Connell Wagner Pty Ltd
ABN 54 005 139 873
60 Albert Road
South Melbourne
Victoria 3205 Australia

Telephone: +61 3 9697 8333
Facsimile: +61 3 9697 8444
Email: cwmel@conwag.com
www.conwag.com

Racing Victoria Limited

Smart Water Fund

Drought-proofing Racing
Final Report

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Glossary

Black water	Waste water from toilets and kitchens. This is not easily treated and is generally discharged to sewer to be treated at a sewage treatment works.
Grey water	All non-toilet wastewater. Includes wastewater from showers, baths, spas, hand basins, washing machines, laundry troughs, dishwashers and kitchen sinks.
Ground water abstraction	Water held in aquifers below ground that is taken from boreholes
Potable water	Water that is fit for human consumption (ie the public drinking water supply)
Sewer mining	The extraction and treatment of water from sewers
Surface water extraction	Water taken from natural rivers, streams or lakes
Treated effluent	Treated water discharged from a sewage treatment works
Water recycling	Collection of waste water and reusing it. This may require treatment.

Executive Summary

Racing Victoria Limited (RVL) is the peak body of the Victorian thoroughbred racing industry. As a result of the extended drought conditions in Victoria and the subsequent application of water restrictions, the thoroughbred racing industry in Victoria is at risk of not receiving adequate water supply to ensure the continued well being of the industry.

As an initial step in addressing the risks involved, RVL was awarded a grant of $100,000 from the Smart Water Fund to undertake investigations of alternative water supply and improving water management for eleven racing venues around Melbourne. RVL appointed Connell Wagner to undertake investigations to identify water conservation measures and alternative viable water sources that will enhance drought proofing of the various racing venues.

At present, the courses use around 860Ml of water per year, of which up to 650Ml is taken from the public water supply. Over 70% of the overall water demand is for irrigation of the courses, with the remainder being used for domestic appliances, racehorse facilities or irrigation of gardens.

This study has demonstrated that if water from the domestic supply currently used for irrigation is replaced with an alternative supply, then up to 450Ml per year could be saved. If domestic appliances are replaced with more water efficient variants, then a further 28Ml/year can be saved from the public water supply demand. Overall this would be enough water to serve a population of over 8,000 people for a year.

In some cases, the sites already have a secure supply and are not reliant on the public water system for anything other than domestic requirements. In others, plans are already well advanced to reduce reliance on the public supply, whilst at the same time ensuring security for drought periods.

This study recommends that all courses except Sandown and Healesville produce plans for implementation of drought-proofing schemes. For the thoroughbred racing industry to decide how to invest in these courses, the priorities indicated in Table ES1 below should be used as a guide. This table has been produced to take into account that the cost of potable water is very low in Victoria. This means that there is little direct cost saving in replacing this source with an alternative (a process that can be very expensive). There are a number of incidental factors that need to be taken into account if the thoroughbred racing industry is not to be adversely affected by the continued water stress caused by the prolonged drought, however. These include financial loss due to closure, the public impact of a closure and its effect on the industry, and overall impact on the industry of the general loss of facilities.

It is also recommended that the proposals for Cranbourne Training Centre and Cranbourne Racecourse are promoted as a demonstration project for the use of site drainage and treated effluent for irrigation needs.

For all courses it is recommended that an audit of domestic and sanitary appliances be undertaken. This will enable the range of facilities to be recorded, their type, age and likely replacement date, which in turn will assist in the clubs producing a quantified plan to upgrade to the most water efficient products over time. It may also assist in defining those facilities where grants or other incentives are available for replacement. At the same time, any leakages or faults can be noted and repaired to minimise wastage.

Course	Preferred Solution	Indicative Cost ($,000)	Potential Potable Water Saving (Ml/year)	Cost Score	Financial Loss	Public Image	Industry Impact	Water Saved	Overall Score	Overall Priority
Caulfield Racecourse	Off-site drainage	550	80	1	3	3	3	3	13	1=
Cranbourne Training Complex	Treated Effluent	210+EIS	0 to 140	2	3	2	3	3	13	1=
Moonee Valley Racecourse	Sewer Mining	1000	77	1	3	3	3	3	13	1=
Mornington Racecourse	On site drainage	540	52	1	3	2	3	3	12	4
Cranbourne Racecourse	Treated effluent & on-site drainage	400+EIS	44	2	2	2	2	3	11	5
Werribee Racecourse	Treated effluent	630	21	2	2	2	2	2	10	6=
Yarra Valley Racing Centre	Improve on site drainage	50	3	3	2	2	2	1	10	6=
Pakenham Racecourse	Treated effluent	350	29	2	2	1	2	2	9	8
Balnarring Racecourse	Treated effluent	80	2	3	1	1	1	1	7	9
Healesville Picnic Racing Club	On-site drainage	150	0	2	1	1	1	1	6	10
Sandown Racecourse	None required	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table ES1 Summary of Proposed Schemes for Racing Victoria Limited

1. Introduction

Racing Victoria Limited (RVL) is the peak body of the Victorian thoroughbred racing industry. As a result of the extended drought conditions in Victoria and the subsequent application of water restrictions, the horse racing industry in Victoria is at risk of not receiving adequate water supply to ensure the continued well being of the industry.

As an initial step in addressing the risks involved, RVL was awarded a grant of $100,000 from the Smart Water Fund to undertake investigations of alternative water supply and improving water management for eleven racing venues around Melbourne. RVL appointed Connell Wagner to undertake investigations into alternative water sources and improving water management for eleven racing venues around Melbourne. The objective of the investigations is to identify water conservation measures and alternative viable water sources that will enhance drought proofing of the various racing venues.

The study was undertaken in two phases: a preliminary investigation of current racecourse practices to develop a framework to guide possible alternative sources and methods; and a more detailed review of the individual racecourses. A proposal for a project to demonstrate some of the alternative supplies and the associated design and management requirements has been developed.

The results of the investigations and suggested options have been reviewed by the individual racecourse managers to ensure that all issues have been reported and that the particular circumstances at each course have been considered sufficiently.

Sections 2 to 8 of the report discuss the general research and produce a framework to enable anyone to review the current water use and resources at an individual site and establish a plan of action most appropriate to their needs and circumstances. Section 9 describes the specific recommendations for the sites studied in this investigation; and Section 10 describes the proposed demonstration project at Cranbourne.

2. Background

2.1 Project Objectives

Overall objectives of the project are:

- To develop a framework for water management of re-use of non-potable water resources. The framework will allow:
    i. Water conservation methodology to be developed for use at racetracks
    ii. Social, environmental and economic issues in substitution of potable water with recycled water to be identified
    iii. Implementation of recycled water programs to be adopted by each racing club
    iv. Robust understanding of the regulatory and planning requirements for the implementation of recycling projects to be documented and promulgated
    v. Transferable water management framework for use throughout the Victorian racing industry and other related industries to be developed and promulgated
- To develop master plans to improve the security and management of water used at each the venues included in the scope of the project (ref below)
- To demonstrate to stakeholders and the broader community that water re-use in this application is viable from economic, social environmental and regulatory perspectives

More specific objectives are to:

- Identify the social, environmental and economical issues and opportunities in potable water substitution with recycled water;
- Encourage individual racing clubs to consider the implementation of recycled water programs through consultation, workshops, site visits and education in the use of recycled water.

2.2 Deliverables

Deliverables from the project include the following:

- A framework for providing reliable water resources to the racing industry in Melbourne (this report). The framework will document a robust understanding of the regulatory and planning requirements for the implementation of recycling projects and be appropriate for use throughout the Victorian racing industry and other related industries
- A database of information on current water usage practices at the various racecourses; and
- Recommendations on viable alternative water sources and improved water management practices at each site.
- detailed implementation plan for a demonstration project at one of the selected Racecourses

2.3 Scope of the Works

This study investigated potential water conservation measures and alternative water sources at eleven racecourse venues in and around Melbourne. The racecourses under investigation were:

Balnarring	Mornington
Caulfield	Pakenham
Cranbourne	Sandown
Cranbourne Training Complex	Werribee
Healesville	
Moonee Valley	Yarra Valley

The study investigated and analysed alternative sources of water supply for each site including:

- Potable (Town) Water;
- Rainwater / Stormwater collection;
- Surface water abstraction;
- Groundwater abstraction;
- Effluent reuse;
- Sewer mining; and
- Combinations of the above sources.

The study also considered potential water conservation opportunities at each site including:

- Water recycling;
- Improved efficiency and effectiveness of water application and irrigation systems;
- Water efficient outlets, and other related opportunities.

2.4 Approach and Methodology

The methodology for the study involved the application of a standard approach to business planning and analysis. That approach follows the following steps:

- Identification of objectives
- Identification of current status (and practices)
- Assessment of the gap between current status and objectives
- Analysis of the gap
- Development of the migration strategy from the existing to proposed water regime.

A standard questionnaire was developed and sent out for response from the various bodies responsible for each racecourse, to identify current status and practices, and to identify any issues and concerns. The standard questionnaire is presented in Appendix A.

The analysis work followed and incorporated site visits to each facility, with one-to-one contact with key stakeholders at each racecourse to discuss opportunities and site specific issues. Feedback from these on site meetings has been documented and is presented in Appendix B. In general, the main issues concerned reliability of supply from existing or proposed water sources, potential alternative sources, irrigation practices and the over-reliance on the public water supply.

Connell Wagner utilised in-house water industry and geotechnical knowledge, together with external knowledge sourced through CSIRO, EPA, DSE, South East Water, Yarra Valley Water, City West Water, Southern Rural Water, and Melbourne Water to complete the study.

2.5 Other Related Investigations

GHD was commissioned by the Victorian Racing Club to undertake a similar investigation specifically for the Flemington Racecourse with particular focus on sewer mining opportunities. There is a demonstration of sewer mining at the site that is being monitored to ensure that a consistent standard of treated effluent is produced suitable for use on the site, prior to full scale implementation of the proposal.

3. Racecourse Information

3.1 Racecourse Information

Information collected from the responses to the questionnaire includes the number and type of race meetings, the estimated water consumption levels, the estimated amounts of water used for different track activities, the irrigation system and methodology and current development proposals. These data are presented in Appendix C, Tables C1 & C2.

3.2 Current Potable Water Demand

Each of the eleven racecourses have a potable water supply provided through the Melbourne reticulated water supply system. The demand for potable water varies across the eleven courses in the study from a very basic domestic demand at Healesville to a full reliance on the public supply for all water use on the course at Pakenham and Cranbourne. From the data supplied by the course managers typical consumption (and associated costs) from the public supply are presented in Table 3.1 below.

Table 3.1 Potable Water Demand

Course	Potable Water Demand (Ml/year)	Annual cost ($)	Course	Potable Water Demand (Ml/year)	Annual cost ($)
Balnarring	3	2300	Mornington	70	60000
Caulfield	115	90000	Pakenham	33	28000
Cranbourne	58	44000	Sandown	30	25000
Cranbourne Training Complex	2*	2000	Werribee	30	25000
Healesville	<1Ml	<1000	Yarra Valley	6	7000
Moonee Valley	120	102,000	Total	467	386,000

*Cranbourne Training Complex can have a much heavier demand in drought years, when the costs could increase to similar to those of the racecourse.

It is seen from the above table that a substantial quantity of potable water from the metropolitan supply systems is used at the eleven tracks / venues. It is highly likely that, given this volume, opportunities exist to reduce this consumption.

3.3 Current Water Resource Systems

At most racecourses the potable demand described above is supplemented by alternative water sources for irrigation and ground watering purposes. Some of the Racing Clubs already have advanced plans to provide further supplementary supplies to those listed in Table 3.2 below in order to reduce their reliance on potable water in response to current water restrictions. These are listed in Table C4 and are discussed in more detail in Section 9.

Table 3.2 Current supplementary water supplies:

Racecourse	Supplementary Supply
a) Balnarring	Storage tank supplemented by rainfall.
b) Caulfield	A storage lake fed primarily from groundwater boreholes, but supplemented by collection of surface water from the site. This is sufficient to irrigate part of the site (the training tracks), but there is still a high demand for potable water
c) Cranbourne Racecourse	None
d) Cranbourne Training Complex	Three interconnected lakes fed from the on-site drainage system. There is also a groundwater borehole, but this is ineffective currently. In most years there is sufficient storage for all irrigation requirements
e) Healesville	None
f) Moonee Valley	A storage lake supplied primarily from the Moonee Ponds Creek, but supplemented by collection of surface water from the site and also from two nearby road drains. High salinity levels (1200mg/l) mean that potable water is needed for dilution
g) Mornington	None
h) Pakenham	None
i) Sandown	A storage lake fed from an open surface water drain (Mile Creek). This is a reliable supply due to its large catchment
j) Werribee	A storage lake exists which is filled from both the potable supply and site drainage. After rains, water is occasionally extracted from Werribee Creek (which normally has high salt concentrations of over 3000mg/l).
k) Yarra Valley Racing Centre	A storage lake fed from a small stream. There are additional, smaller lakes, fed from the on-site drainage system. This is generally sufficient for irrigation requirements. The harness track uses large volumes of potable water mainly for dust suppression

Cranbourne Training Complex is particularly at risk during drought conditions as the lakes are drained for irrigation and are not replenished by rainfall. In these circumstances, the current practice is to obtain flows from the public supply. The other systems are generally reliable, as the sources of water are not as reliant upon summer rains, although these too can be affected to a lesser extent.

