becoming brittle and damaged, and to ensure there is no loss of 'fines' (which bind the other layers of product) from the surface of the court; and
- require regular rolling, bagging and sweeping to maintain a level playing surface.

Grass courts provide the fastest surface on which to play tennis, however they require maintenance on a daily basis. Maintenance varies with the volume of court use and the level of the competition, but generally includes:

- watering;
- mowing;
- regular rolling to maintain a level playing surface;
- fertilising and chemical spraying to ensure grass health; and
- light "dust ins" and general court maintenance

3.1.1 Water on Courts

Water restrictions have the potential for severe impacts on tennis clubs. Due to current water restrictions it is becoming more difficult to maintain the required water content of court surfaces, in particular red porous courts, which is having an adverse impact on the surface quality. It is also resulting in the conversion of existing red porous courts into alternative/waterless surfaces.

In 2006 there were approximately 1,700 red porous courts in Melbourne, across 335 venues. Prior to Stage 3 water restrictions, each court used approximately 1000 L / day on average in summer and 600 L / day on average over a year. Since water restrictions were introduced in 2006, clubs reduced their usage by approximately 80% in summer.

These guidelines outline methods to reduce the volume of water used on the red porous and grass tennis courts and provide minimum operating standards for clubs to ensure the environmental sustainability of tennis in Victoria.

Water Conservation Plans

Under current water policy, all water users using more than 10 ML/year must produce Water Conservation Plans (WCP). These WCPs outline how the user will work to becoming more water efficient. In the tennis environment, Tennis Victoria has negotiated WCPs on behalf of the tennis clubs in metropolitan Melbourne.

In metropolitan Melbourne, clubs with red porous tennis courts have two options under the WCPs. Clubs can treat their courts with a chemical treatment (calcium or magnesium chloride), then apply to water retailer and be permitted to water all courts within an allocation set by the water retailer. Alternatively, without treatment, clubs are only permitted to water one in every two courts. Similarly, only every second grass court can be watered within Melbourne unless the club has negotiated alternative arrangements with the water retailer or are using an alternative water source.

Under the WCPs, clubs may be required to install a separate water meter to monitor court irrigation, and court treatment must be evidenced by sending receipts for court treatment to the water retailer. Clubs are required to meet water usage ceiling limits set by the retailers (equivalent to a 20% reduction during the same period under Stage 3 water restrictions).

Regional clubs are on various stages of water restrictions and can negotiate entitlements with their retailers.

3.2 Supporting Infrastructure

The infrastructure at tennis clubs generally consists of not only the tennis courts, but also of clubhouses, change room facilities (including toilets and showers), kitchen facility or café, car parks, spectator areas and general garden areas.

The environmental initiatives developed in this policy aim to address the water, energy and waste considerations of not only the playing areas of the tennis clubs, but the supporting infrastructure as well.

3.2.1 Water in Clubhouses

The water uses at a tennis club include indoor uses such as amenities (toilets and showers) and kitchen facilities or café, as well as maintaining any outdoor garden and spectator areas. Improving water efficiency will increase member awareness of environmental issues, as well as reduce club water bills.

3.2.2 Energy Uses

Many tennis courts are floodlit to allow games to be played outside sunlight hours, and to extend the tennis season into winter. Where clubs have flood lighting, it often contributes the greatest proportion of the energy bills

Other energy uses are likely to include indoor lighting, appliances, and water heating, as well heating and cooling systems. Improving energy efficiency will reduce energy bills for clubs.

3.2.3 Waste Considerations

Waste generated at tennis clubs is predominately municipal type waste resulting from food preparation or consumption. Providing appropriate waste management facilities consistent with those provided by the local council will reinforce the “Reduce, Reuse, Recycle” message.

4. Environmental Policy and Considerations

This section of the guidelines outlines the current Victorian State Government water, energy and waste guidelines, and provides rationale as to why clubs should move toward becoming more environmentally friendly.

4.1 Water

Water restrictions are in place across much of Victoria and are preventing or severely restricting watering of sports facilities, including tennis courts.

A summary of the current water restrictions rules are provided in Table 1 with the detailed requirements across Victoria provided in Appendix A.

Table 1. Current Water Restriction Rules

Water Restriction	Impact on Tennis Clubs	Example of Towns Under Restrictions
Permanent Water Saving Rules	No restriction applies to using a hand-held hose fitted with a trigger nozzle, a watering-can or a bucket, at any time.	Many Gippsland Towns
Stage 1	Hand held hoses fitted with trigger nozzles can be used at any time	Shepparton
Stage 2	Provided exception is granted, courts may be watered	Phillip Island
Stage 3	Provided exception is granted, courts may be watered	Hamilton
Stage 3a	May water one in two red porous courts; or all courts if applying treatment under Water Conservation Plan.	Metropolitan Melbourne
Stage 4	Watering banned on all sports grounds, however in some areas and under some circumstances exceptions to enable watering may be granted.	Geelong

Current Victorian water policy is for permanent water saving rules to remain in place. With the continued drought, and with the added uncertainty of climate change, water restrictions are likely to remain into the future, even as non-rain dependant water sources are developed (e.g. desalinated water).

In addition to permanent water saving rules, the Federal Government has introduced the Water Efficiency Labelling and Standards (WELS) Scheme which provides a consistent system for measuring the water efficiency of water using fixtures and fittings. The WELS scheme places restrictions on the sale of appliance, fixtures or fittings that are not considered water efficient.

Appendix A provides an understanding of the fixtures and fittings currently covered under the WELS Scheme.

All residences, businesses and recreational clubs are being forced, via restrictions and the availability of fixtures, to use water more efficiently.

4.1.1 Alternative Water Sources

Generally water must be treated to a standard to ensure that it is "fit for the intended end use". With respect to using alternative water sources, there are some water sources that can not be used for certain end uses, regardless of the level of treatment. For example, within Victoria, State Policy provides that recycled sewage can not be placed directly into the potable water supply system. The current Victorian Definitions of Alternative Water Sources, and a comment on availability, is provided in Table 2.

Table 2. Victorian Definition of Alternative Water Sources

Source	Definition	Comment on Availability
Rainwater	Water collected directly from roof run-off.	Volume available for use depends on the location of the tennis club, roof area and size of rainwater tanks.
Stormwater	Urban surface water run-off captured from rainfall events.	Volume and quality depends on the location of the collection surface, the method of collection and the size of the storage tanks.
Greywater	All household wastewater excluding that derived from toilets or urinals. Generally also excludes wastewater derived from kitchens.	Primary sources of greywater are showers and washing machines. Volume available for reuse depends on the number of facilities and the treatment process selected.
Sewage/Blackwater	Any wastewater containing human excreta.	Not recommended for reuse for a tennis club as the cost to treat the wastewater considered prohibitive.
Industrial Water	Wastewater produced from processes at industrial or commercial premises. Industrial water includes any type of wastewater derived from these premises, except sewage.	Unlikely to be available. Quality will depend on the type of industrial/commercial process

		generating the wastewater.
Recycled Water	Wastewater generally sewage, that is treated to a standard appropriate for its intended use.	Dual pipe networks supplying recycled water may be available from the water authority.
Groundwater	Water sourced from groundwater bores.	Requires aquifer with adequate supply and appropriate water quality. Requires licence to establish bores from rural water authority.
River water	Water extracted from river system.	Requires confirmation of adequate supply and appropriate water quality. Requires extraction licence from managing authority.

Table 3 outlines the current Victorian allowable alternative uses for a range of alternative water sources and end uses. This table assumes that the club is served by mains water supply.

Table 3. Allowable Uses of Alternative Water Sources

	Alternative Water Source			
Use	Rainwater	Stormwater	Greywater	Groundwater or other local water
Drinking	X	X	X	Water quality dependant
Food preparation	X	X	X	Water quality dependant
Personal washing	√	X	X	Water quality dependant
Clothes washing machine	√	√ (with treatment)	X	Water quality dependant
Outdoor Use	√	√ (with treatment)	√ (with treatment)	Water quality dependant
Toilet flushing	√	√ (with treatment)	√ (with treatment)	Water quality dependant
Surface Irrigation	√	√ (with treatment)	√ (with treatment)	Water quality dependant
Subsurface Irrigation	√	√ (with treatment)	√ (with treatment)	Water quality dependant

Key: √ = Use allowed, X = Use not allowed

4.2 Energy Considerations

The Federal Government is committed to ensuring that 20% of Australia's electricity is derived from renewable sources by 2020.

Additionally, the Building Code of Australia requires that all works to public buildings (new buildings or refurbishments) must adhere to the energy efficiency requirements of the Code.

Buying energy is a real cost. By reducing energy consumption, operational costs can be reduced. Tennis clubs should aim to be energy efficient, predominantly to reduce costs.

4.3 Waste Wise

Sustainability Victoria has released the Public Place Recycling (PPR) Guidelines which aim to increase the volume of recyclable material collected from high-use public areas such as retail, recreational, sporting, tourist and transport sites.

The guidelines provide information to:

- Enable a consistent approach between recycling at home, work/school and play;
- Develop an easily-maintained waste and recycling system, and
- Implement a staged approach for maximising recovery of recyclable resources.

There is now a much greater expectation in the community that there will be access to recycling facilities in private and public locations, largely as a result of state and local government policies that have made home recycling a way of life for so many Victorians. Tennis clubs should aim to provide appropriate waste collection facilities consistent with those provided to local residents by the local council.

5. Options

This section of the guidelines present a range of options for tennis clubs to become more water, energy and waste efficient. Options presented focus on tennis court areas separately clubhouse and other areas.

Please note that costs are valid for 2008 and may be subject to change. In many cases the actual cost depends on a number of different factors, and therefore it is recommended that clubs source their own cost estimates from local suppliers or contractors before committing to any particular initiative.

5.1 Water Saving Options

This section outlines a range of water saving options available for tennis courts and clubhouses within Victoria.

5.1.1 Water Saving Options for Tennis Courts

This section relates to water saving opportunities on tennis courts. In general, options available can be divided into the following categories:

- Remove water-using surfaces,
- Use water more efficiently,
- Use alternative sources of water to mains water; and
- Other.

Each of these options is discussed below, and includes a comment on:

- The time frame of the solution (short, medium or long term);
- Advantages and disadvantages of the option;
- An indicative cost to implement, where available;
- Expected water savings;
- Any ongoing maintenance requirements;
- Important considerations for clubs; and
- Examples of clubs that have implemented this water saving option, as well as any useful references.