There are water quality issues related to the alternative supplies described above: in particular salinity levels are high at Moonee Valley and Werribee such that the flows need to be shandied with clean water from the public supply.

3.4 Current Water Use

The current water usage for the various racecourses are presented in Table C2 (Appendix C) and discussed in more detail in Section 9 including an indication of the volumes used and typical application rates. The majority of water at most locations is used for irrigation of the tracks and domestic use (drinking water, hand washing, toilets, etc.). Other uses include watering gardens, washing down of stabling areas and dust suppression on harness and sand tracks.

3.4.1 Grassed Track Irrigation

Irrigation of racetracks serves two purposes: to supply water for growth; and to condition the ground for racedays. The water requirements for each objective are different, with growth being served by intense watering at a spacing of several days and a requirement to water daily to condition the track for racedays. For races the track cannot be too dry, as this is more likely to cause injuries, or too soft, as this affects the performance of the horses. As discussed in Section 5.6, water used for irrigation of grass tracks needs to be of a minimum Class B standard with suitable health and safety controls as necessary.

3.4.2 Dust suppression

For harness racing and sand tracks, watering is needed to maintain the structure of the surface and to suppress dust from rising into the air. Such tracks need to be watered daily. As discussed in Section 5.6, water used for dust suppression needs to be of a minimum Class B standard with suitable health and safety controls as necessary.

3.4.3 Domestic and Stabling Use

The volume of water used for domestic purposes varies greatly across the courses studied. In general, this reflects the number of race meetings, the associated attendances and the level of training facilities. Water used for domestic purposes needs to of potable standard.

3.4.4 Gardens

Six of the courses studied have significant garden areas, located mainly around the grandstands. These consist of lawns and flowerbeds and in all cases are currently watered from the public water supply. If using hoses, water used for watering gardens needs to be Class B standard or better. If drip feed irrigators are used, a Class C water quality may be used.

4. Statutory Requirements

4.1 Legislation

Acts of particular significance to waste water management and reuse and appropriate levels of disinfection include:

- Environment Protection Act 1970;
- Health Act 1958;
- Food Act 1984; and
- Australian New Zealand Food Authority (ANZFA) Act 1991.

The Health Act 1958 makes provision for the prevention and abatement of conditions and activities that are, or may be, offensive or dangerous to public health. Therefore use of reclaimed wastewater for any purpose will be subject to Health Department considerations and approval.

Under the Environment Protection Act 1970, discharges to the environment must be managed so they do not adversely affect the receiving environment (land, surface water, or groundwater). This Act also includes provisions for EPA Victoria works approvals and licensing to ensure the appropriate control of discharges with significant potential to harm the environment. To support their Legislative requirements the EPA have two “Guidelines for Environmental Management” relating to use of reclaimed water, ie:

- Disinfection of Treated Waste water; and
- Use of Reclaimed Water.

The Victorian Government have issued a green paper entitled “Securing our Water Future”, with an associated technical paper “Water Recycling Scenarios for Melbourne”. Both of these documents investigate the current and future water requirements in the State and look at the options for reducing reliance on the potable supply and increasing the opportunities for recycling, particularly for the two main waste water treatment plants in Melbourne.

To extract water from watercourses and underground aquifers, there is a licensing system. This is administered generally by Southern Rural Water following guidance from the DSE. The exception to this is the Yarra River and its tributaries, where Melbourne Water is the governing body. All surface water licenses and most groundwater licenses have volume restrictions to control the amount of water that can be taken annually and seasonally. This is aimed at achieving a sustainable abstraction rate whilst maintaining flows for other users and the environment. Where an abstraction ceases, the flow can be transferred to others as long as they are within the same catchment (ground or surface) and can satisfy the environmental assessment requirements.

4.2 Water Quality

Table 4.1 below, shows the EPA effluent quality guidelines for recycled water. These relate the EPA requirements for the quality of effluent water to the range of uses proposed. Improvements to the quality of the reclaimed water by adding water from other sources are not taken into consideration.

To use treated effluent, the EPA Guidelines for Environmental Management must be followed, and, in particular, an Environmental Improvement Plan (EIP) must be produced for each site. The EIP should show that the risk to the surrounding environment and to the health of humans and stock animals are minimised and controlled. Where Class A treated effluent is to be used, this EIP must be endorsed by the DHS and have the approval of the EPA. (The guidelines for producing an EIP are provided in Appendix D and are taken from “Guidelines for Environmental Management – Use of Reclaimed Water” produced by the EPA, which are available from their website).

Table 4.1 EPA Guidelines for Use of Reclaimed Water

Class	Water Quality Objectives	Treatment, Disinfection and Pathogen Objectives	Range of Uses (including all lower class uses)
A	<10 E.coli/100ml turbidity <2NTU <10/5 mg/l BOD/SS pH 6-9 1 mg/l Cl_2 residual (or equivalent disinfection)	Tertiary and pathogen reduction with sufficient log reductions to achieve < 10 E.coli/100ml <1 helminth/100ml <1 protozoa per 50l and < 1 virus/50l	Urban (non-potable): with uncontrolled public access Agricultural: human food crops consumed raw Industrial: Open Systems with worker exposure potential
B	<100 E.coli/100ml pH 6-9 <20/30 mg/l BOD/SS	Secondary and pathogen (including helminth reduction for cattle grazing) reduction	Agricultural: dairy cattle grazing etc Industrial: washdown water, etc No time restrictions
C	<1000 E.coli/100ml pH 6-9 <20/30 mg/l BOD/SS	Secondary and pathogen (including helminth reduction for cattle grazing) reduction	Agricultural: human food crops cooked/processed, grazing/fodder for livestock (no access for minimum of 4 hours after application) Industrial: systems with no potential worker exposure Urban (non-potable): with controlled public access
D	<10000 E.coli/100ml pH 6-9 <20/30 mg/l BOD/SS	Secondary	Agricultural: non-food crops including instant turf, woodlots, flowers

5. Alternative Water Resource Options

5.1 General

As noted earlier, the racecourses use a variety of water sources for their needs. In this section the varied sources are discussed with a general overview of their availability and limitations.

5.2 Public Water Supply (Town or Potable Water)

Clean water suitable for human consumption is provided by the water companies across the metropolitan area. The majority is not used for drinking, but is used where a lower quality supply would be acceptable (eg irrigation, toilet flushing, etc.).

Historically, the potable supply has been plentiful, but the extended drought of recent years has exposed the limitations of the drinking water supply when restrictions are applied. As a consequence, the requirement to preserve these supplies and to concentrate their use for drinking and washing has become a much more important issue for society.

5.3 Rainwater / Stormwater Collection

Racecourses occupy large areas of land, of which less than a third on average is used for racing facilities, with the centre of most tracks being unused land. Without a collection system, rainfall is lost to ground, overland flow and evaporation.

Melbourne receives an average of around 750mm of rain each year (varying from 520mm to 890mm across the city). This could yield a maximum of 6Ml/ha if all the water was collected and stored (not taking into account potential evaporation losses): for a 50ha site this amounts to 300Ml a year. It is neither possible nor desirable to collect all of this flow, however, as losses to the environment occur. With an efficient collection system, however, around 25% collection could be achieved. For paved areas, this could increase to over 80%.

It is clear that the collection of site run-off is a much under used resource. Even for those courses that collect a significant volume of rainwater, the collection systems are relatively inefficient and are concentrated in the track and building areas. The central areas of tracks tend to be neglected in terms of drainage, whereas, given the large area, the use of a comprehensive field drainage system could contribute a significant amount of water.

5.4 Surface Water abstraction

Historically, extraction from rivers and surface water drainage systems was the source of first choice for irrigation. This often led to environmental degradation, particularly if extraction occurred in summer months when river flows were lower. Where well managed, with land available to provide a sufficient storage volume to store winter or flood flows for extended dry periods, surface water abstraction remains an attractive option.

The quality of surface water is variable: river flows close to Port Phillip Bay tend to have high salinity levels; and rivers with large areas of roads draining into them can contain hydrocarbons and heavy metals. Therefore the quality as well as the quantity of supply should be considered, especially for the racing industry where there are occupational health and safety issues in relation to track workers and other industry participants.

In the case of piped drainage systems, the operating authority could be Melbourne Water, VicRoads or the local authority. In terms of quantity of flow, those drains operated by Melbourne Water or VicRoads are likely to be more significant.

Table 5.1 Summary of Water Supply Options

Venue	Current Sources	Alternative sources	Comments
Balnarring	Potable supply	Hastings TP - 4 km.	Transfer pipeline within 600m
	Drainage from roofs	ETP Outfall - 12 km	
		Borewater possible	Borehole sunk - awaiting commissioning, water to fill surface tanks
		Site surface water collection	
Caulfield	Potable supply	Borewater possible.	Additional borehole sunk - awaiting commissioning. Second lake to be built in 2004
	Track drainage	Sewer Mining	
	Site surface water collection	Off-site surface water collection	Melbourne Water Drain in Wanalta Road
	boreholes		
Cranbourne Racecourse	Potable supply	Site surface water collection	Collection and storage of car park drainage imminent
		Cranbourne TP - 7.5 km	
		ETP - 15 km	Eastern Irrigation Scheme
Cranbourne Training Complex	Potable supply	Borewater possible	Bore exists but currently dry
	Track drainage		Main source of supply already
	car parks & building drainage	Cranbourne TP - 7.5 km	
		ETP - 15 km	Eastern Irrigation Scheme
Healesville	Potable supply	Watts Creek adjacent	
		Healesville TP - 2 km	
		Site surface water collection	
Moonee Valley	Potable supply	Borewater possible.	high salt levels
	Moonee Ponds Creek		Already used, mixed with potable supply due to high salinity levels
	surface water collection	Sewer Mining possible	Large sewer along eastern boundary of site. City West Water Proposal at Princes Park
		Surface water drain	Some road drainage already collected.

Venue	Current Sources	Alternative sources	Comments
Mornington	Potable supply	Balcombe Creek - < 1km.	
		Borehole possible	Borehole sunk - awaiting commissioning, lagoon to be excavated in 2004
		Mornington TP - 4km	
		ETP Outfall - 1 km	
		Site surface water collection	
Pakenham	Potable supply	Pakenham TP close-by (<1km to pipeline)	South East Water have offered Class C supply
		site surface water collection	
		Pakenham Creek adjacent	Piped flow with surface flood channel. Could collect flood flows.
Sandown	Potable supply	Borewater possible	Borehole sunk for emergency supplement to surface drains - awaiting commissioning
	Surface water collection	No TP's nearby	
		Sewer Mining possible.	
Werribee	Potable supply	Borewater possible	High salinity
	Site surface water collection	WTP close-by	Re-use main to Werribee Park
		Werribee River close-by	used occasionally - high salt levels normally
Yarra Valley	Potable supply	Borewater possible	
	Surface water collection	Yarra River close-by	Diversion of small stream, replaced with winter flows from Yarra proposed by Melbourne Water
	Track drainage	No TP's nearby	
		Sewer Mining	possible but unlikely
		Winery effluent	

5.5 Groundwater Abstraction

The Melbourne metropolitan area is underlain by aquifers of varying yield and quality. Because of this, almost all courses have investigated the possibility of groundwater abstraction at some time.

The main issues are yield and quality, which is reflected in the status of some aquifers. Groundwater Management Areas (GMA) have strict licences covering the volume that can be extracted. These aquifer areas are monitored to ensure that they are not being drawn down excessively and that salt-water intrusion is prevented. Non GMAs tend to be areas of higher salinity and lower yield: all racecourses except Caulfield lie in these areas.

5.6 Effluent Reuse

Sewage treatment plants have traditionally treated sewage to a standard where the biological impact on the receiving waters and risk to human health were minimised. As knowledge of environmental impacts and public concern has increased the required quality of treated effluent has increased.

Most effluent is discharged to the sea either directly or through discharges to local rivers. Increasingly, this loss of treated water to the environment is seen as a waste of a potential resource. Reuse would have the benefits of reducing reliance on the potable supply and reducing the impact on the receiving waters. Because of this, the viability of re-using treated effluent is being investigated and promoted across the State.

For Melbourne, the majority of sewage is treated in two large treatment plants operated by Melbourne Water: the Western Treatment Plant near Werribee; and the Eastern Treatment Plant near Carrum. Other, smaller treatment plants operated by the city's retail water companies also exist mainly in the peripheral areas of the city.

Most treatment plants currently treat effluent to a Class B or C standard (refer to Table 4.1 for an explanation of the classifications). Melbourne Water and the retail companies are investigating the feasibility of upgrading some or all of the effluent to Class A standard so that it can be used without restriction. In particular, plans are well advanced to produce Class A effluent from the Eastern and Western Treatment Plants.

The class of supply offered is fundamental to the racing industry. Because of the occupational health and safety risks as well as the high value of the horses and the way in which courses operate, it is not generally acceptable to use a Class C supply for irrigation due to subsequent access restrictions. It would be possible to use Class C if the delivery system avoided the use of spray irrigators (ie sub-surface trickling irrigators). The use of Class B may be acceptable, but the conditions of use need to be carefully considered, as the risk (real or perceived) to site staff could be an issue of concern. According to the EPA Guidelines, effluent treated to Class A will be acceptable in all conditions: the only restrictions being the need to ensure that this supply is prevented from draining directly to ground waters and certain restrictions on spray drift and that such supplies are prevented from being used for drinking or similar potable requirements.

To use recycled water, it is likely that some storage will be required to balance input flow rates and peak demand. This storage of recycled water needs to be carefully considered as the nutrient levels could be such that algal blooms could arise with the associated health and safety risks that they can bring.

Other uses for recycled effluent could include garden watering and flushing toilets. As with track irrigation, Class C would only be acceptable provides that the delivery system was closed so that accidental human contact was avoided. The volumes involved will also be a factor in the physical and financial viability of using recycled flows for such uses. For example, major tracks that attract large crowds will use a large amount of water for toilets, whereas some of the smaller tracks will use relatively little.

By its nature, treated effluent contains nutrients. This can be an advantage in that this could reduce the amount of fertilizer used on the racetracks. Conversely, control of nutrients will need to be considered to ensure that there are no adverse effects on the immediate water environment. Similarly, treated effluent will contain dissolved solids, which more or less reflect the salinity of the effluent before treatment, which itself is variable. For example, treated effluent from the Eastern Treatment Plant has a salinity level of around 500ppm, whereas that from the Western Treatment Plant is around 1000ppm. This clearly is an issue for track maintenance and how this source can be used.

Storage of treated effluent needs to be carefully considered, as exfiltration to groundwater needs to be restricted to ensure that groundwater cannot be contaminated. Similarly, discharges to watercourses also need to be considered and controlled to protect the water quality.

For those courses where treated effluent is a viable alternative, specific requirements are discussed in Section 9.

5.7 Sewer Mining

For areas remote from sewage treatment works, but close to a large diameter sewer, sewer mining may be a viable alternative. In effect, sewer mining involves locating a small, specialised sewage treatment plant next to an existing sewer to draw off and treat sewage, using the clean water produced to replace the potable supply. This process is expensive and requires a reasonably large flow to make it technically viable. The sewage available for treatment varies through a daily cycle and this must be sufficient to enable the mining operation to function on a continuous basis. As with treated effluent, to use this type of operation, it is likely that some storage will be required to balance input flow rates and peak demand. The issue of increased nutrient load needs to be assessed in the same way as for treated effluent.

The standard of treatment for sewer mining will need to be as that for using treated effluent described in Section 5.6 above and is strictly regulated by the EPA.

5.8 OH&S Issues relating to treated effluent

Where treated effluent is proposed (and irrespective of the treatment standard), due consideration of the health and safety of racecourse personnel and the general public will be needed (and would normally be provided in the Environmental Improvement Plan). The details will vary from site to site and will need to reflect the operational and management structure at each site to ensure that the proposals can be implemented with minimal disruption.

Site staff will require suitable regular training to adequately operate and maintain the system to minimise their direct exposure to the water. This will also extend to trainers and jockeys, particularly at training sites. Where frequent contact is expected, suitable protective equipment may need to be provided and worn. Measures to ensure that adequate washing facilities are provided and used and that all staff are aware of the potential risks of using treated effluent.

The irrigation system should be designed to minimise contact. For example, automatic systems or remote controls where towlines are used will enable staff to operate the irrigators without being wetted by the spray. Warning signs and plumbing controls will be required to ensure that accidental contact is avoided.

6. Water Conservation Measures.

6.1 System

As discussed previously, the main use (typically around 75%, but refer to Table C3 for details of each course) of water at the racecourses is for watering of the tracks both for grass irrigation and for dust suppression on artificial tracks. Other uses include watering gardens, washdown facilities in the stables and race day supply requirements for the racegoers.

6.1.1 Irrigation.

The racing industry in Melbourne (with many variations) uses both automatic and manual irrigation systems, often in combination.

Automatic systems involve a water supply pipe around the track with valves at regular intervals, which spray water across the track for a designated period. Sprays can be directional to take account of the wind (such as at Moonee Valley) although most are fixed.

Manual systems require an irrigator to be towed around the track irrigating a section at a time. This can be connected to a fixed ring main with tapping points or use a portable tanker (as is usually the case for the harness tracks). Again, the manual methods usually involve a spray irrigator to spread the water evenly over the track. In some cases an overtrack boom is used to control the spray and deposit the water more evenly over the track.

Trickle irrigators, where water is supplied through a system of shallow buried porous pipes, is not used at any of the racecourses studied. This is because these systems deliver water more unevenly and because they are more likely to be damaged by the trafficking of horses.

6.1.2 Domestic uses

Domestic potable supplies are used for washdown facilities for the horses and for race day attendees. In the case of the training tracks, the supply for horses is significant and needs to be of a high standard to protect the health of both the racecourse staff and the horses.

The demand on race days varies with the significance of the course. On average a consumption of between 50 and 75 l/head can be expected. The majority of this is for toilet flushing, rather than drinking water needs. In addition, many courses have restaurant and bar facilities which require water for food preparation, cleaning and laundry.

6.2 Collection and Recycling

All tracks except Healesville have efficient undersoil drainage systems on at least part of the course so that excess water (either from irrigation or rainfall) is removed thereby maintaining the quality of the turf. It would be sensible, therefore, to collect this excess and store it for re-use. Several of the courses already have such a collection system in place.

Similarly, the opportunity for collection of rainfall should be maximised as discussed in Section 5.

Grey water recycling is not thought viable for most courses, as the supply is relatively small (grey water is usually generated from washing: the majority of waste flows are from toilets or washdown water at racecourses).

6.3 Control systems

6.3.1 Irrigation

In the following discussion, the comments apply to all courses except Healesville which does not have an irrigation system.

Reference should be made to "Efficient Irrigation: A Reference Manual for Turf and Landscape" (Geoff Connellan, Burnley College 2002 – reproduced as Appendix E) or similar guidelines for general guidance on good irrigation practice, although it should be understood that this is deals primarily with crop growth and does not consider track conditioning.

Timing.

Ideally, irrigation should take place at night. This is because lower temperatures will result in minimal evaporation losses.

Automatic systems are more likely to be suitable for irrigation at night. Manual systems require considerable staffing resources and would result in extremely high costs. This, together with the health and safety issues related to prolonged night shift working make overnight irrigation generally unacceptable for courses with manual systems.

Because of this and, although night-time irrigation is preferable to minimise losses, 90% of the courses irrigate in the late afternoon or early evening with two courses also irrigating in the morning, typically over a four-hour period. Table C2 in Appendix C contains data about current practices at each course.

When to irrigate

All courses decide when and how much to irrigate based on the knowledge and experience of the track managers, supported by data from the meteorological office. The dual needs of promoting good turf growth and preparing tracks for racing can produce conflicting requirements to ensure that the highest standards are provided and maintained.

Prevailing weather conditions and forecasts, the type of turf and base and the race programme all influence the decisions of when to irrigate. In summer, most courses are watered daily, increasing the volumes applied when preparing the track for racing. In most cases, however, to promote turf growth, less frequent but more intense irrigation should be used with daily irrigation used for race preparation only. Such a system may be feasible for courses with less frequent, evenly spaced meetings.

Three courses have computer controlled irrigation systems, linked to data from weather radar and, in the case of Moonee Valley, soil moisture sensors. These, combined with track management experience are used to optimise irrigation procedures and, therefore, minimise wastage.

Controls

All courses except Healesville use some form of spray irrigators. Most of these are fixed in terms of volumes and direction. Because of this, adverse wind conditions can result in water being lost to the surrounding area rather than on the intended target. Directional controls would enable water to be used more efficiently.

Electric solenoid valves which have small ports and diaphragms are used extensively. For waters that have high algal content, algae can grow on the diaphragm and cause blockage. This means that, for courses considering the use of recycled effluent for irrigation, the valve system will need to be investigated and, if necessary, upgraded to either contamination resistant valves or hydraulically controlled valves (as occurred at Cranbourne Training Centre during its upgrade, for example).

Garden areas.

All of the courses have garden areas, which are usually watered manually with hoses. The use of buried trickle filters would allow greater control and reduce the amount of water used as well as the labour required.

Replacing some or all of the plants with native plants that can tolerate low water conditions would also reduce the water demand in such areas.

Ensuring that flowerbeds have an application of mulch will reduce evaporation losses and preserve moisture levels, again reducing overall demand for water.

6.3.2 Domestic

All courses require a potable supply for domestic needs. Those that attract large crowds or have training facilities have a large demand for potable water which, if used more efficiently, could be reduced greatly. Some techniques that are available are discussed below.

<u>Maintenance</u>. All tapping points should be checked regularly to reduce leakage. For large and complex facilities such as racecourses, the volume lost to leakage could be considerable if maintenance is not sustained. Management systems to ensure that faults are easily reported and repairs quickly made should be put in place.

<u>Spray taps</u>: for use in hand washing, spray taps use a fraction of the volume of traditional taps. This means that less water is used and less will be wasted if left running.

<u>Automatic taps</u>: taps with sensors that switch on and off automatically will ensure that water is not wasted. The maintenance requirements of such systems will be higher as the sensors will need to be replaced periodically.

<u>Water efficient showerheads</u>: for use in both domestic showers and for washing down horses, these reduce wastage whilst still providing sufficient flow for adequate cleaning.

<u>Waterless / low water urinals</u>: these urinals use a combination of chemical and plumbing techniques to reduce or eliminate the need for water for flushing and cleaning.

<u>Dual flush toilets</u>: 3/6 litre or better are available and could save up to 3 litres per flush (an equivalent of up to 30kl for an attendance of 10,000 people).

<u>Hosing</u>: high pressure cleaning device for hosing down will use less water than a traditional hose.

Many of these suggestions would be expensive to implement and should only be considered as part of a general plan to renew facilities, if they are to be cost effective.

7. Framework of Water Resource Options

Seven of the courses rely heavily on the potable water supply as a major source of irrigation flows and Cranbourne Training Centre also has a high demand in dry years. With the introduction of water restrictions, there is a general realisation that alternative supplies should be sought and more efficient use of the existing supply be made. Should the drought continue and Stage 3 restrictions be enforced, many of the courses will be forced to limit their operations with the consequent loss of earnings.

The larger courses will continue to have a large demand for potable supply because of the size of crowds that are attracted and the frequency of racing events. Similarly, for those courses that have training facilities, water demand for drinking and cleaning of horses will be relatively high.

Figure 7.1 shows the generic water uses typical of a racecourse and possible methods to reduce the water demand. Reduction of water use will be the basic premise for all courses in this study and the significance of each option in this flow chart will vary with location.

Figure 7.2 is a flow chart indicating alternative approaches to using the potable supply, in particular as a source of water for irrigation. In general the left-hand area of the chart shows those methods that are easier and cheaper to implement and should be investigated first. The right-hand side shows those where implementation would typically be more expensive and have greater regulatory issues and larger continuing costs. Clearly, these are not absolute and will depend upon local conditions, but are sufficient as a guide.