Remove Water-using Surfaces

A. Conversion to a waterless surface					
Concept	Conversion to a surface which does not require watering - such as acrylic (cushioned or uncushioned), sand filled artificial grass (SFAG) or synthetic clay.				
Time frame	Long term				
Advantages	• Red porous and grass courts are high maintenance. Conversion allows clubs to have a low-maintenance surface. • Conversion to a waterless surface ensures the long-term drought-proofing of the courts.				
Disadvantages	• Conversion of a red porous court to a waterless surface reduces the availability of player development surfaces. • The cost of conversion can be high compared to other adaptation measures. • Manufacture of synthetic surfaces may not be environmentally friendly.				
Water Saving	100%.				
Indicative cost	Can range from $26,000 to $80,000 depending on many factors including site conditions, club aspirations, and fluctuations in cost of materials and advances in surface technology. Capital, maintenance and replacement costs, as well as expected life cycle of different court surfaces for a conversion from red porous courts are as follows:				
Comparison of surfaces	Surface	Installation cost (from red porous) ($/court)	Annual maintenance cost ($/court)	Replacement cost ($/court)	Life expectancy (years)
	Acrylic (non-cushioned)	$26 - $35,000	$600	$7,500	10-15
	Acrylic (semi-cushioned)	$39 - $53,000	$600	$20,000	10-15
	SFAG	$30 – $39,000	$1,000	$20,000	7 - 14
	Synthetic Clay	$36 - $49,000	$1,000	$23,000	12 -18
	In all conversion cases, Tennis Victoria recommends the construction of a stable base (i.e. concept or asphalt) at a cost of $20 - $30k per court.				
Maintenance requirements	Maintenance requirements are dependant on court surface but are lower than red porous or grass courts.				
Considerations for clubs	This may be the best option for some clubs who cannot sustain watering and maintenance requirements. However, clubs should weigh up all options prior to committing to a surface change and should also consider the preferences of members.				
Case study	Heatherdale Tennis Club (Synthetic Clay)				

Use Water More Efficiently

The following options are available to use water more efficiently for watering red porous or grass courts:

- Treat courts with chemicals to reduce the volume of water required to maintain the court (red porous courts)
- Update watering systems to a more efficient system

- Install sub-surface irrigation systems to eliminate the need for hand watering

A. Treatment with Calcium Chloride ($CaCl_2$) or Magnesium Chloride ($MgCl_2$)		
Concept	Treatment applied to red porous courts to retain water in the courts for longer and therefore reduce water requirement. The chemicals are applied to the courts and improve the water retention characteristics through the absorption of moisture from the air which turns the chemical into a liquid solution.	
Time frame	Generally 6-12 months for each application, depending on factors such as weather and court usage.	
Advantages	• Treatment saves water by reducing the watering requirements for the courts • Treatment currently allows watering under Stage 3a water restrictions in metropolitan Melbourne, under the Water Conservation Plans developed in conjunction with the water retailers • Application of these chemicals is an effective, immediate solution for reducing water use at clubs. It is relatively inexpensive and is a proven technology. • Treatment reduces loss of 'fines' from surface of court	
Disadvantages	• The material is soluble in water and, over time, will wash out of the court and require reapplication. • In times of severe water restrictions, clubs are not protected from drought and may not be able to water their courts, unless an alternative water supply is also sought. • The long-term impacts of chemical use on courts (particularly structural integrity) are currently unknown	
Treatment and Water Conservation Plans	Clubs participating in the treatment of courts as part of the Water Conservation Plans are required to treat courts once per year, and are required to maintain water usage below ceiling limits set. Light hand-held watering of all courts is then allowed in accordance with watering guidelines developed by Tennis Victoria. The club must not exceed its water usage ceiling and may need to install a separate water meter for court irrigation.	
Water Saving	Savings of 60 - 80 %. Little difference in water saving performance has been observed between the two chemical treatments.	
Differentiating factors	$CaCl_2$	$MgCl_2$
Cost	• $500 / court / treatment	• $200 - 500 / court / treatment • Costs can be substantially reduced with respect to $MgCl_2$ as chemical can be applied by the club.
	• Early indications are that the treatment may pay for itself as a result of reduced expenditure on water and red porous topping fines.	
Application and maintenance	• $CaCl_2$ is in liquid form and needs to be applied by an experienced contractor. • Calcium chloride is applied as a diluted liquid to a court. Tennis Victoria strongly recommends that $CaCl_2$ be applied by experienced contractors in all cases due to OH&S risks.	• $MgCl_2$ is less corrosive and less irritating on the skin than $CaCl_2$, is safe to use around vegetation, has a low risk of concrete spoiling and provides significantly less chloride runoff and pollution. • $MgCl_2$ is in granule/flake form and is thought to be more applied more easily by many tennis clubs

	Application will be most effective during prolonged dry periods. • Method of application can be selected by clubs, but best practice information to date indicates that spraying of the product in a diluted form results in a more even distribution and reduces the likelihood of moist/dry patches on the court.	than $CaCl_2$. • $MgCl_2$ can be applied either as a water solution or by spreading solid flakes and watering them in. Application will be most effective during prolonged dry periods. • It is recommended that a court maintenance contractor administers the treatment where there is limited expertise amongst maintenance personnel and volunteers.
Considerations for clubs	The materials are water soluble and over time will wash out of the courts. Reapplication is required periodically with frequency depending on the availability of alternative water sources to the club, climatic conditions and level of court use. Signs should be erected indicating that clubs are participating in a WCP with court treatment allowing watering (signs are available from Tennis Victoria).	
Case study	Bulleen Tennis Club and Blackburn Tennis Club (featured in this document); others include Wellington, Donvale, Royal Park, St Finbars, Mulgrave and Knoxfield Tennis Clubs.	
References	Tennis Victoria Fact Sheet's on chemical treatments and other online resources http://www.tennis.com.au/vic	

B. Encouraging more water efficient watering practices	
Concept	Encouraging members to water courts appropriately through educating them on watering requirements of courts.
Time frame	Long term
Advantages	• Behavioural change is an essential part of water conservation and water savings can be made simply through education.
Disadvantages	• None identified
Water Saving	Not definable.
Cost	No cost

C. Updating watering system fixtures	
Concept	Reducing water use through implementing water efficient fixtures, e.g. more efficient hose nozzles.
Time frame	Long term
Advantages	• Can reduce volume of water applied and thus reduce instances of overwatering. • Simple, low cost structural change to help reduce water use.
Disadvantages	• If insufficient flows result, it may take longer to water courts or insufficient watering may occur.
Water Saving	Dependent on fixture installed and method of use.
Cost	Low
Maintenance/application	Maintenance requirements should not be increased, unless water flows are insufficient and watering takes longer.
Case study	Blackburn Tennis Club
Resources	Efficient fixtures can be purchased from many gardening or hardware stores, including Mitre Ten, Bunning's and speciality shops such as the One

	Stop Sprinkler Shop.

D. Treatment of court profile with bentonite during court construction	
Concept	Bentonite (a type of clay) is added to the layers of the court during construction. This is similar to technology commonly used on French courts.
Time frame	Long term
Advantages	• Addition of bentonite to the court during rebuilding improves water retention and provides an excellent playing surface. • Acts as a binding agent to reduce material lost on windy days.
Disadvantages	• In times of severe water restrictions, clubs are not protected from drought and may not be able to water their courts, unless and alternative water supply is also sought.
Water Saving	60% on average
Cost	In the order of $30,000 per court
Considerations for clubs	This is only feasible when courts require a rebuild.
Case study	Dendy Park Tennis Club

E. Rebuild red porous courts using subterranean watering system	
Concept	Rebuilding of courts and installation of a subterranean watering system. There are different options available that use different water conveyance and court construction methods; however they are all dependent on capillary action of water through the court surface to maintain moisture in the court. The base material can be wetted either continuously through the use of a subsurface reservoir system or intermittently through the use of an electronically controlled timer which turns a water source on / off. There are four main systems current used in both Australia and overseas which are detailed below. *Cal-Cap (Calico Raquet Courts)* - CAL-CAP®'s system consists of a specially prepared base upon which is placed a heat-seamed, low density polyethylene liner. This liner, which is spread over the entire sub-surface of the court, is claimed to be puncture-proof and impervious to extreme weather fluctuations. Laser-drilled, dual-chambered polyethylene tubes and pipe are then installed, allowing for a high degree of controlled and carefully monitored flow of water to exactly irrigate the upper surfaces of the court. The CAL-CAP® system collects and stores natural rainwater beneath the court surface, and when needed is automatically fed by capillary action into the upper surfaces. *Hydrocourt (Lee Tennis Products)* - HydroCourt is a self-regulating irrigation system that waters the court from below. Each court is constructed with six, fully lined, individually controlled cells. Each cell is monitored by a water control box allowing adjustments to be fine tuned to player preferences. Increasing the water in the control boxes increases the water level in the court. Once the appropriate water level is achieved a float valve and an overflow pipe inside the control box keep the water level constant. *HydroGrid (HydroGrid Tennis)* -

	HydroGrid is an underground watering system that reduces irrigation costs, cuts maintenance time and personnel costs and eliminates down time completely. *AquaGrid (Har-Tru Corp)* - This dual-action watering capability prevents courts from getting too wet or dry, and can be easily maintained in prime playing condition. Sprinklers are positioned around the perimeter of the court with heads elevated above the court surface. The subsurface water pipes are spaced to release water slowly that rises to the surface through capillary action. Both systems are controlled with electric valves and a time clock.
Time frame	Long term
Advantages	• Saves a great deal of water via reducing evaporation through the court. • Courts stay moist due to capillary action up from the subsurface. • The amount of material lost to wind, water runoff and through play is reduced due to the continually moist surface.
Disadvantages	• If system is not designed appropriately, clubs can be left with a suboptimal solution. • Although these installations are extremely common in the U.S., experience in Australia is limited.
Water Saving	Almost 70% in annual water savings has been achieved at Port Melbourne Tennis Club.
Cost	$35,000 / court at Port Melbourne Tennis Club
Considerations for clubs	Clubs should consider and research different systems. Global Tennis Design recommends a service after installation from the contractors, to ensure proper adjustment of the system and proper instruction to maintenance personnel. It is essential to employ an experienced contractor. Care must be taken to ensure the optimal system design is achieved.
Case study	Port Melbourne Tennis Club
Resources	Cal-Cap - http://www.calcaptennis.com/system.htm Lee Tennis - http://www.leetennis.com/hydrocourt.php HydroGrid – http://www.welchtennis.com/ AquaGrid - http://www.httennis.com/watering.php Global Tennis Design - http://www.globaltennisdesign.com/

F. Rebuild grass courts using subsurface watering system	
Concept	Rebuilding courts and installation of a subsurface watering system. Irrigation systems for grass courts are similar to those used for other grass playing surfaces including cricket pitches.
Time frame	Long term
Advantages	• Saves a great deal of water through reducing evaporation through the court.
Disadvantages	• Time period required for settling of courts following installation may be significant.
Water Saving	Estimated at 50%
Cost	$15,000 per court at Geelong Lawn Tennis Club.
Considerations for clubs	Allow time and effort for ensuring an appropriate design and for required soil settlement.
Case study	Geelong Lawn Tennis Club

G. Thicker topdressing of red porous courts	
Concept	Temporary dressing with thicker topdressing of surface material protects the court by reducing evaporation.
Time frame	Short term
Advantages	• Protects courts • Can be scraped off in cooler or wetter months
Disadvantages	• Can change court playing characteristics negatively, such as causing bad bounces, buried lines.
Water Saving	Not defined.
Cost	$300 / court
Case study	Blackburn TC
Resources	Contact: Hydro-clay (Thomastown, Victoria) Tennis Court Aggregate (Thomastown, Victoria)

Use Alternative Water Sources

Alternative water sources that could be considered for use for watering red-porous courts are:

- Rainwater (water collected directly from roof-runoff)
- Stormwater (urban surface water run-off captured from rainfall events)
- Groundwater (water extracted from groundwater bores),

A. Installation of rainwater tank and rainwater capture	
Concept	Harvesting of rainwater from the club roof.
Time frame	Intermediate - long term
Advantages	• Long term solution.
Disadvantages	• Does not guarantee supply in drought – if it doesn't rain, your tank won't fill!
Water Saving	As much as can be captured and stored and replaced from mains water.
Cost	$5,000 - $35,000 for a tank and pump, depending on number and size of tanks, requirements for new piping and pumps, and other infrastructure.
Considerations for clubs	This can be implemented in most places. Clubs with larger roof space on their buildings will reap greater benefits, provided sufficient storage can be installed. If your club has limited roof space, consider teaming up with an adjacent factory or clubhouse – "donation" of harvested rainwater or rainwater tanks to a club can in some circumstances be a tax incentive for businesses.
Rainfall calculation	The amount of rainwater available for reuse is a function of area of roof area available, rainfall, storage provided for and frequency of use. An excellent resource to assist in calculating the correct size of tank for your club is the EnHealth document "Guidance on use of rainwater tanks". Appendix B of this document includes a table from this document to assist in providing an indication of the correct rainwater tank size based on average rainfall, roof area and demand. As an example, for an average clubhouse with a roof area of 400 m^2 in Melbourne, a 30 kL tank should provide 400 L/day for most of the year (90% of days). Annual rainfall for your area can be found at the Bureau of Meteorology, http://www.bom.gov.au.
Case study	Bulleen Tennis Club, Blackburn Tennis Club

B. Harvesting of stormwater from converted hard court or other surface	
Concept	Harvesting stormwater from hard courts for watering of other courts. This option may involve converting one or more courts to hard court if none are available. A treatment system (possibly a filtering system) may be required prior to reuse.
Time frame	Intermediate - long term
Advantages	• Provides water self-sufficiency
Disadvantages	• Court conversion to provide stormwater may not be a good option if the club does not have a lot of courts. For tournament clubs it can be problematic to have multiple different playing surfaces.
Water Saving	100% on the converted court. Volume of water available for use from the converted court depends on the collection and treatment system as well as the volume of the storage tanks provided. As an example, one tennis court located in Melbourne (fitted with an efficient collection and treatment system) with 19 kL of storage, could supply approximately 400L/day of stormwater for the majority of the year.
Cost	Conversion costs: $66,000 for conversion of two red porous courts to synthetic courts and harvesting of the water from these
Considerations for clubs	An integrated engineering project is required to enable harvesting of hard courts to water other courts, which requires project planning and design before court construction. Loss of red porous or grass courts should be considered.