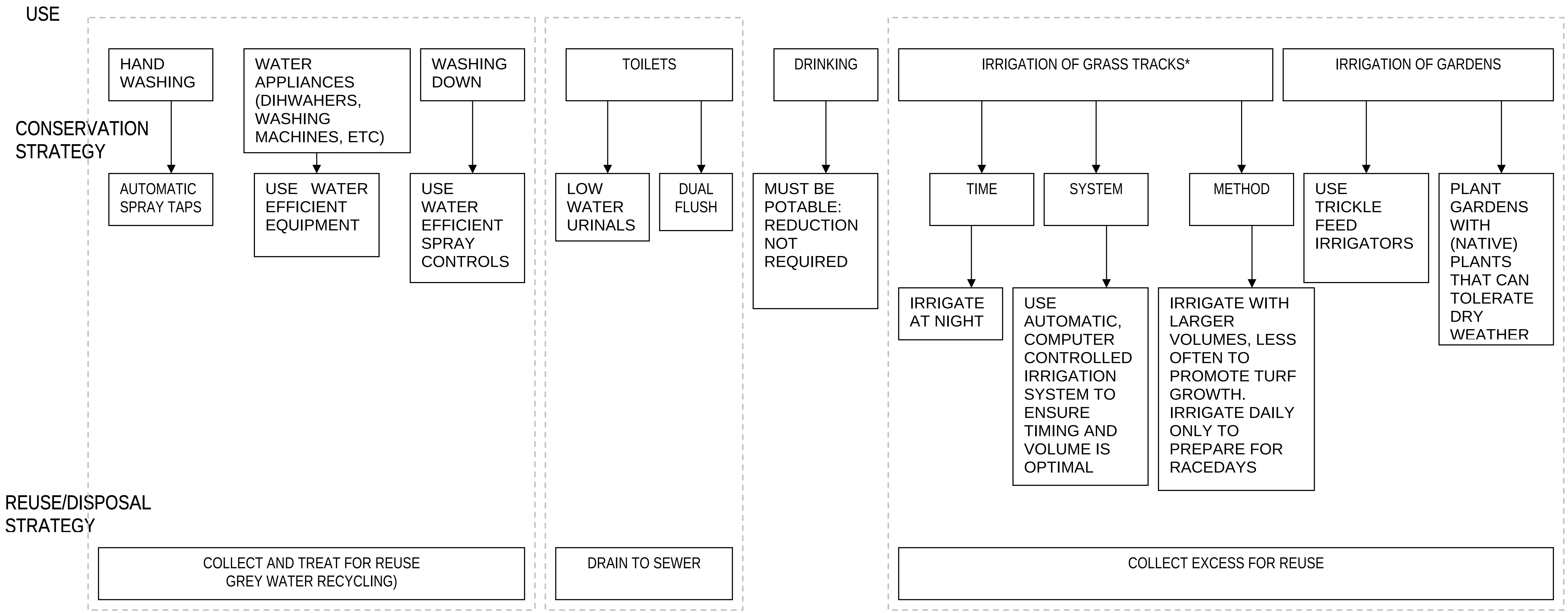
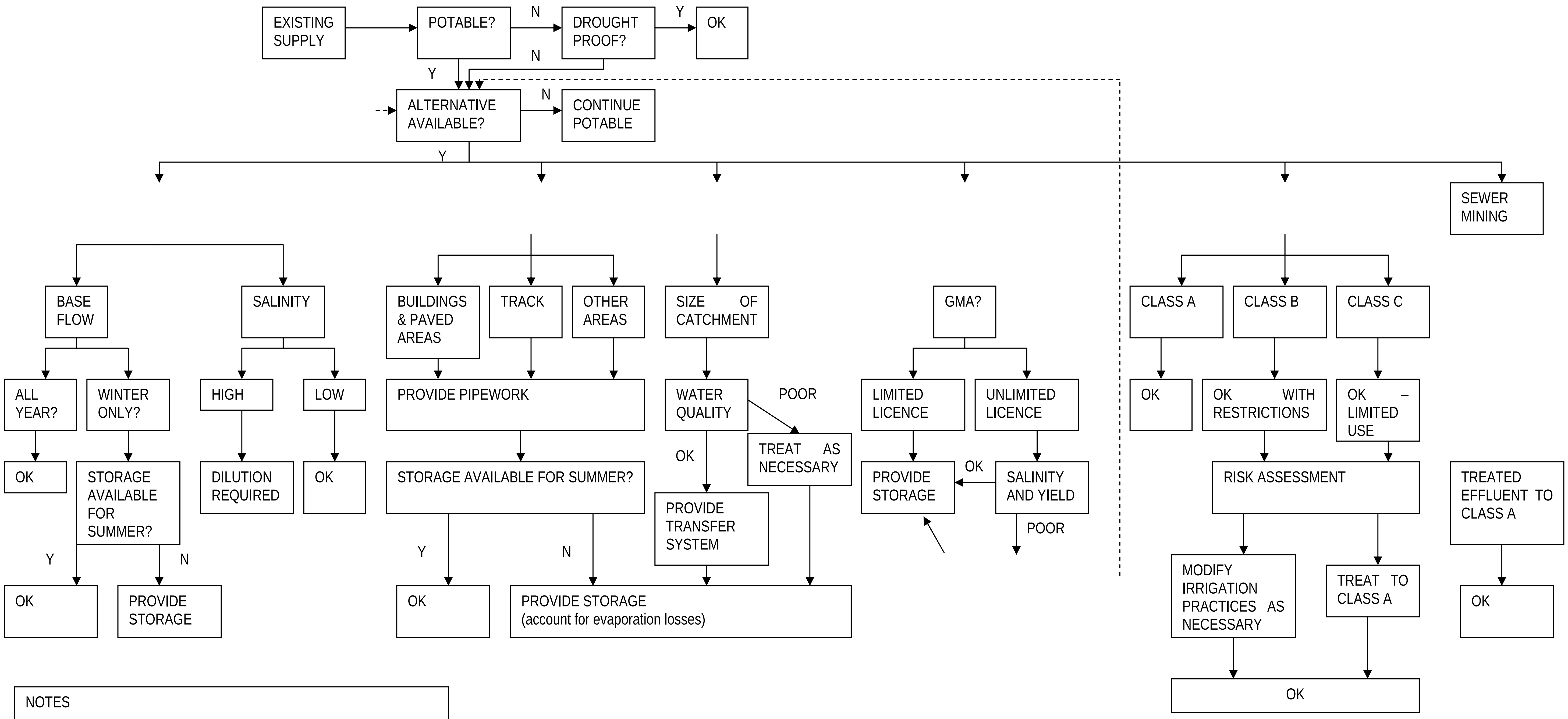


FIGURE 7.1 MEANS OF REDUCING WATER DEMAND

* Artificial tracks require water for dust suppression: it is unlikely that significant water savings will be attained for such areas



NOTES

1. Licensing for groundwater abstraction is provided by Southern Rural Water
2. Licensing for river abstraction is provided by Southern Rural Water or Melbourne Water
3. Licensing for the use of treated effluent is provided by the EPA to ensure water quality standards are achieved and maintained
4. This flow chart does not consider the costs of providing any infrastructure that may be required, but indicates the alternatives that should be investigated.

<u>FIGURE 7.2</u> <u>FLOW CHART TO INVESTIGATE ALTERNATIVE WATER SUPPLY OPTIONS</u>

8. Impact of Drought

One of the drivers for this project is the increased profile of the use of water resources across the State in response to the extended drought. This has led to the acknowledgment across government agencies, the water industry and the public at large that the use of high quality drinking water for non-potable uses such as irrigation is not acceptable in the long term.

Because of the need to maintain high quality turf suitable for racing, the thoroughbred industry has a vested interest in securing long term water supplies that are reliable in all conditions to avoid the possibility of restrictions, as without such supplies many racecourses would have to close.

This report discusses the actual costs involved in procuring alternative supplies and the associated operational costs compared to those of the public supply. It is clear that in most cases the payback period based upon these costs alone would not justify the expenditure required. This is primarily due to the relatively low cost of drinking water in Victoria. There are many associated costs that are not possible to evaluate, however, some because of the generic impact and some because of commercial confidentiality. Some of these are described below. It should be noted that the volume of drinking water used or saved is not necessarily a factor in these assessments, but more simply reflects the impact that a loss of water supply would have.

It should be understood that it is for the individual courses and the thoroughbred racing industry as a whole to evaluate the significance of these figures. This study has viewed these issues qualitatively in order to establish the relative merit of different schemes and therefore assist in the prioritisation of resources.

The impact of continued drought leading to possible course closures would be as follows:

- Actual Cost

This is the cost of physically installing an alternative supply and the operational costs associated with them. These costs are presented in Section 9 of this report.

- Financial Loss

The cost to the individual racecourse and the industry as a whole of having to close due to drought. This will include loss of gate receipts and money from the betting industry and could also include loss of revenue from radio and television broadcasts. Clearly, those courses with more frequent races and larger crowds will lose the most revenue in this way.

For course with training facilities, additional losses will occur as the horses are transferred to alternative facilities.

The length of time that a course could survive closure will be important. In some cases, a short closure may be sustainable, but for others such closure would be terminal. This could be due to the direct loss of revenue during closure, but may also occur due to a failure to recover afterwards (because of trainers moving horses to other centres or racegoers finding alternative venues to attend, for example).

- Public Image

The damage that may be caused to the affected racecourse and the thoroughbred racing industry in Victoria as a whole by the adverse publicity that would occur if a course were to close. This can be measured in terms of press impact: a closure that is reported in the national or international press is clearly more damaging to the reputation of racing than one that is only reported locally.

- Industry Impact

There may be a knock on effect of a loss of quality of thoroughbred horses retained in Victoria because of facilities closing. This would affect those venues with training facilities in particular, as owners and trainers move their stock elsewhere. Initially this would more severely affect the higher end of the market as owners would be better able and more willing to transfer their stock to other states, but eventually this could be expected to have a negative impact on the whole industry. For this reason, measures to protect courses with significant training facilities should be given higher priority than those that do not.

The other way in which industry impact can be measured is by the standard of races held and therefore their relative importance in maintaining a high class thoroughbred racing industry. This means that those courses holding Group 1 meetings or races will have a greater impact (and therefore value) than those holding lower grade races.

9. Review of Racecourses.

Taking the flow charts presented in Section 7, together with the knowledge gained of the current status of each racecourse, a list of viable options for each course has been generated. Where possible, cost estimates have been produced to give an indication of the likely costs to each course and, where several options are possible at one site, enable cost comparisons to be made. These include operational or repetitive costs where possible so that the long-term implications of particular options can also be assessed.

The Health and Safety implications of each option are reviewed along with a general review of the advantages and disadvantages of each option.

For some of the courses, improvements to alternative water supplies and working practices are already being pursued (and in some cases well advanced). Where this is the case, this is simply reported and no further analysis undertaken. Suggestions for further improvements or alternatives are still made and costed where appropriate, however.

Where treated effluent is shown as a viable alternative supply, the capital costs assume the cost of providing pipework from the treatment plant or effluent line to the course, any amendments to pipework within the course and, where necessary, the cost of upgrading the supply to the appropriate class (usually from Class C to Class B). It may be possible to negotiate with the relevant water company for them to provide the infrastructure with the racecourse paying for this through an increased unit cost for the water that is used.

Where operational costs are indicated, these are based upon a unit cost figure, derived from information supplied by various sources. These may vary when specific schemes are developed, but indicate the order of costs that may be affected. It is evident, however, that, because the unit cost of potable water is low, the nominal costs described will rarely be a sufficient driver for change.

As discussed in Section 8, there are, however, many associated costs that will be a factor: the primary one being the effect upon a racecourse of the public supply being removed (in Stage 3 restrictions, for example).

For all courses it is recommended that an audit of domestic and sanitary appliances be undertaken. This will enable the range of facilities to be recorded, their type, age and likely replacement date, which in turn will assist the clubs to produce a quantified plan to upgrade to the most water efficient products over time. It may also assist in defining those facilities where grants or other incentives are available for replacement. At the same time, any leakages or faults can be noted and repaired to minimise wastage.

9.1 Balnarring Racecourse

Annual Total Water Use	*6 Ml*
Annual Potable Water Use	*3 Ml*

Balnarring Racecourse is located at the southern end of the Mornington Peninsula and is part of the Emu Plains Reserve (from whose management board the course land is leased).

Approximately 6Ml per year are used at the course, of which around 5Ml is used for irrigation. The water is sourced from the public supply and by collection of rainfall from the roofs of the racecourse buildings. There are two 5,000 gallon (23 cubic metre) tanks which store the water, which is then pumped to irrigate the track.

The track is irrigated using towlines, typically for 3 hours morning and evening during dry weather. Because of the relatively high rainfall in the area and the small number of meetings, irrigation is usually limited to the summer months only.

A borehole has recently been commissioned which will generate sufficient flows to remove the demand for potable water for irrigation. The initial yields show an acceptable salinity level and flow rate, making this supply a dependable source in all weather conditions. It is understood that a third tank is being considered to help to regulate the flow and improve storage and distribution.

There are plans to create a sand track inside the course proper, which, if implemented, will mean an increase in water demand at the site.

Because of the introduction of the borehole supply, the existing site is now effectively drought proof and has a minimal reliance on the public water supply. Should there be a need to expand the course (with the introduction of a sand track, for example) or increase the irrigation requirements (to hold a higher standard of race for example), the options described in Table 9.1 below are possible alternatives.

Following Figure 7.2:

Is the existing irrigation supply mainly or partly potable?	Yes		
Are alternative sources available?	Yes		
	River?	No	
	On-site drainage?	Yes	
		Buildings?	Already Collected
		Track and other areas?	Yes -Provide pipework to collect
		Storage available?	No – Provide storage
	Off-site drainage?	No	
	Bore Water?	Yes – already collected	Non GMA – unlimited licence
			Salinity? OK
			Yield? OK
	Treated Effluent?	Yes – from Hastings STW	Class C supply – may need to treat to Class B with suitable OH&S controls
	Sewer Mining?	No	

Option/Issue		Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
1	Drain grassed area to lake storage area	Rainfall is sufficient to store water for prolonged drought period	Environmental issues as heathland is affected	200,000		2	1,600
2	Recycled effluent from South East Water	Drought proof source	Extensive infrastructure requirements both on and off-site	50,000	400	2	1200
		Would enable greater irrigation rates	Environmental Improvement Plan Required				
		Will enable expansion of track area irrigated	Additional treatment to a minimum of Class B (eg chlorination plant)	*30,000*	*400*	*2*	*800*
3	Replace sanitary fittings with low water options	Refurbishment is planned so opportunity is viable	Additional cost over traditional fittings	<10,000	Minor	Minor	<500
		Possible rebate from water charges					

Table 8.1 Options for Balnarring Racecourse

From Table 9.1, it is clear that the capital costs associated with recycling will be lower than for collection of site drainage, but that the operating costs will be higher. Given the fact that the existing arrangement of bore water plus roof water collection is sufficient for the site's current needs and that running costs are minimal, it is recommended that no further enhancements are needed at this stage.

If the sand track is to be installed, however, there will be an increased demand for water for dust suppression. The irrigation method for dust suppression is much easier to control and, therefore, Class C effluent may be suitable for this purpose, thus making use of Class C effluent a viable source. It should be noted that discussions have already been held with South East Water to investigate the viability of taking treated effluent from Hastings STW. If this was to be taken further, an Environmental Improvement Plan in accordance with EPA guidelines will be required, which would have to take due account of the reserve status of Emu Plains.

9.2 Caulfield Racecourse

Annual Total Water Use	*139 Ml*
Annual Potable Water Use	*115 Ml*

Caulfield Racecourse is one of the premier thoroughbred racing centres in Victoria and is also a major training centre. Although relatively few races (19 per year) are held at this venue, they are well attended with around 200,000 visitors annually. There are a number of training tracks (sand, artificial and grass) with on-site facilities for up to 500 horses.

The racecourse lies in a highly urbanised area, 10km south east of Melbourne CBD. The suburban railway, the Princes Highway and major residential roads surround the course.

The site is currently served by three main sources of water: the public supply, surface drainage and borehole supply. The boreholes feed a lake in the middle of the course and this is used to irrigate the sand training track. This supply is supplemented by surface drainage from the course proper, the grandstand and the stabling areas (but which is then mainly accounted for by evaporation losses). A second lake has been excavated recently, and it is anticipated that this will provide sufficient storage to facilitate irrigation of the remaining training tracks. Approximately 10ha of land at the course are irrigated requiring up to 100Ml of water annually, of which 75Ml is from the public supply (reducing to 50Ml when the second lake is commissioned).

The domestic demand at this course is very high – up to 30Ml per year. Therefore the management of the domestic supply needs to be reviewed as major efficiencies could be achieved, potentially saving around 5Ml (or $4,000) per year.

Because of its location, there are no simple options for replacing the public supply with other sources. The site is 20km away from the Eastern Treatment Plant and, because of the urbanised area any pipeline would have to pass through, the cost of taking water from this source would be prohibitive, unless it was part of a large scale project to supply that area of the city generally.

The sewers and drains around the site are minor, making localised sewer mining or surface water abstraction difficult without major streetworks. The nearest main sewer is at Gardiners Creek, some 3km away. The nearest major surface water drain is in Wanalta Road, approximately 400m to the east of the site.

For sewer mining an Environmental Improvement Plan would have to be developed in accordance with EPA guidelines. There are no major aspects of this site that would be of particular concern for an EIP as the groundwater abstraction is from deep aquifers.

For abstraction from Melbourne Water drain in Wanalta Road, the agreement of Melbourne Water would be required. There are technical difficulties involved in pumping from an existing piped drain of this nature, but these can be overcome. It is likely that some land would have to be purchased or leased to site the pumping station.

Because Caulfield is a training centre as well as being one of the premier courses in Victoria, the need to secure drought-proof supplies is very high. Changes to the operations on site have reduced the reliance on potable water for irrigation, but further supplementary flows are required if the long-term security is to be ensured. It is recommended, therefore, that the possibility of abstraction from the Wanalta Road drain is investigated further and discussions held with Melbourne Water to pursue this option.

From Figure 7.2

Is the existing irrigation supply mainly or partly potable?	Yes		
Are alternative sources available?	Yes		
	River?	No	
	On-site drainage?	Yes	
		Buildings?	Already Collected
		Track and other areas?	Yes –already collected
		Storage available?	Yes
	Off-site drainage?	Yes – main drain in Wanalta Road 400m SE of site	Pumping station would be required to transfer flows
	Bore Water?	Yes – already collected	GMA – limited licence
			Salinity? OK
			Yield? OK
	Treated Effluent?	No	
	Sewer Mining?	Yes	Gardiners Creek MS 3km away

Option/Issue		Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
1	Off-site Collection	In combination with borehole and existing on-site supply, it is believed that rainfall is sufficient to store water for prolonged drought period	Pumping station off –site – need large storage or large pumps and rising main	550,000	10,000	46	26,000
		The size of catchment means that storage can be replenished even with small amount of rainfall	Pipework required in streets – high cost and disruption				
2	Sewer Mining	Drought proof source	Extensive infrastructure requirements both on and off-site	1,830,000*	28000	46	8,000
		Would enable greater irrigation rates					
3	Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	250,000	0	5	4000

*This would reduce to around $1,400,000 if a suitable local sewer was found rather than using Gardiner's Creek MS

Table 9.2 Options for Caulfield Racecourse

9.3 Cranbourne Racecourse

Annual Total Water Use *58 Ml*
Annual Potable Water Use *58 Ml*

This track, at the edge of Cranbourne is used jointly for thoroughbred, harness and greyhound racing. As a result, it is utilised frequently and domestic water uses are relatively high to service the attendees. At present, this course is solely dependent upon the public water supply system for its water needs. The total demand at the centre is 58Ml per year, of which 44ML is used for irrigation. There are plans (described below) to provide both stormwater storage and take treated effluent to replace the public supply for irrigation at this site.

- The Eastern Irrigation Scheme (EIS) to transport Class A treated effluent from the Eastern Treatment Plant has now been given approval and the implementation programme is advancing. Cranbourne Racecourse has applied to take around 10Ml per year from the EIS. The exact arrangements are to be confirmed, but this will be primarily in summer months to supplement other supplies. The issue of whether the flow will be stored on site or distributed directly from the supply main is to be resolved, but will be addressed in the implementation plan for the site.
- Collection of surface water flows from the paved carparking areas to a new 34Ml lagoon.

In the case of stormwater collection, it is intended that the grandstand, other buildings, overflow car park and half the main car park will be drained to the new lagoon – a total of around 4ha. Given average rainfall conditions, around 25Ml can be collected from this area: significantly less than the volume of the proposed lagoon and certainly less than required to service the track requirements. Taking into account likely evaporation losses, it is estimated that a minimum of 10ha of paved areas will need to be drained into the lagoon to service the irrigation needs at this course. It is not possible to drain any of the track areas or the neighbouring South Gippsland Highway because of the sandy soil conditions at the site. An alternative measure would be to pave (using tarmac) some of the central area of the course to create an artificial rainwater collection basin, but this would cause obvious environmental problems.

If treated effluent is to be used, an Environmental Improvement Plan in accordance with the EPA guidelines will be required. The location of this site close to the Royal Botanical Gardens, Cranbourne means that the environmental issues associated with using recycled effluent are more significant than at other locations as there is a need to minimise the nutrient load (particularly phosphorous) that can transfer to the groundwater system. For this reason, a groundwater monitoring system will have to be implemented to ensure that nutrient levels remain stable. Nutrient levels should be managed through nutrient budget calculations and incorporation into the fertilizer application programme. Additionally, monitoring through soil tests will be a useful additional source of data to control nutrient levels.

From Figure 7.2

Is the existing irrigation supply mainly or partly potable?	*Yes*		
Are alternative sources available?	*Yes*		
	River?	*No*	
	On-site drainage?	*Yes*	
		Buildings?	*Already Collected*
		Track and other areas?	*No*
		Storage available?	*34Ml to be provided*
	Off-site drainage?	*No*	
	Bore Water?	*No*	
	Treated Effluent?	*Yes - EIS*	
	Sewer Mining?	*No*	

It is recommended that the on-site collection system that has been planned and approved be implemented and monitored to check the volumes collected and the associated losses due to evaporation. The supply from the EIS should be procured and, together with the data from the site collection, be reviewed to see if increased amounts are required and if so are available.

The Environmental Improvement Plan required to use recycled water at this site needs to be produced as soon as possible so that the water can be used as soon as the pipeline is built. As the plan will have to be approved at a government level because of the additional requirement to protect the Royal Botanic Gardens Cranbourne, the approval process is more complex and will therefore take longer than at other sites.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Recycled effluent from eastern Irrigation Scheme	Drought proof source	Extensive infrastructure requirements both on and off-site (assume 0.5Ml storage, replacement of valves, pipework and revised drainage)	200,000 on site + EIS costs	EIS costs 4,000 est.	10	4,000
On site drainage collection	Prevent run-off going to waste	Extensive infrastructure requirements on site Not drought-proof – insufficient drainage area available	200,000	<1000	24	18,000
Create drainage collection areas (ie pave over area of course to prevent loss to ground)	Will collect much higher volumes of run-off, sufficient for normal year requirements	High cost Not drought proof Environmental concerns	>2million			
Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	<50,000		1.5	$1,300

Table 9.3 Options for Cranbourne Racecourse

9.4 Cranbourne Training Centre

Annual Total Water Use 185 Ml
Annual Potable Water Use <1 Ml
(up to 100Ml in a drought year)

The Training Centre is adjacent to Cranbourne Racecourse. Its facilities include several training surfaces and extensive stabling, which are used daily. The tracks are irrigated with an automatic irrigation system that has been upgraded to replace the valves with hydraulic varieties to provide a more robust system capable of dealing with higher nutrient levels than conventional electric solenoid valve systems.

In a normal year, water is provided by the site drainage system, which drains the stables, buildings and tracks to two lagoons located in the centre of the tracks. There is a third lagoon, which is supplied from the high water table in the sand lenses that lie beneath the neighbouring Botanical Gardens. This is used to supplement flows when the two main lagoons are running low.

In extended periods of drought (around once every ten years), the lagoons run dry and the irrigation of the track is supplied by the public water supply system. As the complex uses 185Ml per year, this can cost up to $80,000 in water costs, compared to less than $1,000 in a normal year.

It is known that the two main lagoons are poorly sealed and, therefore, lose significant volumes (estimated at up to 30Ml) to the ground each year. There is also a problem of algal growth in these lagoons, due mainly to nutrient loads created by draining the stabling areas directly (there is a large area of reed bed on the site, but the drainage of the stables by-passes this to flow directly to the storage lagoon). This is a significant problem that could affect the intake of the pumping station and the means of controlling this needs to be addressed. This could be by construction of a second reed bed treatment area or by collecting the “first flush” from the stabling areas and pumping it to the existing reed beds. The latter will be the more cost-effective solution.

The complex is on the route of the Eastern Irrigation Scheme and the management has applied for a supply in excess of 100Ml per year from this source. The training centre management has indicated that this will be used to drought-proof the course and also to make more water available to increase irrigation rates in order to improve the overall standard of facilities. If treated effluent is to be used at this site, an Environmental Improvement Plan in accordance with the EPA guidelines will be required. The location of this site close to the Royal Botanical Gardens, Cranbourne means that the environmental issues associated with using recycled effluent are more significant than at other locations as there is a need to minimise the nutrient load (particularly phosphorous) that can transfer to the groundwater system. For this reason, a groundwater monitoring system will have to be implemented to ensure that nutrient levels remain stable. Nutrient levels should be managed through nutrient budget calculations and incorporation into the fertilizer application programme. Additionally, monitoring through soil tests will be a useful additional source of data to control nutrient levels.

The exact arrangements on site have yet to be determined and will be the subject of detailed design. Because of the leakage problem described above, if flows from the EIS are to be stored on site, this will have to be in a new, sealed storage lagoon to prevent egress to the water table and the sensitive ecosystem of the Botanical Gardens. A detailed environmental implementation plan will be required for this proposal to ensure that the concerns of the Botanical Garden are addressed, in particular with respect to control of phosphorous levels in the water table. The continued collection and use of surface water will be important to help to control nutrient levels and to lower the overall operational costs.