C. Harvesting of groundwater	
Concept	Installation of a bore to harvest groundwater. Water can be pumped into a tank from where it can be distributed to the courts.
Time frame	Short term
Advantages	• Currently a cheap source of water that can replace mains water and result in large water savings to the water supply network. • Can apply for the licence immediately • No restrictions on quantity if yield is sufficient
Disadvantages	• Subject to a licence • Sinking a bore may or may not be an option due to the availability or water quality (salinity) of groundwater. • Possible long term impacts include permanent drawdown and causing subsidence in nearby properties. Water level may also drop below the bore. • Some additional energy costs associated with pumping of water, although small.
Water Saving	Bore water can completely replace mains water supply if volumes are sufficient.
Cost	$7,000 - $15,000
Considerations for clubs	Bore water is not available in all areas.
Case study	Port Melbourne, Dendy Park, East Malvern, Black Rock and Kings Park Tennis Clubs
Resources	Individual licences for groundwater use are issued by the relevant rural water corporations (Southern Rural Water, Goulburn-Murray Water, Grampians Wimmera Mallee Water or Lower Murray Water).

D. Connection to recycled water scheme (dual pipe)	
Concept	Connection to a dual pipe scheme supplying Class A or lower recycled water. The Class of water refers to the level of treatment, with Class A being the highest quality.

Time frame	Long term
Advantages	• Is a high quality treated water suitable for use for court irrigation
Disadvantages	• Is only available in certain areas, usually close to treatment plants • May be restrictions on watering, depending on the class of water obtained
Water Saving	Could supply 100% of required water for courts
Cost	Unknown
Case study	MacKillop College – irrigation of school ovals (see City West Water website for details, http://www.citywestwater.com.au/residential/recycled_water_resources.htm)
Resources	Contact your local water retailer to find out if this option is available to you

E. Imported water	
Concept	Purchasing tanker loads of water (recycled water, groundwater or other sources).
Time frame	Short term
Advantages	• This can be a quick-fix in the case of no water being available in order to preserve courts.
Disadvantages	• It is not a suitable long term or sustainable solution to truck water in from off-site as trucking water has a high energy cost, depending on distance travelled. • Trucking of water is expensive.
Water Saving	Dependant on volume trucked.
Cost	Dependant on supplier and distance travelled. As an indication, South East Water has the following rates for tankering of Class A water: 0-20kms radius $13 per kilolitre (kl) 20-40kms radius $16 per kl delivered 40-60kms radius $19 per kl delivered 60-80kms radius $22 per kl delivered 80-100kms radius $25 per kl delivered Tankering of groundwater by South East Water is approximately twice the above recycled water tankering costs.
Resources	Your local water retailer Priority Plumbing 132 812 / 9552 3615 South East Water alternative water options, under solutions for business: http://www.southeastwater.com.au/SOLUTIONSFOR/BUSINESS

G. Underground harvesting of water	
Concept	Harvesting of court runoff underground using an underground lining or other capture system
Time frame	Long term
Advantages	• Reduce waste of water lost through court surface
Disadvantages	• Requires court rebuilding for installation
Water Saving	Unknown
Cost	$1,000 - $3,000 / court
Resources	Tennis Victoria Technical Services http://www.tennis.com.au/pages/default.aspx?id=3&pageId=11887 Invisible Structures http://www.invisiblestructures.com.au Atlantis http://www.atlantiscorp.com.au Crest Tennis Courts

Other options

Other options which have not been detailed above include:

A. Covering of courts	
Concept	Covering the court surface with hessian, shadecloth or weedcloth while not in play.
Time frame	Short term
Advantages	• Provides protection of court when not in use or not permitted to water • Reduces evaporation loss
Disadvantages	• Does not allow play
Cost	$400 - 500 /court
Case study	St Luke's Tennis Club, Thomastown Tennis Club, Bennettswood Tennis Club
Resources	Monbulk Rural Enterprises Tennis Victoria Technical Services http://www.tennis.com.au/pages/default.aspx?id=3&pageId=11887

B. Topdressing of courts with brickie's (clayey) sand	
Concept	Thicker topdressing with brickie's sand manipulates the surface layer of the court with thick layers of granular materials, in order to protect the court from the effects of evaporation.
Time frame	Short term
Advantages	• Is a solution to medium term closure of the court e.g. from November- March • Protects courts
Disadvantages	• Needs to be removed for play.
Water Saving	Not defined.
Cost	$100 / court
Case study	Noble Park Tennis Club

5.1.2 Water Saving Options for Tennis Clubhouses

Water saving for non-club areas includes using water more efficiently throughout the clubhouse, and using alternative water sources.

This section outlines some water saving options available for tennis clubhouses within Victoria. These fall under the categories:

- Use water more efficiently, or
- Use alternative water sources.

Each of these options is discussed below, and includes a comment on

- The actions that can be performed;
- The reasons behind those actions;
- Some notes on the associated technologies; and
- Resources to find out more information.

Use Water More Efficiently

Water metering and leak detection	
Actions	• Regularly check for and repair leaks and plumbing problems. • Read water meters on a regular basis, document results and monitor use. • Install stickers or signs with hotline numbers near taps to encourage leak detection. • Install a separate water meter for clubhouse and courts
Reasons	• Leakage can lead to substantial losses - for example, water audits of all types of clubs in Sydney showed 25% of water lost due to leaks. Regular inspection and/or monitoring will help identify if leaks are occurring. • Clubs should understand volumes of water being used in order to set targets and measure improvements. • Education and reminders encourage desirable behaviours in users. • At a minimum, clubs should be aware of the volumes of water being used on their courts and clubhouses separately.
The technology	• Common areas of leakage include piping joints, toilets and urinals, pump seals, hose nozzles, shut off or control valves, drinking fountains and taps • To detect a leak, ensure all taps are turned off. Check your water meter and note the reading. Then check the reading again after about three hours. If no water has been used, the reading should be the same. If the meter has moved, you have a leak that needs to be found and fixed. • A smart meter provides real-time water use information, and can help to detect leaks and identify major water uses.
Resources	Smart Metering with HydroShare, accessible from: http://www.yvw.com.au/yvw/YourBusiness/WaterConservation/Programs/ A video tutorial available from the Savewater website shows how to check your water meter. http://www.savewater.com.au/how-to-save-water/in-the-home/video-tutorials

Showers	
Actions	• Encourage a reduction in showering times through posting water conservation messages on posters or stickers. Encourage 4 minute showers. • Install shower timers in showers to encourage shorter showers. • Install flow restrictors inside the showerhead or adjust the water pressure to minimise flow. • Install a AAA or at least 3 star rated water efficient showerheads (may be free from your local water authority).
Reasons	• If your club has a shower that is used more than once per day, and flow is 15 L/min or more, replacement with a 9 L/min showerhead has a payback period of less than one year. If you replace your showerhead with a free one from your water retailer, payback is immediate!
The technology	• Water efficient showerheads, shower timers and water conservation stickers may be available for free from your water retailer.
Resources	• Ask your water retailer if they supply stickers and shower timers for free. • A video tutorial available from the Savewater website shows how to replace a showerhead. http://www.savewater.com.au/how-to-save-water/in-the-home/video-tutorials

Toilets	
Actions	• Inspect cisterns regularly to identify any leaks. • Replace rubber cistern seals, before leaks occur. • Periodically replace valves and ballcocks. • Implement measures on existing toilets to reduce flush volumes or reduce losses. • Replace cisterns on existing toilets to lower volume models. • Replace toilets with 4.5/3 litre dual flush systems, which are rated 4 stars.
Reasons	• A leaking toilet or urinal can waste up to 200 L of water per day, costing $135 per year. • Older toilets can use up to 11 litres per flush.
The technology	The measures suggested relate to maintenance or partial replacement procedures on existing toilets, or replacement of toilets with more efficient models.
Resources	The Water Efficiency Guide for Offices and Public Buildings (Department of Environment and Heritage) contains good background information on improvement options available for toilets: http://www.environment.gov.au/settlements/publications/government/water-efficiency-guide.html

Urinals	
Actions	• Reduce losses via reduced flush volumes • Install technologies to existing urinal to enable a low water or waterless operation, such as blue urinal cubes. • If on-demand controls are preferred (for single stalls) install automatic individual sensor flush units. • Replace cyclic flushing cisterns with sensor-operated flushing units. • Install water-efficient models rated at least 3 stars. • Install fully waterless urinals.
Reasons	• Sensor units controlling up to three stalls will still save water and money. • A club with a 4m trough-type urinal can save up to 200 kL of water / year by installing technologies that enable a low water or waterless operation.

	• The payback period for sensor-operated flushing units is typically less than six months. These should have routine maintenance and it should be ensured that the battery or power supply is well maintained.
The technology	Waterless urinals have three main designs, described briefly below. *Oil barrier (either refillable or replaceable cartridge)* - A refillable oil cartridge or oil trap creates a physical barrier between the user and the plumbing. *Mechanical designs* - One-way valves enable urine to pass into the plumbing system, but stop odours going back into the washroom. These are the newest type of waterless urinals. *Microbial blocks* - The microbial blocks are an easy solution as they can be retrofitted to an existing system. Bacteria are contained in a water-soluble block (like a large sugar cube) which is placed in the urinal, and the blocks are designed to break down on contact with urine to release odour-masking agents and bacteria that will break down the components of urine that cause scale and odour. See the resources for further information.
Resources	Sydney Water Best Practice Guidelines for Clubs – has good tips and guidelines for reducing water use in urinals http://www.sydneywater.com.au/Publications/FactSheets/BPGsForClubs.pdf http://www.sydneywater.com.au/Publications/FactSheets/WaterlessUrinalsFactSheet.pdf

Taps	
Actions	• Erect signs reminding users to turn off taps when not in use. • Encourage users to report leaky or faulty plumbing. • Inspect taps regularly to identify any leaks. Ensure prompt repairs are undertaken. • Fit long-life tap washers to taps (usually with a rubber O-ring and mechanical protection against over tightening) • Fit aerators to basin spouts or install flow regulators. • Adjust flow valve or fit flow control regulators to reduce water flow to a practicable flow rate. • Fit new water efficient tapware with at least a 4 star rating. • Update the tap system to include automatic shutoff, metered shutoff or trigger sprays.
Reasons	• Education and reminders via posting signs/stickers above taps, or via other communication with members, encourage desirable behaviours in users • One drip per second is 7,000L/year • Flow restrictors can reduce flow rate by up to 84% • Aerators can reduce the flow by up to 50%, and are inexpensive (typically $2 per aerator). • Typical taps discharge 15 - 20 L/min. New low flow and aerating models may use as little as 2 L/min. Quarter turn taps with ceramic seats give greater flow control and are less prone to leakage.
The technology	*Flow regulator* - A flow regulator fitted to a tap suits areas with a wide variation in mains water pressure, delivering a reduced, but even flow of water. *Aerators* - An aerator is fitted to the tap nozzle. It reduces the flow and mixes air with the water stream.