From Figure 7.2

Is the existing irrigation supply mainly or partly potable?	No	Drought-proof?	No
Are alternative sources available?	Yes		
	River?	No	
	On-site drainage?	Yes	Already Collected
	Off-site drainage?	No	
	Bore Water?	No	
	Treated Effluent?	Yes	EIS
	Sewer Mining?	No	

It is recommended that the Environmental Improvement Plan required to use recycled water at this site is produced as soon as possible so that the water can be used as soon as the pipeline is built. As the plan will have to be approved at a government level because of the additional requirement to protect the Royal Botanic Gardens Cranbourne, the approval process is more complex and will therefore take longer than at other sites.

Once the recycled flows are available, the opportunity should be taken to drain down the lagoons on site to install improved lining to minimise losses to the ground and prevent pollutants for entering the groundwater system.

Finally, the drainage of the stables area should be modified so that the first flush is taken through the existing reed beds to help to remove the nutrient load and thus reduce the risk of algal blooms in the existing lagoons.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Recycled effluent from Eastern Treatment Plant outfall	Drought proof source	Extensive infrastructure requirements both on and off-site	Confidential with EIS		100	40,000
	Irrigation system already installed capable of dealing with recycled flows	5Ml lined Storage lagoon and associated infrastructure	210,000			
		Increased nutrient load				
Seal existing lagoons	Will save large leakage volumes	High Cost	>500,000	0	30	25,500
	Will reduce need to protect overflow lagoon to benefit of RBG Cranbourne	Loss of facilities whilst constructing				
Provide additional reed bed to treat site drainage; or	Control of algae in existing lagoons	Availability of land/site layout	170,000	0	0	0
Redirect flows to existing reed bed: requires run-off from stables to be partially pumped	No new storage required	Pumping station will increase operational costs	75,000	600	0	(600)
	Control of algae in existing lagoons					

Notes:
1. The operations costs at this site apply to a drought year only as the centre is self sufficient in other years.
2. The storage lagoon for recycled flows may not be necessary due to the existence of large reed bed area which it may be possible to utilise for this purpose, which would also have the added benefit of further treating the flows.

Table 9.4 Options for Cranbourne Training Centre

9.5 Healesville Racecourse

Annual Total Water Use	*<1 Ml*
Annual Potable Water Use	*<1 Ml*

Situated on the outskirts of Healesville, adjacent to Watts Creek, this racecourse has limited facilities sufficient for six race meetings a year held in the summer months. The track lies within the flood plain of the Creek and benefits from high rainfall and water table, resulting in it largely being unaffected by the recent droughts. There is no irrigation system for the track, water being used only for domestic demand for the toilet and catering facilities.

It is recognised that resources are limited and, although desirable, the course does not suffer through a lack of irrigation.

The options available to the club to provide irrigation are collection of water from site drainage and use of recycled flows from the line currently being investigated for the RACV club.

The cost of collection would be around $100,000 with minimal on-cost (but not including the cost of the irrigation system), whereas the cost of using the recycled flow system would be considerably cheaper, but with an on-cost of around 45c/kl (or $2000 per annum based on a similar usage rate to Balnarring).

The advantages to the club of having an irrigation system would be that the condition of the track could be improved enabling a higher standard or frequency of races to be held.

The disadvantage is the high cost of installation and maintenance for a track that is limited in the opportunities for expansion given its location and resources.

Following Figure 7.2:

Is the existing irrigation supply mainly or partly potable?	Yes		
Are alternative sources available?	Yes		
	River?	Yes	
	On-site drainage?	Yes	
		Buildings?	Yes
		Track and other areas?	Yes
		Storage available?	No
	Off-site drainage?	No	
	Bore Water?	No	
	Treated Effluent?	Yes	Class C supply from Yarra Valley Water
	Sewer Mining?	No	

Because of the limited number of races and the generally acceptable conditions, it is recommended that no action is taken at this site.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Recycled effluent	*Drought proof source*	*Extensive infrastructure requirements both on and off-site*	*150,000*	*2500*	*0*	(2500)
	Would facilitate expansion of facilities	*Class C supply – would need to be upgraded to Class B*	*50,000*			
On site drainage collection	*Good hydrological conditions*	*Extensive infrastructure requirements on site*	*150,000*	*<1000*	*0*	(<1000)

These figures do not include the cost of providing an irrigation system, which would be in excess of $100,000. The cost of taking recycled flow could be reduced if the RACV paid the majority of the infrastructure cost.

Table 9.5 Options for Healesville

9.6 Moonee Valley Racecourse

Annual Total Water Use	*150 Ml*
Annual Potable Water Use	*120 Ml*

Moonee Valley Racecourse is one of the premier racing venues in the city, holding a significant number of thoroughbred race meetings and serving as the sole metropolitan harness racing centre. The course lies within a developed area to the north of Melbourne City Centre adjacent to the Tullamarine Freeway.

Total potable water use at Moonee Valley is around 120Ml/year, of which around 50% is used for irrigation requirements, mainly associated with irrigation and gardening, but also for dust suppression on the harness course.

The racetrack is irrigated with an automatic system which utilises moisture sensors in the track to optimise irrigation requirements. Because of this, it is the lowest relative user of water for irrigation of the major tracks, with only Balnarring using less. Irrigation water is provided by abstraction from Moonee Ponds Creek to the east of the Freeway, supplemented by potable water to reduce salinity levels. The track and some of the paved areas are positively drained into the storage lagoon to try to minimise the reliance on potable water. In addition, some surface water from public highway drains in Dean Street and Wilson Street is discharged into the lagoon, although this is limited.

The main issues at Moonee Valley are those of supply (for the gardens, harness track and domestic use) and of salinity (course proper). Moonee Ponds Creek has an average salinity of around 1200mg/l which is much higher than the desirable maximum of 500mg/l that the turf could tolerate. Potable water is used to shandy the flows to a tolerable salt level and also to wash out the turf should accumulated salt levels get too high.

A reliable alternative supply is needed because of the risk of water restrictions due to the drought and also because salinity levels in Moonee Ponds Creek appear to be increasing, thus making this a less reliable supply. The course management would also like to improve their facilities, which an alternative, less restricted supply would provide. This would include increased irrigation of the steeplechase track, growing of replacement turf on site (thus reducing the reliance on external suppliers) and improvements to the garden nursery stock.

The options for this course are:

- Sewer mining is possible linked to a major proposal by City West Water (CWW) to develop facilities at Princes Park to potentially supply extensive areas of North Melbourne. CWW are about to conclude a feasibility study for the project, with likely implementation of Stage 1 within 18 months. The water to be supplied will be Class A standard with additional treatment to reduce salinity levels, thus making it suitable across a range of uses.
- An alternative sewer mining source would be the large sewer running along the eastern boundary of the site. This would require a small treatment plant to abstract and treat flows from the sewer to a Class A standard. The salinity level of the raw sewage would be reflected in the treated effluent unless additional treatment measures were implemented to reduce salt levels. This in turn will affect the effectiveness of this solution in replacing potable water for irrigation.
- Desalination of creek flows. As with sewer mining, the technology for desalination has advanced greatly in recent years, thanks largely to improved membrane standards which enables lower pressures to be used to remove salts. Desalination may be an option at Moonee Valley, but will only operate within a restricted range of salt concentration levels. This can be achieved for river water abstraction by providing additional controls to bypass the desalination unit should salinity levels fall outside the range.

From Figure 7.2:

Is the existing irrigation supply mainly or partly potable?	*Yes*		
Are alternative sources available?	*Yes*		
	River?	*Yes – already done*	*Salinity an issue*
	On-site drainage?	*Yes*	
		Buildings?	*Already Collected*
		Track and other areas?	*Yes –already collected*
		Storage available?	*Yes*
	Off-site drainage?	*Yes – small sw drains already utilised*	
	Bore Water?	*no*	
	Treated Effluent?	*No*	
	Sewer Mining?	*Possible*	*City West Water Princes Park Scheme or main sewer alongside site*

Refer to Figure 9.6 below for an expansion of the options and associated costs

<u>Recommendations</u>

- To develop dialogue with City West Water about the Princes Park sewer mining scheme. This appears to offer the most overall benefit to the course as a whole, especially in view of the standard of treated effluent to be produced. Early indications are that City West Water will be able to be flexible in relation to the level of initial investment compared to the unit cost of effluent used. The use of water from this source will enable facilities at the course to be improved or expanded and secure a long term drought-proof supply. This option would have an incidental environmental benefit of reducing abstraction from Moonee Ponds Creek.
- Carry out an audit of water use on site, with particular reference to sanitary fittings, kitchen appliances, laundry appliances and garden use. This will give an indication of the age and range of facilities and will enable the course management to plan medium term replacement with more water efficient products. It will also help to ensure that maintenance and repairs are managed better, thus reducing water demand (and therefore costs) across the course facilities.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Sewer Mining – Princes Park Scheme	Drought proof source High standard of treatment – salinity levels similar to potable are forecast Flexible pricing arrangements as overall scheme is likely to proceed Would facilitate greater irrigation rates for steeplechase, nursery and turf growing to improve overall track services	Extensive infrastructure requirements both on and off-site	1million*	Similar to public supply*	60	0
Sewer Mining – local scheme	Drought proof source Would facilitate greater irrigation rates for steeplechase, nursery and turf growing to improve overall track services	All costs (capital and operational, including testing) will be borne by the racecourse Salinity levels will be high requiring additional treatment	1,400,000	As potable supply	60	0
Desalination of Moonee Ponds Creek Flows	Connection to creek already exists	Additional Maintenance Not drought-proof Would only cater for course proper requirements as drawing large additional flows for lawns, etc, will not be acceptable	150,000	5600	14	6,400
Reduce irrigation volumes for gardens, etc and review garden requirements	Significant water savings	May require extensive works to lawns and gardens	0 to 250,000	0	7	6,000
Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	250,000		10	8,500

**estimated costs only – exact share of capital and operational costs to course subject to negotiation with City West Water*

Table 9.6 options at Moonee Valley

9.7 Mornington Racecourse

Annual Total Water Use	*95 Ml*
Annual Potable Water Use	*70 Ml*

The irrigation system at Mornington Racecourse is manual supplied completely from the public water supply system. Mornington currently uses around 70ML per year of potable water, of which 46Ml is used for irrigation. Flows are supplemented by 25Ml abstracted form a recently commissioned borehole. This is stored in a 300kl above ground tank.

The course has extensive training facilities, which means that the irrigation levels are relatively high to ensure that the conditioning is good enough for continual use.

The centre of the course is rough grassland.

The available options for Mornington are summarised in Table 9.7 below. There are three alternative sources of water that could be used to provide for the irrigation demand: collection of on-site drainage; bore hole supplies; and recycled effluent. In addition to these, efficiencies could be gained in the domestic demand of 4.75Ml per year by replacing sanitary fittings and water using equipment with more efficient varieties. This could save up to 1.5Ml per year in water demand and should be considered when upgrading and refurbishing of facilities at the course are planned. The remaining potable water is used for facilities for horses where this quality of water is required.

By positively draining the track and central areas for collection of surface water run-off, up to 85Ml a year would be available in a normal year (taking into account evaporation losses), which would reduce to 44Ml in a drought year. This means that, provided sufficient storage is provided and utilising the 25ML from the borehole, the course could be protected for a drought year: Supplementary flows would still be required for an extended drought, however.

For recycled effluent, the course lies close to the outfall pipe from the Eastern Treatment Plant. The effluent from the ETP is currently Class C, but recent initiatives have resulted in an implementation plan to raise the standard to Class A for all flows from this Plant. If an upgrade to Class A occurs, the flows could be taken from the outfall sewer without further treatment being required and at relatively low cost. A previous study was carried out for Melbourne Water to consider the supply to local users, with the principal one being Mornington Racecourse. This concluded that the minimum cost of a scheme to bring flows to the racecourse alone would be $690,000. This could either be borne by Melbourne Water and transferred to the course by way of increased supply costs or paid as an up front infrastructure charge with reduced supply costs. The latter case has been considered in the table below. It is clear that, without financial incentive, the cost of using recycled water at this location would be prohibitively expensive, only offering marginal cost savings with a payback period of over 30 years. The major benefit of using this supply is that it would completely drought-proof the course.

From figure 7.2

Is the existing irrigation supply mainly or partly potable?	*Yes*		
Are alternative sources available?	*Yes*		
	River?	*No*	
	On-site drainage?	*Yes*	
		Buildings?	*Revised plumbing required*
		Track and other areas?	*Extensive under-drains required*
		Storage available?	*No – provide storage*
	Off-site drainage?	*no*	
	Bore Water?	*Yes – already collected*	*nonGMA – unlimited licence*
			Salinity? OK
			Yield? OK
	Treated Effluent?	*Possible*	*Eastern Outfall sewer*
	Sewer Mining?	*no*	

It is recommended that the option of collection and storage of surface water should be developed as the best overall means of reducing potable demand at the site. A storage volume of around 40Ml would be required. Although this would not completely drought-proof the site, the hydrological conditions are such that (provided the storage volumes are sufficiently large) the course's needs will be supplied in all but the most extreme droughts.