	Flow restrictor - A flow restrictor is also fitted to the tap, is cheaper and constrains the flow of water but is not sensitive to varying mains pressure. *Pressure limiting valves* - These are fitted to the main water line into the home and control the pressure to all taps to a preset maximum, reducing water wastage and water hammer. *Movement-sensor operated basin spouts* - Automatically turn on when hands are placed underneath spout. They are the most hygienic but can be expensive and have complex maintenance. May be feasible only in high usage areas. *Spring-loaded taps* - These shutoff immediately after use. *Tapware* - Water efficient tapware should have at least a 4 star rating.
Resources	For small modifications, consult your local hardware shop for fittings. Video tutorials available from the Savewater website show how to install a water flow controller and change a tap washer. http://www.savewater.com.au/how-to-save-water/in-the-home/video-tutorials For more involved modifications or installations, consult a Green plumber.

Dishwasher	
Actions	• Water conservation messages are posted to encourage running dishwasher only when fully loaded. • Dishwasher is a water efficient model.
Reasons	• Education and reminders encourage desirable behaviours in users. • Efficient models can provide substantial water savings compared to older styles. The most efficient dishwashers use half the water of average models.
The technology	If replacing, look for a water efficient dishwasher which will use less water per cycle. The best water rating achieved by dishwashers is 5 Star.
Resources	Case study of development of a water efficient Fisher and Paykel dishwasher http://www.environment.gov.au/archive/settlements/industry/corporate/eecp//case-studies/fisher-dfe.html

Hot water urn	
Actions	• Use an appropriate kettle size, and only use the hot urn when required. • Check that the urn isn't leaking
Reasons	• Filling and boiling a large volume of water in an urn is a waste of both energy and water (if the urn is emptied at the end of the day).
The technology	• Use an appropriate sized kettle for the number of hot drinks required

Hot water service	
Actions	• Check temperature setting of hot water services
Reasons	• Hot water services should be set at a maximum of 60° C. Using higher temperatures wastes both energy and water as the hot water must be diluted with cold water to make a comfortable temperature to use.
The technology	• Hot water services use a large proportion of inside energy use. A newer model unit will be more energy efficient.

Garden irrigation	
Actions	• Ensure watering occurs on an "as needs" basis, before 6am or after dusk, and in line with water restrictions. • Use mulch on the gardens. • Install moisture sensors to determine the amount of water required for gardens. • Plant drought tolerant native species • Install efficient irrigation system
Reasons	• In cooler parts of the day, evaporation of water will be reduced. • Mulching can reduce evaporation by up to 70% • Sensors act as an override facility to prevent automatic systems from working when there is enough moisture in the soil, and are inexpensive. • Plants that demand high volumes of water are not sustainable in the long term if on mains water.
The technology	Fixed watering systems are available in drip, micro-spray or pop-up sprinklers. Timers are preferable but are inefficient if they turn on during rain. *Drip irrigation* Drip irrigation delivers a controlled trickle of water directly to the roots of the plant and avoids wetting the foliage. The slow rate of application means that no water is wasted through run off. *Fixed sprinklers* In micro irrigation, miniature spray heads or jets are mounted onto rigid risers plugged into a network of black PVC irrigation tubing, known as polytube, as feeder lines, usually 13mm in diameter. The spray heads are available in a variety of spray patterns and spreads enabling efficient, even coverage only to those areas of the garden requiring watering. Choice of sprinkler type is dependent of water restriction requirements and the garden area to be watered.
Resources	Sydney Water Best Practice Guidelines for Clubs – has good tips and guidelines for reducing water use in outdoor areas http://www.sydneywater.com.au/Publications/FactSheets/BPGsForClubs.pdf The Savewater website offers good tips of savings water in the garden http://www.savewater.com.au/how-to-save-water/in-the-garden

Use Alternative Water Sources

Alternative water sources	
Actions	Harvest rainwater, stormwater, greywater or groundwater for use in and around clubhouse. • Rainwater tanks can be plumbed to the clubhouse for uses other than drinking and food preparation. If your roof capacity is not sufficient, consider teaming up with an adjacent factory or clubhouse - "donation" of harvested rainwater to a club can be a tax incentive for businesses. • Water harvested from hard courts can be used for outdoor and some indoor uses. • Water from basins, showers and washing machine can be stored, treated and reused for garden irrigation (must be subsurface irrigation unless appropriate controls are

	implemented), and • Groundwater may be used for all non-potable uses. Extraction of bore water is not always environmentally sustainable in the long run, and quality and accessibility can vary from location to location. Consult the relevant rural water authority as to the depth, availability and quality of the local resource. Pumping can also lead to increased energy costs.
Reasons	• Replacement of mains water supply is your best option to "drought-proof" your club.
The technology	More details on these sources are given in Table 3.
Resources	More details on these sources are given in Table 3.

5.2 General Sustainability Options for Tennis Clubs

This section outlines some energy saving options available for tennis clubs within Victoria. These are divided into the following categories:

- Use energy more efficiently,
- Use alternative energy sources; and
- Waste considerations

Each of these options is discussed below, and includes a comment on

- The actions that can be performed;
- The reasons behind those actions;
- Some notes on the associated technologies; and
- Resources to find out more information.

Use Energy More Efficiently

Court lighting	
Actions	• Court lighting is not left on when not in use. • Court lighting design is at a level consistent with the clubs level of play. • Modern fittings are installed rather than older styles. • Court lighting is on low mount fittings.
Reasons	• Energy is wasted if lights are left on when not in use. • International, competition or recreational levels of play have different requirements for lighting levels as outlined in Australian Standard 2560.2. If you're not a competition club, you won't require as many lights. • Modern fittings are more efficient. • Low mount fittings are more efficient than high mount, and are the preference of many councils.
The technology	• Metal halide lights are the current standard fitting and are the most efficient.
Resources	• Australian Standard 2560.2.1 Sports Lighting - Lighting for outdoor tennis • Tennis Queensland Technical Services Advisory Group – Technical Manual for the Design, Construction, Maintenance of Tennis Facilities. Available via the Tennis

	Australia website. • Contact your local tennis lighting supplier/installer for more information

Electricity metering and monitoring	
Actions	• Energy meters read on a regular basis, with results documented and monitored.
Reasons	• In order to set targets, clubs must understand their consumption and through monitoring of metered energy, this can be tracked.
Technology	• Smart meters provide real-time energy use information, and can help identify major uses.
Resources	• There are a number of commercial brands of smart electricity meters available including the Energy Smart Meter available from the solar shop (1800 988 877 or www.solarshop.com.au)

Light fittings	
Actions	• Post energy-efficient messages to encourage energy conservation through switching off lights when not in use. • Install energy efficient light fittings
Reasons	• Education and reminders encourage desirable behaviours in users. • Compact fluorescent light bulbs use 80% less energy and last 8 times longer than incandescent bulbs.
The technology	Below are typical running costs for incandescent and compact fluorescent light blubs (Source: Sustainability Victoria Fact Sheet on lighting):

Power	Approximate Balloons of Greenhouse Gas	Purchase Price	Expected Operating Hours	Electricity Running Costs (Approx per year)*
Incandescent	75 Watt	$1.00 - $1.20	1000 - 2000 hours	$12.30
Fluorescent	15 Watt (75 Watt equivalent)	$4.00 - $10.00 (cheaper if buy in pack of 2-3)	Around 8000 hours	$2.30

* Based on 5 hours of use per day, at 15 c per kilowatt hour

Resources	Sustainability Victoria has a number of excellent resources under their Publications page including a fact sheet on lighting: http://www.sustainability.vic.gov.au/www/html/2038-energy-saving-fact-sheets.asp

Appliances	
Actions	• Post energy-efficient messages to encourage energy conservation through switching off appliances at the wall when not in use. • Turn appliances (such as televisions) off at wall rather than use standby mode when not in use. • Dispose of unnecessary appliances (such as second fridges or freezers), where not really required.
Reasons	• Education and reminders encourage desirable behaviours in users. • Standby mode on appliances can amount to 10% of energy use in households. • Older, less efficient models of fridges and freezers could have operating costs up to 100% higher than newer models. Consider whether that second fridge is really needed.

The technology	Appliances such as fridges, freezers, microwaves, toasters, kettles, computers, televisions, dishwashers,
Resources	Sustainability Victoria has a number of excellent resources under their Publications page including a fact sheet on appliances: http://www.sustainability.vic.gov.au/www/html/2038-energy-saving-fact-sheets.asp

Hot water	
Actions	• Reduction of hot water use is encouraged through water conservation measures described under the Water section • Reduce temperature of hot-water service to 60°C • Consider installing a solar hot water system
Reasons	• Reduction of volumes or of temperatures of hot water used saves energy. • Solar hot water can save up to 60% on energy bills in households.
The technology	There are a range of hot-water services available
Resources	Sustainability Victoria has a number of excellent resources under their Publications page including a fact sheet on hot water, and appliances, which gives costs for different hot water systems: http://www.sustainability.vic.gov.au/www/html/2038-energy-saving-fact-sheets.asp

Heating and Cooling	
Actions	• Adjust heating systems to a maximum of 20°C. Increasing the temperature increases the cost to supply. • Adjust the cooling systems to be cooler than outside, but not more than 5°C cooler (i.e. minimum temperature of 25°C on a 30°C day) • Use or install blinds and window coverings to minimise heating and cooling losses
Reasons	• Cooling or heating unnecessarily wastes energy
The technology	• There are a range of technologies available
Resources	The save energy website (http://www.saveenergy.vic.gov.au) provides details on how to save energy via using heating and cooling systems more efficiently.

Use Alternative Energy Sources

Alternative energy sources	
Actions	• Install renewable energy, such as solar panels or wind generators • Consider purchasing Green Power
Reasons	• The technology is available for self- generation of some or all of a clubs energy requirement. • Purchasing of Green Power is an easy step that clubs can take to reduce their environmental impact. For household level electricity use, the cost increase is around $4-7 per week.
The technology	• Renewable energy sources are intermittent, so a method of storing energy is needed. The most common solution in Australia is storage batteries. These are used in a Stand Alone Power System (SAPS). The alternative is to use the electricity grid to store the energy, known as Grid Interactive Systems. Grid connected systems are eligible for receipt of a 60 c per kWh feed in tariff from 2009, for systems of up to 2 kilowatts. • For Green Power, contact your local electricity supplier.

Resources	Sustainability Victoria has a number of excellent resources under their Publications page, on green power and renewable energy: Green power http://www.resourcesmart.vic.gov.au/for_households_1855.html Renewable energy fact sheet, downloadable from http://www.sustainability.vic.gov.au/www/html/2038-energy-saving-fact-sheets.asp

Waste Considerations

Waste Management	
Actions	Separate recycling facilities for glass, plastics, paper/cardboard are available consistent with that provided by your local government
Reasons	There is now a much greater expectation in the community that there will be access to recycling facilities in both private and public locations, including sports facilities.
The technology	Correct signed and located bins for collection of each waste stream.
Resources	Local Government Sustainability Victoria's Public Place Recycling Guidelines http://www.sustainability.vic.gov.au/www/html/2736-public-place-recycling-guidelines.asp

6. Case Studies

<table>
<tr><td colspan="2">Bulleen Tennis Club – Combining court treatment with rainwater harvesting to reduce demand on mains water
The club installed 6 rainwater tanks to store water harvested from the clubhouse roof, and applied court treatments to reduce the watering requirements of their red porous courts.</td></tr>
<tr><td>The club</td><td>10 red porous courts and 260 members.</td></tr>
<tr><td>Aims and objectives</td><td>To reduce water demands for the courts, and reduce mains water usage through rainwater harvesting.</td></tr>
<tr><td>The project
  </td><td>Rainwater and stormwater harvesting
• Installation of 6 rainwater tanks collecting from clubhouse roof (total of 136,000 L of rainwater storage), done in two stages:
- Stage 1: Installation of four water tanks, with a capacity of 91,000 litres, as well as a 36-metre long pipeline and cyclonic filter that connects the roof of the clubrooms to the tanks.
- Stage 2: Connection of a pump and reticulation system, with the taps located in the centre of each pair of courts. This enabled watering hoses to be connected to either tank or mains water. A water meter was also installed in the pump house.
- Extra funding since has allowed the upgrade to 136,000 L of storage, and the installation of a stormwater capture system, which captures runoff from one court and delivers it into an underground tank. This is transferred via a submersible pump into the main tanks for court watering.
Court treatment
• Treatment of the courts with calcium chloride has also been undertaken to reduce the watering requirements on the courts. This chemical is applied to red porous courts and improves its water retention characteristics, through the absorption of moisture from the air which turns the chemical into a liquid solution.
Other initiatives
• Club has also upgraded toilets to dual flush.
• Club is currently planning to convert a pair of courts to hard court. Additional stormwater harvested is expected to provide enough water to allow self-sufficiency from mains water for court watering.</td></tr>
<tr><td>Water savings</td><td>Rainwater tanks supplied approximately 1/4 of the water requirements for the club between March and November 2008.</td></tr>
<tr><td>Funding</td><td>The total cost was approx $65,000, including tanks, pump house and pipe work. Funding was provided by:
- Federal Government Community Water Grant ($50,000)</td></tr>
</table>

	- Remainder by club ($15,000)
Timeline	The club commenced looking into water grants in 2006, and the project was completed in 2008.
Results and evaluation 	*General* • Reducing their demand on mains water has allowed the club to retain their red porous courts, which are a superior playing surface for player development *Rainwater and stormwater harvesting* • The initiative makes use of the available rainwater and reduces the reliance on mains water • Tank capacity is 136,000 L and has gone a long way to reduce demand on mains supply. • Depending on rainfall received, the club will have the ability to become water self-sufficient if they convert a pair of courts to hard court and harvest this stormwater. *Court treatment* • The court treatment has led to a reduction in water requirements • The club recommends applying chemical treatments once per year if using water from rainwater tanks.
Important considerations for other clubs 	• Although reduced, watering is still required on treated courts, which puts clubs at risk under more severe water restrictions if no alternative water source is installed. • Additional energy consumption due to pumps should be considered within the clubs overall environmental impact. • Space available for installation of tanks must be considered. • Clubs should select which chemical treatment to use based on the available information and experienced contractors.
Lessons learned	*Rainwater harvesting* • The club would like to install more tanks and implement the hard court stormwater harvesting scheme described above. • Some approval issues impacted on the allowable tank location, causing the tank site to be relocated from the club's preferred area. Adequate consultation with stakeholders is important in ensuring a smooth-running project. • The water pressure from the rainwater tanks was found to be slightly less than from the mains supply; however this has not presented a significant problem

	Court treatment • The club will try the magnesium chloride treatment next time, believing it to be easier to use (self-application is possible), and cheaper than $CaCl_2$.

Blackburn Tennis Club – Combining court treatment with rainwater harvesting to reduce demand on mains water The club installed 5 rainwater tanks to store water harvested from the clubhouse roof, and applied court treatments to reduce the watering requirements of their red porous courts.	
The club	Seven red porous courts and 300 members.
Aims and objectives	To reduce water demands of the courts, and reduce mains water usage through rainwater harvesting.
The project 	*Rainwater harvesting* • The project involved the installation of 5 rainwater tanks collecting from the clubhouse roof. *Court treatment* • The courts are being treated with calcium and magnesium chloride. • These chemicals are applied to red porous courts and improve water retention characteristics. *Other initiatives* • The club is also using low flow nozzles on hoses to reduce water flow onto courts.
Water savings	Water savings of greater than 75% have been achieved as a result of the court treatments.
Funding	The total cost for the tank installation and associated infrastructure was approx $35,000. Funding was provided by: - Sport and Recreation Victoria Grant ($15,000) - Tennis Australia rebate ($8,000) - Remainder by club ($12,000) Court treatments have been funding with a combination of club funds and Tennis Victoria rebates. Over 250 volunteer hours were contributed to the project to ensure its success which kept costs down.
Timeline	The club began to make initial enquires about a water saving project in 2006. An application was made in 2007, and the project was completed in February 2008.
Results and evaluation	*General* • Reducing demand on mains water has allowed the club to retain their red porous courts, which are a superior playing surface for player development. They were also able to maintain a number of same-surface courts, which is important for tournaments. *Rainwater harvesting*

	• The project makes use of available rainwater and reduces reliance on mains water *Court treatments* • The club has achieved water savings of greater than 75%. The club is recommending treatment 1-2 times per year if able to use alternative water sources, or 3-4 times per year if on mains water.
Important considerations for other clubs	• Smaller clubs need a surface with a lower maintenance cost and retention of red porous courts may not be a suitable solution for small clubs with only 2-3 courts and a small clubhouse. • Although reduced, watering is still required on treated courts, which puts clubs at risk under more severe water restrictions if no alternative water source is installed. • The effect of additional energy consumption caused by pumping water should be considered in the context of the clubs overall environmental impact. • Space available for installation of tanks must be considered. • Clubs should select which chemical treatment to use based on the available information.
Lessons learned 	*Rainwater harvesting* • Due to planning issues particular to their location and land, tanks could not necessarily be put into the most optimal place for rainwater capture and use. *Court treatments* • The club will use the magnesium chloride rather than calcium chloride in their next treatment, believing it to be easier to use (self-application is possible), and cheaper. • The club found that if top dressing is replaced at the same time as treatment is applied, better results are obtained.

Dendy Park Tennis Club – Rebuilt courts with bentonite and installed a groundwater bore This club used a technique commonly used in France to incorporate bentonite into the courts during rebuilding. Additional top-dressing with bentonite provides water savings on non-rebuild courts, and a groundwater bore provides independence from mains water supply.	
The club	19 red porous courts and 500 members.
Aims and objectives	The club wished to retain the use of its 19 red porous courts under water restrictions and into the future, due to the high quality of its surface and the requirement for use of courts in competitions and tournaments. The club felt that they should be contributing to player development within Victoria, and although they consider European Clay to be the best court surface for player advancement, they believe red porous to be the next best option.
The project 	*Court rebuilding and treatment with bentonite* • The courts were rebuilt using bentonite clay additive to help absorb and retain water. The chemical properties hold moisture in the court surface, reducing the amount of water required. Further, the treatment also acts as a binding agent which increases the weight of the top dressing, reducing the amount of red porous surface being blown from the court on windy days. 6 courts were rebuilt, and the remaining courts have been treated with bentonite as a top dressing. *Groundwater Bore* • The club has also installed a bore and storage tank. *Other initiatives* • The club is currently looking into harvesting stormwater from nearby stormwater drains to supplement their water supply.
Water savings	Average yearly water savings of around 60% have been achieved on the rebuild courts. A single half day test in summer demonstrated a 25% water saving. The club does not rely on any mains water supply for the courts, due to installation of the bore.
Funding	The total of the rebuilding project was approximately $31,000 per court. Funding was provided by: - Smart Water Fund ($105,000) - Tennis Australia Research and Development Funding ($25,000) - Remainder by club ($56,000)

	In addition, the total cost for installation of the groundwater bore, tank and associated infrastructure was approx $35,000, which was paid for by the club.
Timeline	The club first researched extensively the methods and examples of rebuilding with bentonite in France. Rebuilding of the first two courts were completed in January 2007, with another four courts completed in 2008. Courts are out of action during rebuilding, as with any rebuilding of a red porous court.
Results and evaluation	*Bentonite rebuilding and top dressing* • 25-60 % water savings have been achieved, depending on season • The courts have been described by the club as a "beautiful playing surface". • If constructed well, this option works extremely well and greatly reduces water requirements. *Groundwater bore* • The club is self-sufficient from mains water supply.
Important considerations for other clubs 	• Bentonite treated courts still require watering which puts clubs at risk under more severe water restrictions and if no alternative water source is installed. • The effect of additional energy consumption caused by pumping water should be considered in the context of the clubs overall environmental impact. • Limited number of contractors able to build or rebuilt red porous courts. • Harvesting stormwater from public stormwater drain is likely to require a high level of treatment and may require approval from both local government and Melbourne Water (or other local authority responsible for waterway).
Lessons learned 	• Evaluation results suggested that a marginally increased concentration of bentonite in the layers could further improve water retention results. This was implemented in construction of the most recent four courts. • Careful selection of contractors is recommended to ensure high quality construction is achieved.

Port Melbourne Tennis Club – Drought-proofing through installation of subterranean reservoirs. The club installed an underground watering system below their red porous courts, as well as a groundwater bore and tank, to improve water efficiency and eliminate their need to use mains water on their courts.	
The club	A red porous tennis court club with 3 courts and 230 members
Aims and objectives	The club's red porous tennis courts were nearing the end of their life and required rebuilding, prompting consideration of options available to the club in reducing the courts' water demand. The club had started considering water-saving options some years prior to water restrictions, and went into the project with an aim to be using 100% non-mains water.
The project 	*Subterranean Watering System* • The installation of a subterranean watering system known as the 'Water Miser Red Porous Tennis Court'. Pods were installed in the subsurface of the court and water is drawn to the surface court via capillary action to reduce the amount of wastage and evaporation from conventional watering. A subsurface control unit was provided for each water pod to control the pod's water level, reticulation and drainage. Three pods per court were installed, and the pods are lined to retain the water. Figure 1 shows the system. *Groundwater Bore* • A groundwater bore, pumps and storage tank were installed as part of the project to supply the subterranean watering system.
Water savings	Installation of the system reduced annual usage by 68% on 2004/05 usage (to approximately 320 L / court / day). Latest figures from January 2007 to January 2008 indicate a use of 450-500 L per court per day, with the increase attributable to a loss of water through breaches in the liners. The club does not rely on any mains water supply for the courts, due to the installation of the bore.
Funding	The total cost was approx $140,000. Funding was provided by: - Federal Government Community Water Grant ($40,000) - Sport and Recreation Victoria Grant ($55,000) - Local Government ($27,500) - Remainder by club - Project management services were provided by Tennis Victoria and funded by Smart Water Fund
Timeline	The rebuilding occurred in 2007. Rebuilding of the courts

	required the closure of courts for around 6 months. Tennis Australia provided access to Albert Reserve during this time for club members to continue play.
Results and evaluation 	*General* • The club was able to retain their red porous courts, which are a superior playing surface, by reducing water demands. • The subsurface watering system offers many benefits such as not having to wait for courts to be playable following watering and reducing rolling requirements, • There has been an excellent response from players who have found the courts to be a high quality play surface. *Subterranean Watering System* • This is a proven technology used frequently in the U.S. • Great water savings can be achieved through subterranean reservoirs. • Some issues associated with the design and setup of the pods has resulted in a less-than-optimal water coverage. As a result the moisture distribution can be patchy, and some hand watering must be applied to the drier patches. • The inner liner has become broken or breached in places. • Due to system design problems, the automatic control unit could not work effectively and the club has had to revert to manual control. *Groundwater Bore* • The bore provides all of the court watering supply.
Important considerations for other clubs	• The depth, availability and quality of groundwater should be confirmed at the site before undertaking further steps. • Installation of subterranean reservoirs is best undertaken when court rebuilding is required, as courts must be completely removed and rebuilt for installation. • The effect of additional energy consumption due to pumping water should be considered in the context of the clubs overall environmental impact. • Selection of the type of subsurface watering system and ensuring adequate design of the system is important. There are a number of technologies available.
Lessons learned	*General* • Extensive planning, and patience in dealing with the required approval processes and with stakeholders, is essential to a successful project.