Should the economic conditions improve such that the cost of taking treated effluent from the Eastern Outfall Sewer is significantly reduced, however, then this source would offer a more stable overall solution.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Drain grassed area to lake storage area	Rainfall is sufficient to satisfy demand in an average year	In extreme drought, supplementary flows would still be needed from potable supply	540,000	500	46	38,500
Recycled effluent from Eastern Treatment Plant outfall	Drought proof source	Extensive infrastructure requirements both on and off-site	690,000	29,000	46	10,000
		Additional treatment to bring up to a minimum of Class B is required	50,000	4,600		(4,600)
Replace manual irrigation system with automatic	With sophisticated controls could reduce demand	Cost	>100,000		<2	1,700
	Will enable irrigation at night, thus reducing evaporation					
Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	<50,000		1.5	1,300

Table 9.7 Summary of Options for Mornington Racecourse

9.8 Pakenham Racecourse

Annual Total Water Use	*33 Ml*
Annual Potable Water Use	*33 Ml*

Located at the edge of Pakenham, this course has recently replaced its course proper with a higher grade surface with extensive underdrains. Because of this, the water usage has been distorted over the last two years due to increased irrigation required whilst establishing the turf.

The irrigation system at Pakenham is manual supplied completely from the public water supply system. Pakenham currently uses around 33ML per year of potable water, of which 28Ml is used for irrigation. Excess flows from both the racetrack and the sand training track drain into Pakenham Creek.

The centre of the course is rough grassland with one or two copses of trees. Pakenham Creek runs adjacent to the course mainly in underground culvert, but with an extensive surface flood channel.

The available options for Pakenham are summarised in Table 9.8 below. There are three alternative sources of water that could be used to replace the irrigation demand: collection of on-site drainage; recycled effluent; and abstraction from Pakenham Creek. A combination of collecting the track drainage only with abstraction from Pakenham Creek may be a more cost-effective viable solution as it reduces the amount of pipework required.

In addition to these, efficiencies could be gained in the domestic demand of 1.65Ml per year by replacing sanitary fittings and water using equipment with more efficient varieties. This could save around 0.5Ml per year in water demand and should be considered when upgrading and refurbishing of facilities at the course are planned.

The current level of water use for irrigation is very high (the equivalent of 45mm per week in summer) and, whilst it is recognised that this is elevated because of the installation of a new running surface, this is relatively high compared to other tracks in the city with similar facilities. If this demand was reduced to the equivalent of 35mm per week in summer, then a saving of around 4Ml per annum could be achieved. This may be possible using the existing manual irrigation method, but would more easily be achieved with an automatic system.

From Figure 7.2

Is the existing irrigation supply mainly or partly potable?	*Yes*		
Are alternative sources available?	*Yes*		
	River?	*Yes*	*Pakenham Creek*
	On-site drainage?	*Yes*	
		Buildings?	*No*
		Track and other areas?	*Yes – track drainage exists, other areas new drains would be required*
		Storage available?	*No*
	Off-site drainage?	*No*	
	Bore Water?	*No*	
	Treated Effluent?	*yes*	*Class C supply from SE Water*
	Sewer Mining?	*No*	

It is evident from Table 9.8 that the capital costs of the surface water collection are higher than taking recycled flows, whereas the operational costs of using recycled flows are higher than the alternatives. As the main aim is to secure a drought proof supply, then the use of recycled flows should be pursued.

It is recommended, therefore, that the necessary studies to produce an Environmental Improvement Plan in accordance with EPA guidelines is produced, taking due account of neighbouring properties in particular. A more detailed study of the exact requirements to upgrade the recycled flows to Class B and an assessment of the salinity of the water are also needed. Provided that these studies prove satisfactory, then recycled flows should be used at this site.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Drain grassed area to lake storage area	Rainfall is sufficient to satisfy demand in an average year	Environmental issues on site	540,000	500	28	23,300
		In extreme drought, supplementary flows would still be needed from potable supply				
Recycled effluent from South East Water	Drought proof source	Extensive infrastructure requirements both on and off-site	200,000	8600	28	0
		Additional treatment to bring up to a minimum of Class B is required	50,000+	4200		
		Desalination may be required	100,000	11,000		
		Insufficient buffer zones for whole of site (minimum of 15m for Class B)				
Collect winter flows from Pakenham Creek	Creek is adjacent to site with significant flood channel	Abstraction licence required	540,000	1000	28	22,800
	Should be able to collect enough to drought-proof course	Possible environmental effects on the creek				
Replace manual irrigation system with automatic	With sophisticated controls could reduce demand	Cost	>100,000		<2	1,700
	Will enable irrigation at night, thus reducing evaporation					
Reduce irrigation volumes	Will save 4Ml/year in demand		0		4	
Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	<50,000		1.5	1,300

Table 9.8 Options for Pakenham

9.9 Sandown Racecourse

Annual Total Water Use	*52 Ml*
Annual Potable Water Use	*30 Ml*

The track and irrigation systems at Sandown Racecourse were refurbished in 2002 with the storage on site being expanded and the irrigation system completely replaced. The course collects water from Mile Creek and other major drains for irrigation use. Because of the size of the catchment, relatively small amounts of rainfall are sufficient to replenish the storage lagoons. This effectively means that the site is drought proof and has had a secure supply for over 30 years. By way of insurance, however, there is a borehole supply which can be used to replenish the lagoons in times of extended drought.

From Figure 7.2:

Is the existing irrigation supply mainly or partly potable?	No	
Is the alternative Source drought-proof?	Yes	No further Action Required

The irrigation and storage systems were upgraded in 2002 to ensure that the standard of the course is maximised. Irrigation management formed part of this upgrade programme, resulting in efficient use of water for irrigation.

The principal use of potable water at the site is for domestic use, particularly on race days. Included in the domestic demand is water supply for attendance at car races held at the same venue. The total annual attendance at Sandown for all events is around 350,000. Assuming that the average consumption is 80l/head then this accounts for the 28Ml consumed annually for domestic purposes other than gardens or stables. The techniques suggested in Figure 7.1 are therefore appropriate to this course and have the potential to offer significant long term savings.

Replacing the toilets with low flush varieties, replacing the urinals with those which use less water and have more sophisticated controls and replacing hand washing taps with automatic spray varieties could save up to 25% (or 7Ml/annum) of the domestic demand. This equates to a cost saving of around $6,000 per annum.

It is therefore recommended that an audit of potable water use is undertaken for this site to identify where more efficient use could be made and supply an inventory of current water using appliances and whether or not they can be replaced with more efficient alternatives.

9.10 Werribee Racecourse

Annual Total Water Use	*70 Ml*
Annual Potable Water Use	*30 Ml*

Werribee Racecourse is the westernmost racecourse considered in this study. It has the highest evaporation and lowest rainfall levels of all the courses under consideration.

The supply of water comes mainly from surface water collection into an existing lagoon in the track with an equal volume from the public water supply. The course also has an abstraction licence to take water from Werribee Creek, but, because of high salinity levels (>3000mg/l) this is limited to the three days after heavy rains.

The course lies approximately 9km from the outfall to the Western Treatment Plant. There is an existing supply of treated effluent to Werribee Park to the south of the Princes Highway and proposals to create further pipelines to serve the Wyndham, Balliang and Werribee South areas, however. The Wyndham supply line will be laid to the west of the course, coming within 2km at the closest point.

The effluent will be treated to Class A making it suitable for use at the course with minimal restrictions. The salinity levels are currently around 1000mg/l, however, making it unsuitable for long term use without significant dilution. Melbourne Water has indicated that they aim to reduce the salinity levels to around 600mg/l within four years. If this is done, the 14ML of potable water used currently for irrigation could be completely replaced with recycled effluent, with the site drainage collection providing the required level of dilution.

The other option for this course is desalination of flows from Werribee Creek. As the pump line already exists, the infrastructure costs of this option will be limited to the cost of the plant. Again, this could be used to completely replace the potable water used for irrigation.

According to the data supplied by the course, Werribee uses the highest volume of water for irrigation of all the courses (equivalent to a maximum of 60mm per week). This possibly reflects the hydrology of the area, but suggests that this demand is excessive. The supply and demand at this course should be reviewed to see if reducing the irrigation requirements is feasible. If the demand is reduced from a peak of 60mm per week to, say, 50mm, for example, an annual reduction of around 7Ml could be achieved, which could all be from the potable supply.

From Figure 7.2:

Is the existing supply mainly or partly potable?	*Yes*		
Are alternative sources available?	*Yes*		
	River?	*Yes*	*Flood flows from Werribee Creek*
	On-site drainage?	*Yes*	
		Buildings?	*Already Collected*
		Track and other areas?	*Yes –already collected*
		Storage available?	*Yes*
	Off-site drainage?	*No*	
	Bore Water?	*No*	*Salinity levels too high*
	Treated Effluent?	*Yes*	*Western Treatment Plant*
	Sewer Mining?	*Yes*	*WTP main inlet sewer*

It is recommended that the site irrigation system and management is reviewed to ensure that the irrigation rates are not excessive. It appears that there is scope for significant savings by better irrigation management at this site.

The preferred long term solution for this site will be that of taking flows from the Western Treatment Plant from the proposed Wyndham Recycled Water Pipeline. Negotiations with Melbourne Water about the feasibility of doing this will be needed so that the demand from Werribee can be taken into account. Around 2km of pipeline from the Wyndham line to the racecourse will be needed as will modifications to the on-site facilities. This may take a number of years, however. Therefore, parallel investigations about the feasibility of installing a desalination plant to take more flow from Werribee Creek should also be commissioned.

Salinity will be an issue for the recycled water supply and the means of controlling this will have to be considered, even taking into account the proposed reduction to 600mg/l. This could either be through continued shandying from the public supply, dilution from the site drainage or by installation of a desalination unit. With the latter option, the operational as well as the capital costs would increase to higher than the existing supply.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Recycled effluent from Western Treatment Plant	Drought proof source	Extensive infrastructure requirements both on and off-site	490,000	9600	14	2,400
		High salinity levels – desalination may be required	150,000	5600	0	(3,200)
Desalination of Werribee Creek Flows	Connection to creek already exists	Additional Maintenance Not drought-proof Environmental impact on creek	180,000	5600	14	6,400
Sewer Mining	Drought proof source	Treating flows immediately upstream of treatment plant is inefficient High costs Salinity	$1.5million	12,000	14	0
Reduce irrigation volumes	Will save 7Ml/year in demand	May require extensive works to irrigation system	0 to 250,000	0	7	6,000
Replace sanitary fittings with low water options	Possible rebate from water charges	Additional cost over traditional fittings	<50,000		1.5	1,300

Table 9.10 Options for Werribee

9.11 Yarra Valley Racing Centre

Annual Total Water Use *42 Ml*
Annual Potable Water Use *6 Ml*

Yarra Valley Racing Centre lies within the floodplain of the Yarra River at the edge of the town of Yarra Glen. It has thoroughbred racing and harness courses that are irrigated and a jumping racing course which is not. There is vineyard within the Centre's grounds operated by RMIT.

The course proper is irrigated principally from a storage lagoon which is filled from a small creek supplemented by track drainage. The harness track uses a combination of stored track drainage and potable water for its irrigation requirements. The harness track is to be redeveloped and when this is implemented it is anticipated that the potable water demand will reduce significantly.

The storage lagoon is extremely reliable and makes the course effectively drought-proof. The dam that was built to create the lagoon is controlling flows from the creek which would otherwise flow to the Yarra (effectively reducing summer flows in the Yarra). Melbourne Water is seeking to amend the arrangements at the site, hopefully to the mutual benefit of all concerned. The proposal is to divert the creek around the racetrack, restoring the positive flows to the Yarra; the lagoon can be filled in the winter months by a pumped abstraction from the Yarra. Negotiations are being held with the neighbouring landowner, who, it is understood, wishes to create a large vineyard next to the racecourse and will thus require a similar flow from the Yarra. If this is the case, the infrastructure costs can be shared making it more economical for both parties to implement.

As the course is effectively drought-proof, additional drainage from the site could only reduce demand for potable water being used on the harness track. The grassed areas to the rear of the grandstand are used for carparking. These areas become easily waterlogged, however, mainly due to overland flows from the hillside behind. If these areas were to be drained to the harness track lagoons, this would reduce potable demand by up to 3Ml per year (saving around $2,500) as well as improving the available facilities at the site which, in turn, could facilitate higher attendances.

From Figure 7.2

Is the existing supply mainly or partly potable?	*Yes – for harness track*		
Are alternative sources available?	*Yes*		
	River?	*Yes*	
	On-site drainage?	*Yes*	
		Buildings?	*Already Collected*
		Track and other areas?	*Yes –*
		Storage available?	*Yes*
	Off-site drainage?	*No*	
	Bore Water?	*No*	
	Treated Effluent?	*No*	
	Sewer Mining?	*No*	

Implementation of Melbourne Water's requirements is recommended for Yarra Glen. This will secure the long term supply as the storage will be fully replenished each winter.