	*Subterranean Watering System* • With further design enhancements to the water extraction and storage system outlined above, design issues could be avoided. The club believes that increasing the number of "pods" from 3 to 6 would have improved the system design. • Further emphasis on correct selection, installation and maintenance of the liner would have avoided some problems. • Despite the system design limitations, the surface is high-quality and the club is very happy with the result as a whole. *Groundwater Bore* • A slightly larger tank would have been preferable.

Geelong Lawn Tennis Club – Innovative sub-surface watering system to protect club against future drought The club is in the process of installing a sub-surface watering system underneath their grass courts, to retain playing surface quality in the face of continuing drought.	
The club	13 grass courts, 12 red porous, 2 plexi cushion, 1 synthetic grass and 735 members.
Aims and objectives	To retain their playing surface and to reduce their reliance on mains water. The club currently has a water allocation but aims to reduce their reliance on mains water in the face of continuing drought.
The project 	*Sub-surface watering* • The club commenced installation of a sub-surface drip-fed irrigation system for their lawn tennis courts. This is achieved through the removal and rolling back of the grass surface, laying of pipes under the surface at 30cm intervals, and replacement of grass. Moisture sensors tell the system when to turn on and off. • The club has partnered with local water technology firm Jazz Water and international irrigation experts Netafim. • This was commenced but has been delayed due to a longer time requirement than anticipated for "settling" of courts. *Other initiatives* • Trucked recycled water and storage in installed tanks was utilised during 2006-2007 in times of severe water restrictions. This was a temporary solution and is no longer in use.
Water Savings 	There are expected savings in water due to the reduction in evaporation from the surface, and installation of sensors to ensure optimal moisture conditions are achieved, estimated to be around 50%. Actual performance will be determined following the installations.
Funding	The project costs $15,000 per court for installation of the watering system, funded by a federal Government Community Water Grant. If initial court trials are

	successful, the technology will be extended to the other courts.
Timeline	The installation was commenced but has been delayed until April, 2009 due to a longer time requirement than anticipated for "settling" of courts.
Results and evaluation	*Sub-surface watering* • Installations are yet to be finalised so results are still to come.
Considerations for other clubs	• Allow enough time following the rebuild for settling of the courts to eliminate uneven surface issues.
Lessons leaned 	*Sub-surface watering* • The time required for the "settling" of grass courts following construction of underground pipes was far longer than anticipated, and so the project has been delayed until April when it is less likely to disrupt play. Quality of surface immediately following commencement of installation was poor and uneven, and so more time is required for reinstatement. • More feedback will be available following next years' installation. *Recycled water* • The provision of trucked recycled water is an expensive measure and is not considered a long-term solution.
Useful resources	Netafim http://www.netafim.com.au/

Heatherdale Tennis Club – Conversion to a waterless surface while retaining good playing characteristics Replacement of eight red porous courts with the "Classic Clay" synthetic surface	
The club	8 red porous courts and 400 members.
Aims and objectives	With growing concern over water conservation and the increasing expense for court maintenance, the club wanted to look at tan alternative, more resourceful option that was more sustainable from the environmental and financial perspective.
The project 	• Construction of eight "Classic Clay" courts, which do not require any watering. This involved removal of parts of the court surface, cleaning the court drainage system and installing the "Classic Clay" surface over a compacted free draining surface. • The project consisted of a community consultation phase followed by installation.
Water Savings	Savings of 3400 KL per year have been achieved. The only water which is being consumed is in the club room's toilets, showers, court drinking taps and for garden use (approximately 128 KL per year).
Funding	The Smart Water Fund funded this project. The total project cost was $210,000. In 2008 dollars it is expected that this project would cost $250-320,000.
Timeline	The project was approved by the Smart Water Fund in April 2004. Construction commenced September 2004 and took approximately 1 month.
Results and evaluation	• The club were able to convert to a waterless surface while retaining characteristics of a traditional clay court. The courts also have a good shock absorbing quality, reducing risk of injury. • Feedback from players has been extremely encouraging • As there is no turbid runoff from the red porous surface, the water quality and ecosystem of the nearby waterway is protected.
Considerations for other clubs 	• Consider the time of year in which the reconstruction occurs to reduce the risk of weather-related delays. • "Classic Clay" surface can be installed over existing or newly constructed porous or non-porous sub-base such as concrete, bitumen, Macadam, asphalt, painted hard court or equivalent materials. • The makers of "Classic Clay" state that once

	the sub-surface is prepared correctly, it takes 3 days to install the "Classic Clay" surface and is immediately ready for play.
Lessons leaned	• Heavy machinery was used on the courts which cause some problems with the surface, so smaller machinery is recommended • Maintenance of courts during play was a little difficult with wet courts, and a new drag mat was developed to more easily redress court • Spring proved to be an unpredictable time of year to plan the reconstruction in.
Useful resources	Heatherdale Tennis Club http://www.heatherdaletc.org.au/ Class Clay website http://www.classicclay.com/

7. Self assessment of environmental performance

A self assessment checklist is provided in Appendix C of this report.

This tool is designed to allow clubs to demonstrate best practice in environmental sustainability. Complete the checklist in Appendix C and use it to identify where you are performing well, and what steps your club could take in improving performance.

The checklist is intended as a guidance and self-assessment tool which clubs can utilise to measure their performance and take steps toward improvements. Criteria are set out under the following categories:

- Water (separated into courts and clubhouses); and
- General Sustainability (Energy and waste for tennis clubs).

Actions relate particularly to reducing mains water demand for watering of court surfaces, saving water within the clubhouse and surrounds, and educating users of the club facility on conversation water use.

The rating obtained from the checklist will be in one of three categories: GAME, SET or MATCH.

- GAME indicates the minimum level of sustainability clubs should aim for in ensuring they contribute to the overall saving effort.
- SET indicates an improved level of environmental performance. Clubs at this level have taken steps toward improving their club
- MATCH indicates a high level of achievement in environmental performance. Clubs at this level have made significant efforts to improve their performance.

Why not go all the way, and achieve MATCH in all four of the categories – surely this is a GRAND SLAM result!

Game Set Match Instruction Sheet

The following instructions to determining the clubs general level of environmental performance.

- Obtain a copy of the Game/Set/Match Checklists supplied in Appendix C (Consists of three separate rating tools, one for each of the rating categories)
- Undertake self assessment, starting at the Game level.
- If you are successful in achieving the Game level, move up to Set and then Match.
- Where you are not successful in meeting the criteria for Game, identify the “No” responses and take action on these to reach the minimum level of sustainability required of tennis clubs. These identified elements will assist your club to establish an action plan and monitoring program as outlined within Section 8 of this document.

8. Developing and Action Plan

Self-assessment is the first step, but it is important for clubs to set long-term goals and commit to continuous improvement. The following steps are recommended to help your club work toward being an environmentally friendly tennis club. In order to measure improvements, it is essential to set goals and then measure and track performance. It is important to develop and maintain an action plan and assist your club in managing the change that will be an essential element of successfully achieving your goals.

An effective maintenance program should regularly assess water use records and determine the reasons for any increases. The action plan should be based on moving from the “No” elements to the “Match” action.

Step 1: Commit and set up

Get commitment from the club committee and members. This is essential to the successful integration of environmentally friendly principles into everyday club practices. Let Tennis Victoria know that you’re working through this process.

You will probably need to make certain changes in order to be able to measure your performance against your action plan. These may, at a minimum, include the installation of separate court and clubhouse metering, and may include the installation of real-time energy metering. When you can assess your water usage, you will be able to measure improvements that your initiatives have achieved.

Step 2: Develop an Action Plan

Use the checklist provided to assess your current performance. Once you know the current status, use the action plan framework and tips below to:

1. Understand your water usage
2. Identify actions to improve performance
3. For larger actions, research the project in depth, including technology, costs, pros and cons, and any requirements of your local council.
4. Identify funding opportunities for implementation of initiatives (see Chapter 9 for suggestions)
5. Allocate responsibilities
6. Set targets

Step 3: Implement the Action Plan

Put your action plan into practice:

1. Communicate changes and outcomes to the committee and the club, to maintain interest and involvement.
2. Identify successes and failures - learn through experience.
3. Provide incentives to encourage behaviours which will improve sustainability.
4. Recognise and celebrate achievements.

It's rewarding to watch people change their behaviour as progress and achievements become obvious to everyone involved.

Step 4: Monitor and report results

Track progress against your plan:

1. Solve problems as they arise.
2. Share lessons learned.
3. Check progress towards the targets from your action plan.
4. Reassess water and energy usage, waste streams, and current practices to identify benefits and cost savings achieved. This includes assessing data obtained over the period and measuring improvements.

Step 5: Build on experience to achieve continual improvement

Update your action plan annually:

1. Integrate previous results into a new action plan for the following year.
2. Share the sense of achievement and satisfaction throughout your club.
3. Harness this goodwill in order to achieve continual improvement in environmental performance.
4. Develop actions that focus on continual improvement and greater levels of achievement.
5. Share your improvements/innovations/ideas with other clubs (not just tennis) and organisations.

9. Funding opportunities

There is a variety of funding opportunities available to tennis clubs to assist them in undertaking changes within their clubs. These include funding at a local level, through Council, at State or Federal Government, and through bodies such as Tennis Australia, Tennis Victoria and the Smart Water Fund (formed from water retailers and State Government).

Tennis Australia Court Rebate Scheme

The National Court Rebate Scheme is intended to stimulate progressive facilities developments that are also supportive of the National court surface policy, the National facilities blueprint, player, tournament and coaching initiatives. The scheme offers $2 million annually for three years with Tennis Australia's member affiliates invited to submit applications for funding to develop or upgrade court surfaces and associated infrastructure.

More information is available at http://www.tennis.com.au/Pages/default.aspx?id=4&pageId=12631

Tennis Victoria Court Treatment Subsidy Program

The State Government has provided grant funds of up to $200,000 to Tennis Victoria to provide assistance to clubs in treating courts with water saving chemicals (magnesium chloride or calcium chloride) and attaining approval of the new water conservation plan for tennis clubs under the current Stage 3A restrictions.

More information is available at http://www.tennis.com.au/vic

Smart Water Fund

Melbourne's water authorities and the Department of Sustainability and Environment jointly sponsor the smart water fund. It was established to encourage and support the innovation and development of water, biosolids recycling and water saving projects within the community.

Funding may be available to Tennis Clubs under the Smart Water Fund if the club can demonstrate that the project will have a broad reaching benefit (i.e. a benefit the wider community) and demonstrates innovation. It is understood that funding will not be granted through the smart water fund for converting court surfaces.

More information is available at http://www.smartwater.com.au/mainf.asp

Sustainability Fund

The Sustainability Fund has been developed by the Victorian Government and provides funding to successful applicants generally whose innovative projects use resources more efficiently in an attempt to help secure the environmental future.

The successful projects from previous funding rounds will deliver practical and affordable solutions to tackle climate change and help Victoria reduce its environmental impact. The projects incorporate a strong partnership focus, have significant in-kind support and have detailed project plans for tackling sustainability across a number of different sectors. Successful Round 3 projects were announced in April 2008.

Further information is available from Sustainability Victoria at www.sustainability.vic.gov.au

Water Smart Gardens and Homes Rebate Scheme

Rebates are now made available to not-for-profit organisations, including sporting clubs, which are eligible for the Water and Sewerage Rebate on service charges.

The Government will provide funding on a dollar–for–dollar basis of up to $250 for eligible water efficiency improvements.

More information is available at http://www.ourwater.vic.gov.au/saving/home/rebates

Free Showerhead Exchange

The Melbourne metropolitan water retailers offer showerhead exchange programs, where you can swap your old showerhead for free, for a new, water efficient model.

Contact your local water authority for details of Showerhead Exchange program details.

Drought Relief for Community Sport and Recreation Fund

The Drought Relief for Community Sport and Recreation Program 2008 will help community sporting facilities cope with the continuing dry conditions and reduce their water use into the future.

Rural, regional and outer metropolitan councils with areas on Stage 3 or higher water restrictions can apply for up to $100,000 and metropolitan councils can apply for up to $75,000 for projects to keep sport and recreation facilities open or which provide long term, sustainable reductions in potable water use by community sporting facilities

More information is available from the Victorian Department of Planning and Community Development at http://www.sport.vic.gov.au/

Department of Planning and Community Development

The Department of Planning and Community Development (DPCD) administers a range of grants designed to strengthen communities.

In addition to the Drought Relief for Community Sport and Recreation Fund, a number of other programs available including:

- Country Action grant scheme, (Aims to increase the capacity of sport and recreation organisations in regional and rural Victoria. Grants of up to $5,000 are available to successful applicants.)
- Supporting Country Sport program (aims to strengthen the capacity of rural and regional communities to respond to sport and active issues which impact at the grassroots level), and
- Sport Development for Women program (designed to boost the capacity of women as decision makers at all levels of sport)

More information on the grants currently available and the eligibility conditions, contact the Department directly or via the grants web-site (http://www.grants.dvc.vic.gov.au)

Sustainability Victoria

Sustainability Victoria aims to encourage and support government, business and communities to promote environmental sustainability in water, energy and materials.

To assist with their aims, Sustainability Victoria co-ordinate a number of funding programs including:

- Sustainability Fund (encourages projects that increase resource efficiency while improving sustainable practices) and
- Renewable Energy Support Fund (encourages innovative applications of medium-scale proven renewable energy technologies in Victoria) .

More information on the grants currently available and the eligibility conditions, contact the Sustainability Victoria at www.sustainability.vic.gov.au

10. Resources

Organisation and area	Contact details / website
Water efficiency	
Water Efficiency Labelling and Standards Scheme (WELS) - Allows comparison of water use for a variety of products.	http://www.waterrating.gov.au/
Savewater - Water saving tips and case studies.	http://www.savewater.com.au/
Sydney Water Fact Sheets	http://www.sydneywater.com.au/SavingWater/InYourBusiness/FactSheets.cfm
The Water Efficiency Guide for Offices and Public Buildings (Department of Environment and Heritage) contains good background information on improvement options available within buildings.	http://www.environment.gov.au/settlements/publications/government/water-efficiency-guide.html
Water saving products - WELS Product search data base allows you to search for water efficient products. - Reece WaterSaver catalogue	http://search.waterrating.com.au/default.shtml http://www.reece.com.au/new/pdf/watersaver/WS_Guide.pdf?watersaver
Rainwater tanks	
EnHealth Publications - Contains useful resources, especially the rainwater tank sizing calculator provided in Appendix B of the publication: Guidance on the Use of Rainwater Tanks (2004).	http://enhealth.nphp.gov.au/council/pubs/ecpub.htm http://enhealth.nphp.gov.au/council/pubs/pdf/rainwater_tanks.pdf
Court treatments	
Tennis Victoria	Via http://www.tennis.com.au
Energy and waste management	
Sustainability Victoria's website has some excellent resources and fact sheets under "Publications", on energy use, waste and recycling including renewable energy, energy efficient appliances and composting.	http://www.sustainability.vic.gov.au
Other guidelines	
Sydney Water - Water Conservation: Best practice guidelines for clubs.	http://www.sydneywater.com.au/Publications/FactSheets/BPGsForClubs.pdf
City West Water - Water Conservation Solutions Handbook	http://www.citywestwater.com.au/business/docs/Water_Conservation_Solutions_Handbook_-_Aug07.pdf
Councils	
Manningham City Council - Rainwater tank policy	Available from Manningham City Council
Water metering	
Smart Water Metering	http://www.yvw.com.au/yvw/YourBusiness/WaterCons

- Smart Metering with HydroShare, accessible from website.	ervation/Programs/

Appendix A

Current Water Restrictions and WELS Rating Information

Appendix A – Current water restrictions and water efficiency

The following table provides a summary of the current water restrictions in place across Victoria, and the impact these are having on the continued use of red porous and grass courts.

Table A4 Water Restrictions in Victoria

Water Authority	Predominant Water Restriction	Major Towns / Suburb	Impact on Tennis Clubs
Yarra Valley Water	Stage 3a	Suburbs within Yarra River catchment	May water one in two red porous courts; or all courts if applying treatment under Water Conservation Plan.
City West Water	Stage 3a	Melbourne CBD and inner and Western Suburbs	
South East Water Limited	Stage 3a	South Eastern Melbourne Suburbs	
Western Water	Stage 3a	Melton	
Barwon Water	Stage 4	Geelong	May only be watered in accordance with water allocation
Coliban Water	Stage 4	Bendigo/Echuca	Watering banned on all sports grounds
Grampians Wimmera Mallee Water	Stage 4	Horsham, Ararat, St Arnaud	Playing surfaces must not be watered at any time
Wannon Water	Stage 3	Hamilton	Provided exception is granted, courts may be watered
Central Highlands Water	Stage 4	Ballarat	Watering banned on all sports grounds
Gippsland Water	Permanent Water Saving Rules	Traralgon, Sale, Warragul	No restriction applies to using a hand-held hose fitted with a trigger nozzle, a watering-can or a bucket, at any time.
Goulburn Valley Water	Stage 1	Shepparton	Hand held hoses fitted with trigger nozzles can be used at any time
Westernport Water	Stage 2	Phillip Island	Exceptions may be requested
East Gippsland Water	Permanent Water Saving Rules	Bairnsdale, Lakes Entrance	No restriction applies to using a hand-held hose fitted with a trigger nozzle, a watering-can or a bucket, at any time.
North East Water	Permanent Water Saving Rules	Wangaratta	No restriction applies to using a hand-held hose fitted with a trigger nozzle, a watering-can or a bucket, at any time.
	Stage 2	Wodonga	Exceptions may be requested
South Gippsland Water	Permanent Water Saving Rules	Korumburra, Leongatha	No restriction applies to using a hand-held hose fitted with a trigger nozzle, a watering-can or a bucket, at any time.

The following table outlines the water use for different fitting ratings of appliances and fittings.

Table A5 WELS rating specifications for fittings and appliances

		Rating						
Product type	Water Consumption Unit	0 stars	1 star	2 stars	3 stars	4 stars	5 stars	6 stars
Taps	Flow rate (L/min)	>16L/min or failing the performance requirements	12L/m - 16L/m	9 L/m - 12 L/m	7.5 L/m - 9 L/m	6 L/m - 7.5 L/m	4.5 L/m – 6 L/m	<4.5 L/m
Showers	Flow rate (L/min)	>16L/min or failing the performance requirements	12 L/m - 16 L/m	9 L/m - 12 L/m	7.5 L/m - 9 L/m	6 L/m - 7.5L/min	4.5L/min – 6L/min	<4.5 L/m
Toilets	Full flush	n/a	<9.5L	<9.5L	<6.5L	<4.7L	<4.7L	<4.7L
	Half flush		<4.5L	<4.5L	<3.5L	<3.2L	-	-
	Average flush volume		<5.5L	<4.5L	<4.0L	<3.5L	<3.0L	<2.5L
Urinals	Litres/single stall or Litres/600mm width continuous wall	Flush <2.5L/single stall or 4L for two stalls	<4L/ stall	<2.5L/stall	<2L/ stall	<1.5L/ stall	<1L/ stall	<1L/ stall
Dishwashers	Determined using the Star Rating Index formula, which uses water consumption data of the model.							
Clothes washing machines	Determined using the Star Rating Index formula, which uses water consumption data of the model.							

Source: AS/NZS 6400:2005 Water efficient products – Rating and labelling

Appendix B

Rainwater Tank Sizing Guidelines

Appendix B - Rainwater tank sizing calculation

The following table provides an estimate of the size of rainwater tank required to provide a required volume per day, for a given roof area and annual rainfall. For example, with a roof size of 400 m2 and an annual rainfall of 600 mm/year, a tank size of 30 kL can provide 400 L/day of rainwater, at a level of 90% security. What this means is that this will be provided 90% of the time, or approximately 11 months out of 12.

For example, for an average clubhouse with a roof area of 400 m^2 located in Melbourne (rainfall approximately 600 mm/year), a 30 kL tank could provide 400 L/day for most of the year (90% of days).

As an example, one tennis court of approximately 600 m^2 located in Melbourne (fitted with an efficient collection and treatment system) with 19 kL of storage, could supply approximately 400L/day of stormwater for the majority of the year.

Table B6 Tank sizes to provide 90% security of supply

Tank Size (kL)								
Volume required	Annual rainfall	Roof area (m2)						
L/day	mm	100	150	200	300	400	500	600
600	150				20	14		
	200			15	10			
	300	14	6	4				
	400	6	3	3				
	500	4						
	600	3	2					
100	150						34	27
	200				33	19	17	-
	300			16	10	8		
	400		10	8	6			
	500	11	6	5	4			
	600	8	5	4	3			
	900	6	4					
200	250						26	21
	300					29	20	17
	350				26	17	13	12
	400				19	14	11	10
	500			20	12	10	8	
	600		25	15	10	8	7	
	900	26	13	10	7			
	1200	18	10	8	6			
400	350							44
	500					42	30	24
	600					30	22	19
	700				39	27	21	18
	900				27	19	16	13
	1200			34	21	16	13	12

Souce: EnHealth Guidance on the use of rainwater tanks, Appendix B, Table B.3.
http://enhealth.nphp.gov.au/council/pubs/pdf/rainwater_tanks.pdf

Appendix C

Self Assessment Checklist

GAME				
ACTION	WHY, HOW AND CONSIDERATIONS	YES	NO	N/A
COURT WATER				
Water metering and leak detection	-			
Regularly check for leaks from hoses, distribution pipes or fittings and repair problems.	Regular inspection and/or monitoring will help identify if leaks are occurring.			
Read water meters on a regular basis, document results and monitor use.	Clubs should understand what they are using in order to set targets and measure improvements.			
Water efficiency - Red porous courts	-			
Erect signs adjacent to courts explaining water restriction requirements	Signs should educate members about watering requirements to prevent over-watering. Signage from Tennis Victoria should also be present if club is acting under a Water Conservation Plan.			
Install water efficient hose nozzles	Improved nozzled reduce delivery of water from hoses and can reduce water use. Flows were reduced by 50% at Blackburn TC.			
Treat courts with chemicals (magnesium or calcium chloride - red porous courts only).	Both treatments offer substantial water savings, around 60-80%. Magnesium chloride generally seems to be the preferred option, being easier to apply, less irritating to humans and less polluting.			
Water efficiency - Grass courts	-			
Erect signs adjacent to courts explaining water restriction requirements	Signs should educate members about watering requirements to prevent over-watering. Signage from Tennis Victoria should also be present if club is acting under a Water Conservation Plan.			
Ensure watering occurs on an "as needs" basis, before 6am or after dusk, and in line with water restrictions.	In cooler periods of the day evaporation of water will be reduced.			