Drainage of the grassed car park areas should be installed and connected to the storage lagoons for the harness track. This will remove their reliance on the potable supply and improve the race day facilities.

Option/Issue	Advantages	Disadvantages	Cost ($)	Operating costs ($/Year)	Volume of Potable water saved (Ml)	Net saving in running costs ($/year)
Drainage from grassed car park	*Provide supply for harness track*		*50,000*	*0*	*3*	2,500
Replace sanitary fittings with low water options	*Possible rebate from water charges*	*Additional cost over traditional fittings*	*<50,000*	*0*	*0.5*	400

Table 9.11 Options for Yarra Valley

9.12 Prioritisation

Taking the discussion in Section 9 and the recommendations for each course, a means of prioritising works (and therefore funds) across the industry is needed so that the industry can develop and implement an informed spending programme.

The four main factors are:

Capital Cost
Financial Loss
Public Image and
Industry Impact.

It is difficult to quantify these factors, but for the purposes of this study, the terms low, medium and high have been applied as follows:

Factor	Low (1)	Medium (2)	High (3)
Capital Cost	>500,000	100,000 to 500,000	<100,000
Financial Loss	<10 race days	10 to 30 racedays, no training	>30 racedays and/or training facilities
Public Image	Local issue	state	National or international
Industry Impact	No training and/or minor class races	Minor training and/or some higher class races in calendar	Major training and/or significant higher class races in calendar
Water Saved	<10Ml	10 to 40Ml	>40Ml

Using this assessment, the solutions for each site have been scored as shown in Table 9.12 below. This indicates that the highest priority schemes are those for Cranbourne Training Centre and Moonee Valley followed by Caulfield and Mornington. The lowest priority courses are Healesville and Balnarring.

Course	Preferred Solution	Indicative Cost ($,000)	Potential Potable Water Saving (Ml/year)	Cost Score	Financial Loss	Public Image	Industry Impact	Water Saved	Overall Score	Overall Priority
Caulfield Racecourse	Off-site drainage	550	80	1	3	3	3	3	13	1=
Cranbourne Training Complex	Treated Effluent	210+EIS	0 to 140	2	3	2	3	3	13	1=
Moonee Valley Racecourse	Sewer Mining	1000	77	1	3	3	3	3	13	1=
Mornington Racecourse	On site drainage	540	52	1	3	2	3	3	12	4
Cranbourne Racecourse	Treated effluent & on-site drainage	400+EIS	44	2	2	2	2	3	11	5
Werribee Racecourse	Treated effluent	630	21	2	2	2	2	2	10	6=
Yarra Valley Racing Centre	Improve on site drainage	50	3	3	2	2	2	1	10	6=
Pakenham Racecourse	Treated effluent	350	29	2	2	1	2	2	9	8
Balnarring Racecourse	Treated effluent	80	2	3	1	1	1	1	7	9
Healesville Picnic Racing Club	On-site drainage	150	0	2	1	1	1	1	6	10
Sandown Racecourse	None required	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 9.12 Prioritisation Matrix

10. Demonstration Project

One of the requirements of this study is to recommend a demonstration project where best practice at a course can be implemented and then used to demonstrate the technology to others and thus provide guidance to the thoroughbred racing industry and similar organisations.

Although a number of courses have advanced plans for improvements to both their supply and the way in which water is utilised on site, it is recommended that the proposals for both Cranbourne Training Centre and Cranbourne Racecourse are used for this demonstration. This is because more than one technique will be demonstrated to facilitate comparison, the plans for these locations are well advanced and the fact that they are on neighbouring sites should simplify any coordination issues.

The proposals are for both courses to take recycled flows from the Eastern Irrigation Scheme to supplement and improve their existing supply. Cranbourne Racecourse is also to construct a storage lagoon to collect and store surface water drained principally from their extensive car parking areas. Cranbourne Training Centre already collects significant volumes of rainwater from its tracks. Figure 10.1 below indicates the general requirements of the scheme.

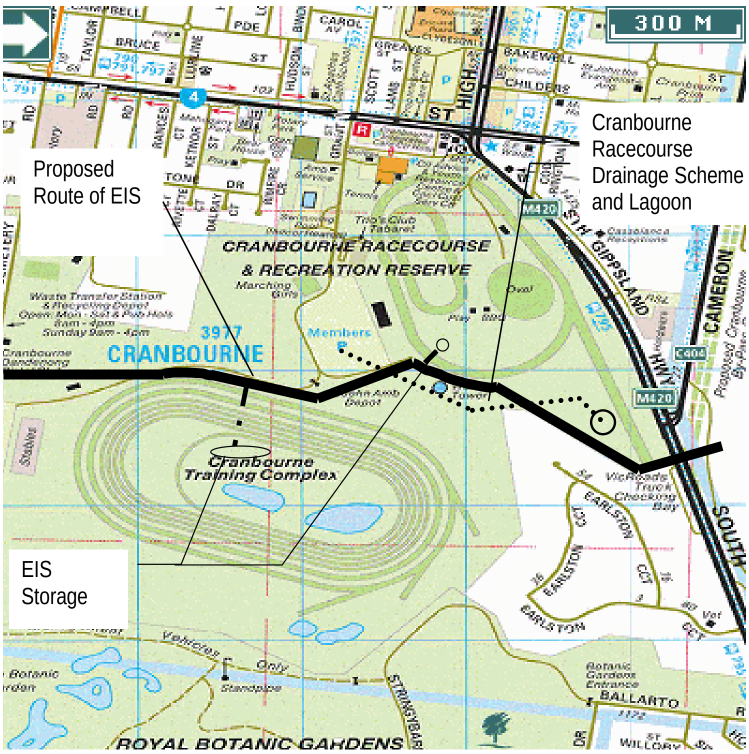


Figure 10.1 Plan of Cranbourne Schemes

In detail:

- Cranbourne Racecourse

i. Complete implementation of drainage collection scheme by construction of new collector drains and 34Ml storage lagoon. The volumes collected and used should be measured to gauge the benefit of this source with respect to collection rates and evaporation losses and whether it will act as the main source for the course or whether it should become a secondary, supplementary source to the recycled effluent water supply.

ii. Connect to the treated effluent supply offered by the Eastern Irrigation Scheme. This will require a pipeline, buffer storage and a control mechanism to link it to the irrigation system and the rainwater collection scheme. The course has currently requested a supply of 10Ml per year, but this should be monitored along with the rainwater collection and, if necessary, increased to suit the demands of the course (subject to the supply being available).
iii. The irrigation scheme on site should be monitored to ensure that water is being used effectively to minimise wastage and therefore reduce costs
iv. An audit of water use on site should be carried out to log the number and condition of water using facilities. This will enable a maintenance and replacement programme to be produced and implemented to reduce domestic water demand in the medium to long term.

- Cranbourne Training Centre

i. Connect to the treated effluent supply offered by the Eastern Irrigation Scheme. This will require a pipeline, buffer storage and a control mechanism to link it to the irrigation system and the rainwater collection scheme. The course has currently requested a supply of 100Ml per year, increasing to up to 140Ml per year. This should be monitored along with the rainwater collection and, if necessary, increased to suit the demands of the course (subject to the supply being available).
ii. The integration of the buffer storage with the existing storage facilities on site needs to be assessed, together with the overall management approach to deal with the different sources. This should be produced to allow the sources to be used separately or combined depending upon the prevailing conditions on site.

As the needs of both centres are very different, this demonstration will enable the racing industry to compare how a racecourse and training course manage their water in different ways as well as the impact on water quality that the different collection and storage regimes produce.

The Eastern Irrigation Scheme has been given Government Approval and it is understood that the implementation plans are now well advanced. The specific negotiations with the individual courses are still to be finalised, however, so the final timetable for completion of the demonstration project cannot be defined. It is understood, however, that the pipeline from the EIS should be available within two years, thus giving the course time to carry out the necessary detailed design and implementation of the on-site works required to enable them to immediately use the recycled flows when available. This pipeline will pass between the two racecourses, allowing relatively easy access to the supply from both sides.

Because of the proximity of the sites to the Royal Botanical Gardens, Cranbourne, there are a number of environmental issues that will have to be resolved before the EIS effluent can be used. The principle issue for the RBG management is one of increased nutrient load (particularly phosphorous) in the unique groundwater table that helps to create the native Australian habitat. The design of the re-use system will need to analyse the nutrient load and demonstrate how this is going to be controlled. The fact that the major supply of water for both centres will remain, as surface water run-off should assist in this process as the use of treated effluent can be controlled to suit prevalent weather conditions.

The initial stage will be for Environmental Improvement Plans to be produced for both courses. It would make sense for these to be produced by a single consultant, as many of the issues will be common to both sites. These will need to be commissioned as soon as possible to enable facilities to be designed and constructed in the time before the flows from the Eastern Irrigation Scheme become available.

It is understood that the design details for the rainwater collection scheme at Cranbourne racecourse is well advanced, but that in all other respects there has been no design work at either site. This will need to be considered in parallel to the production of the Environmental Improvement Plans to ensure that the construction and management of facilities is done in a coordinated fashion.

11. Summary and Recommendations

11.1 Summary

The water resources at eleven thoroughbred racecourses and training centres in the Greater Melbourne area have been studied to assess their use of water on site and the reliability of their current supply, with particular regard to irrigation requirements. Alternative supplies and management issues have been investigated and assessed to indicate a likely preferred option to improve supplies at each site.

In some cases, the sites already have a secure supply and are not reliant on the public water system for anything other than domestic requirements. In others, plans are already well advanced to reduce reliance on the public supply, whilst at the same time ensuring security for drought periods.

The cost of potable water is very low in Victoria. This means that there is little direct cost saving in replacing this source with an alternative (a process that can be very expensive). As described in Section 8 of this report, however, there are a number of incidental factors that need to be taken into account if the thoroughbred racing industry is not to be adversely affected by the continued water stress caused by the prolonged drought.

If the courses all replace potable supplies with alternatives for irrigation and invest in water saving devices, an overall reduction in demand for potable water of around 350Ml per year can be achieved. This would increase to around 500Ml saved in a drought year because of additional demand from Cranbourne Training Centre.

11.2 Recommendations

Drought Proofing Plans

It is recommended that all courses except Sandown and Healesville produce plans for implementation of drought-proofing schemes as described in Section 9. This would help to give an indication of the likely time for implementation and the constraints that may apply (relating to the racing programme or financial matters, for example). For the thoroughbred racing industry to decide how to invest in these courses, the priorities indicated in Section 9.12 should be used as a guide.

Demonstration Project

It is recommended that the proposals for Cranbourne Training Centre and Cranbourne Racecourse are promoted as a demonstration project for the use of site drainage and treated effluent for irrigation needs. To facilitate this, Environmental Improvement Plans are required as soon as possible so that the site planning can be completed within the same programme as the Eastern Irrigation Scheme proposals.

This project will allow different supply methods to be compared from feasibility to implementation and provide examples to other courses about the issues raised by replacing potable water with alternative supplies.

Appliance Audits

For all courses it is recommended that an audit of domestic and sanitary appliances be undertaken. This will enable the range of facilities to be recorded, their type, age and likely replacement date, which in turn will assist in the clubs producing a quantified plan to upgrade to the most water efficient products over time. It may also assist in defining those facilities where grants or other incentives are available for replacement. At the same time, any leakages or faults can be noted and repaired to minimise wastage.

11.3 Next Steps

The responsibility for implementation of the above recommendations lies ultimately with the individual courses with advice and, possibly, financial assistance from Racing Victoria Limited.

Drought Proofing Plans

Racing Victoria Limited should request an outline development plan from each of the courses, which sets out the commitment to transfer to alternative supplies and the constraints that may prevent or delay implementation (course management or financial issues, for example). This, together with the findings of this report, will then enable Racing Victoria Limited to prioritise their spending plans over a number of years to promote the development programme.

Demonstration Project

The management at each course is currently discussing supply issues separately with the providers of the Eastern Irrigation Scheme. Up to now, this is a reasonable course of action as this helps the supply requirements of the EIS to be defined. As on course studies and detailed design are now required, however, Racing Victoria Limited should take a lead to co-ordinate the efforts of both centres to procure the consultancy and construction services that are required.

Appliance Audits

Although it is possible for each course to carry out its own audit, it may be prudent to procure an audit through Racing Victoria Limited across all courses in Victoria. This would ensure that the industry had full records of water using facilities at each site and that improvements could be monitored across the industry. The results of the audit can then be disseminated to the individual club management to enable them to plan a long term change strategy.

Appendix A

Standard Questionnaire

Appendix B

Meeting Reports

Appendix C

Tables

Appendix D

Guidelines for Environmental Management – Use of Reclaimed Water, Section 9 Environmental Improvement Plans

Appendix E

Efficient Irrigation: A Reference Manual for Turf and Landscape