CLUBHOUSE WATER				
Water metering and leak detection				
Regularly check for for leaks and plumbing problems, and repair problems.	Leakage can lead to substantial losses - for example, water audits of clubs in Sydney showed 25% of water lost to leaks. Regular inspection and/or monitoring will help identify if leaks are occurring.			
Read water meters on a regular basis, documente results and monitor use.	Clubs should understand what they are using in order to set targets and measure improvements.			
Install stickers or signs with hotline numbers near taps to encourage leak detection.	Education and reminders encourage desirable behaviours in users.			
Amenities				
Showers				
Encourage a reduction in showering times through posting water conservation messages on posters or stickers. Encourage 4 minute showers.	Encourage four minute showers. Ask your water retailer if they supply stickers.			
Install shower timers in showers to encourage shorter showers.	Shower timers are free from some water retailers.			
Install flow restrictors inside the showerhead or adjust the water pressure to minimise flow	Reduces flow per minute.			
OR				
Install a AAA or at least 3 star rated water efficient showerheads (free from your local water authority).	An inefficient showerhead can use 20 L/min of water, while a AAA-rated showehead uses 9 L/min while still providing comfortable showers. Payback period is less than one year, or immediate if you are eligible for a free showehead from your water retailer.			
Toilets				
Inspect cisterns regularly to identify any leaks. Replace rubber cistern seals, before leaks occur, and periodically replace valves and ballcocks.	A leaking toilet or urinal can waste up to 200 L of water per day. Routine maintenance and replacement reduces the possibility of leaks.			

Taps	-			
Erect signs reminding users to turn off taps when not in use.	Education and reminders encourage desirable behaviours in users.			
Encourage users to report leaky or faulty plumbing.	One drip per second is 7,000L/year.			
Inspect taps regularly to identify any leaks. Ensure prompt repairs are undertaken.	Leakage can lead to large losses.			
Fit long-life tap washers to taps (usually with a rubber O-ring and mechanical protection against overtightening)	Insurance against future leaks, and to reduce maintenance costs.			
Adjust flow valve or fit flow control regulators to reduce water flow to a practicable flow rate.	Flow restrictors can reduce flow rate by up to 84%			
Dishwasher	-			
Water conservation messages are posted to encourage running dishwasher only when fully loaded.	Education and reminders encourage desirable behaviours in users.			
Dishwasher is only run when fully loaded.	Water is wasted if washer is not run full.			
Hot water urn	-			
Inspections of unit is undertaken identify any leaking and repairs are conducted.	Any leakage leads to losses as well as unnecessary energy use.			
Hot water service	-			
Check age and condition of hot water service, and make repairs or plans for replacement as necessary.	Reduce potential for leaks			
Garden	-			
You may mark N/A for the following options if you do not have a garden that is watered.	-			
Ensure watering occurs on an "as needs" basis, before 6am or after dusk, and in line with water restrictions.	In cooler parts of the day, evaporation of water will be reduced.			
Use mulch on the gardens.	Mulching can reduce evaporation by up to 70%			

ENERGY				
Energy efficiency - Court lighting				
Court lighting is not left on when not in use.	Energy is wasted if lights are left on when not in use.			
Lighting - Indoor				
Post energy-efficient messages to encourage energy conservation through switching off lights when not in use.	Education and reminders encourage desirable behaviours in users.			
Appliances				
Post energy-efficient messages to encourage energy conservation through switching off appliances at the wall when not in use.	Education and reminders encourage desirable behaviours in users. Standby can amount to 10% of energy use in households.			
Turn appliances (such as televisions) off at wall rather than use standby mode when not in use.	Standby can amount to 10% of energy use in households. Consider additional appliances such as second fridges or freezers which only need be on occasionally.			
Dispose of unnecessary appliances (such as second fridges or freezers), where not really required.	Older, less efficient models of fridges and freezers could have operating costs up to 100% higher than newer models. Consider whether that second fridge is really needed.			
Hot water service				
Reduction of hot water use is encouraged through water conservation measures (see: Showers and Taps)	Encourage four minute showers. Ask your water retailer if they supply stickers.			
Reduce temperature of hot-water service to 60^{o} C	Reducing temperature of hot water service reduces energy used to heat water.			

SET				
ACTION	WHY, HOW AND CONSIDERATIONS	YES	NO	N/A
COURT WATER				
Water metering and leak detection	-			
Install a separate water meter for clubhouse and courts	At a minimum, clubs should be aware of the volumes of water being used on their courts and clubhouses separately. A smart meter provides real-time water use information, and can help to detect leaks and identify major water uses.			
Water efficiency - Red porous courts	-			
You may mark N/A for the following three options if you have a sustainable water source that completely replaces mains water				
Rebuild courts using bentonite to improve the water-holding properties of the courts (red porous courts only).	Bentonite incorporated into the court surface reduces watering requirements of courts by around 60%.			
OR				
Volume of water required and lost by evaporation is reduced through installation of a sub-surface irrigation system.	Installation of sub-surface watering such as pod systems can reduce water consumption significantly. Approximately 70% savings can be achieved.			
OR				
Convert court to a waterless surface such as acrylic, sand filled artificial grass (SFAG) or synthetic clay.	This can be a good option for some clubs, however it is costly and clubs should consider the benefits of retaining a player development development surface.			
Water efficiency - Grass courts	-			
Upgrade watering system to a more efficient system. Such a system may include installing moisture sensors to determine the amount of water required on the courts.	Volume of water required can be reduced by using a more efficient watering system. Moisture sensors act as an override facility to prevent system from working when there is enough moisture in the soil, and are inexpensive.			
OR				
Install sub-surface irrigation system	Volume of water lost via evaporation is reduced through installation of a sub-surface irrigation system.			

Alternative water sources	-			
Harvest rainwater from buildings for use on courts.	Rainwater tanks can provide water for court irrigation. If your roof capacity is not sufficient, consider teaming up with an adjacent factory or clubhouse - "donation" of harvested rainwater to a club can sometimes be a tax incentive for businesses.			
AND/OR				
Harvest stormwater from hardcourts for use on courts.	Water harvested from hardcourts can be used for court watering.			
AND/OR				
Extract groundwater for use on courts.	Extraction of bore water is not always environmentally sustainable in the long run, and quality and accessibility can vary from location to location. Consult the relevant water authority as to the depth, availability and quality of the local resource. Pumping can also lead to increased energy cots.			

CLUBHOUSE WATER				
Amenities	-			
Toilets	-			
Implement measures on existing toilets to reduce flush volumes or reduce losses.	Options include modification of the float arm or installing a displacement device that reduces the cistern volume.			
AND/OR				
Replace cisterns on existing toilets to lower volume models.	Check that bowls can accommodate the lower volumes.			
OR				
Replace toilets with 4.5/3 litre dual flush systems, which are rated 4 star.	Older toilets can use up to 11 litres per flush.			
Urinals	-			
Reduce losses via reduced flush volumes	Options include routine replacement of cistern flapper valve (every 2 years), and elimination of continuous flushing through minor system modification.			

Install technologies to existing urinal to enable a low water or waterless operation, such as blue urinal cubes.	A club with a 4m trough-type urinal can save up to 200 kL of water / year using the blue urinal cubes.			
OR				
If on-demand controls are preferred for single stall customers, install automatic individual sensor flush units.	Sensor units controlling up to three stalls will still save water and money. These are much more water efficient than cyclic flushing units. Such systems should have routine maintenance and it should be ensured that the battery or power supply is well maintained.			
OR				
Install water-efficient models rated at least 3 stars.	Reduce water use in urinals.			
Taps	-			
Fit aerators to basin spouts or install flow regulators.	Aerators screw onto the tap head and add air to the water flow, can reduce the flow by up to 50%, and are inexpensive. Flow regulators can be used where aerators are not suitable or there is a tap misuse.			
OR				
Update the tap system to include automatic shutoff, metered shutoff or trigger sprays.	Reduces water wastage.			
AND/OR				
Fit new water efficient tapware with at least a 4 star rating.	Typical taps discharge 15 - 20 L/min. New low flow and aerating models may use as little as 2 L/min. Quarter turn taps with ceramic seats give greater flow control and are less prone to leakage.			
Dishwasher	-			
Dishwasher is a water efficient model.	The most efficient dishwashers use half the water of average or older models.			
Garden	-			
You may mark N/A for the following options if you do not have a garden that is watered.	-			
Upgrade watering system to a more efficient system. Such a system may include installing moisture sensors to determine the amount of water required on the courts. Note that any watering must be in accordance with water restrictions.	Fixed watering systems are available in drip, micro-spray or pop-up sprinklers. Timers are preferable but are inefficient if they turn on during rain. Moisture sensors act as an override facility to prevent system from working when there is enough moisture in the soil, and are inexpensive.			

Plant drought tolerant species, e.g. natives	Plants that demand high volumes of water are not sustainable in the long term if on mains water.			

ENERGY				
Electricity metering and monitoring	-			
Energy meters read on a regular basis, with results documented and monitored.	Clubs should understand what they are using in order to set targets and measure improvements. A smart meter provides real-time energy use information, and can help identify major uses.			
Lighting	-			
Install energy efficient light fittings	Compact fluorescent light bulbs use 80% less energy and last 8 times longer than incandescent bulbs.			
Appliances	-			
Replace inefficient appliances with efficient models.	When appliances are due for replacement, choose an energy efficient model to cut energy consumption.			
Hot water service	-			
Update hot water system to a more efficient model	Reduces energy consumption from heating of hot water.			
Alternative energy sources	-			
Purchase Green Power	An easy step that clubs can take to reduce their environmental impact.			
CLUBHOUSE WASTE				
Waste management	-			
Separate recycling facilities for glass, plastics, paper/cardboard are available	There is now a much greater expectation in the community that there will be access to recycling facilities wherever they go. Check with your local council as to whether they accept separated recyclables.			

MATCH				
ACTION	WHY, HOW AND CONSIDERATIONS	YES	NO	N/A
COURT WATER				
Alternative water sources	-			
Alternative water sources (rainwater, stormwater, groundwater) completely replace your mains water supply.	If you have eliminated your demand on mains water supply, you have achieved a Match level!			
CLUBHOUSE WATER				
Amenities	-			
Urinals	-			
Install fully waterless urinals.	Eliminates water use in urinals.			
Alternative water sources	-			
Plumb alternative water sources (rainwater, stormwater, groundwater) for permitted indoor uses.	Reduces mains water demand in areas including at toilets and urinals.			
ENERGY				
Energy efficiency - Court lighting	-			
Court lighting design is at a level consistent with the clubs level of play.	International, competition or recreational have different requirements for lighting levels in Australian Standard 2560.2. If you're not a competition club, you won't require as many lights.			
Modern fittings are installed rather than older styles.	Modern fittings are more efficient.			
Court lighting is on low mount fittings.	Low mount fittings are more efficient than high mount, and are the preference of many councils.			

Hot water system				
Install a solar hot water system	Solar hot water saves electricity used for water heating.			
Alternative energy sources				
Install renewable energy, such as solar panels or wind generators	The technology is available for self-generation of some or all of a clubs energy requirements. Feed in tariff's available from 2009 may mean that grid connection of solar panels can become an income source.			
WASTE				
Waste management				
Club participates in the sustainaball Program	More than 10 million tennis balls are imported into Australia each year. Sustainaball is a community project exloring the reuse and recycling of tennis balls.			