McLaren Vale Sustainable Winegrowing Australia — Workbook

Publisher:
McLaren Vale Grape, Wine and Tourism Association
info@mclarenvale.info

Chair:
Peter Hayes
chair@mclarenvale.info

Editor — Project Manager
Irina Santiago
irina@mclarenvale.info

Production and Design
Kate Stone
kate@mclarenvale.info

Cover imagery
Showpony Advertising

McLaren Grape Wine and Tourism Association
Physical address: Main Road, McLaren Vale
Postal address: PO BOX 169, McLaren Vale SA 5171
Australia
Phone: +61 (8) 8323 8999
Fax: +61 (8) 8323 9332
www.mclarenvale.info

McLAREN VALE
one thing leads to another

Contents

Introduction		iii
Authors and Reviewers		iv
Program History		v
Foreword		vii
Chapter 1	Soil Health, Nutrition & Fertilizer Management	1
Chapter 2	Pest and Disease Management	26
Chapter 3	Biodiversity Management	50
Chapter 4	Water Management	64
Chapter 5	Waste Management	80
Chapter 6	Social (Work, Community and Wineries relations)	95






Introduction

McLaren Vale Sustainable Winegrowing Australia is our program to improve vineyard sustainability using a combination of data reporting, self-assessment through our workbook of viticultural practices and third party audits. The content was written by local growers and validated by Australian wide recognised experts in each topic:

Our workbook comprises of 6 chapters with the following attributed weights:

1. Soil Health, Nutrition & Fertilizer Management ♦ 200 points
2. Pest and Disease Management ♦ 200 points
3. Biodiversity Management ♦ 150 points
4. Water Management ♦ 150 points
5. Waste Management ♦ 150 points
6. Social (Work, Community and Wineries relations) ♦ 150 points

The workbook covers most of the everyday practices related to vineyard management to help growers increase their operational efficiency, minimize any negative impacts to the environment and ultimately increase their overall sustainability and grape quality. The completion of the workbook and the data reporting is used to classify each vineyard in a sustainability category (from 0 to 4).

Sustainability for us is about developing our vineyards, preserving and/or improving the land, increasing the quality of our grapes, meeting the requirements of the wineries, optimizing the use of inputs relative to on farm returns and minimizing potential negative impacts on the environment. The program also aims to promote regional social development and well-being of the people who live in our community.

Irina Santiago
Sustainability Coordinator
McLaren Vale Grape Wine and Tourism Association

Authors and Reviewers

1. Soil Health, Nutrition & Fertilizer Management

Author: **James Hook** ♦ DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)
Reviewer: **Dr Michael McCarthy** ♦ South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

2. Pest and Disease Management

Author: **James Hook** ♦ DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)
Reviewer: **Dr Trevor Wicks** ♦ South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

3. Biodiversity Management

Author: **Richard Leask** ♦ Leask Vineyards
Reviewer: **Dr Linda Thomson** ♦ University of Melbourne—Faculty of Sciences—Department of Zoology (www.zoology.unimelb.edu.au)

4. Water Management

Author: **Rachel Steer** ♦ Chapel Hill Wines (www.chapelhillwine.com.au)
Reviewer: **Dr Michael McCarthy** South Australian Research and Development Institute—SARDI / Department of Primary Industries and Resources of South Australia—PIRSA (www.sardi.sa.gov.au/viticulture)

5. Waste Management

Authors: **Giulio Dimasi** ♦ d'Arenberg Wines (www.darenberg.com.au)
and **Irina Santiago** ♦ McLaren Vale Grape Wine and Tourism Association
Reviewer: **Lynda Wedding** ♦ City of Onkaparinga – Waste & Recycling Education (http://www.onkaparingacity.com/onka/living_here/waste_recycling.jsp)

6. Social (Work, Community and Wineries relations)

Authors: **Dee Hoad** ♦ d'Arenberg Wines(www.darenberg.com.au)
and **Irina Santiago** ♦ McLaren Vale Grape Wine and Tourism Association
Reviewers: **Paul Georgiadis** ♦ Paulmara Estate Wine (www.paulmara.com.au)
and **Dee Hoad** ♦ d'Arenberg Wines(www.darenberg.com.au)

Program History

McLaren Vale Sustainable Winegrowing Australia ("MVSWA") is our sustainability program for wine grape growing. It is special because it is the result of the work of so many different people who care deeply about McLaren Vale wine growing.

Over the last ten years, the growers of McLaren Vale have invested over two million dollars of their own money into levies through the MVGWTA to dramatically improve their viticultural practices, fruit quality and financial viability. This funding has been used for seminars, CropWatch, weather stations, research trials, an Environmental Management Plan, viticultural officers, and newsletters.

In 2005 James Hook, then the Viticultural Officer for MVGWTA, developed the outline of a self-scoring system for grape growers for pest and disease management. The Lodi System in California as well as the outreach work Jodie Pain had done at the City of Onkaparinga had inspired James and his predecessor Richard McGeachey, to explore sustainability systems. The idea at the time was to offer growers multiple paths to minimize their farm inputs while achieving better outcomes.

While the investments in grower education made by MVGWTA yielded dramatic on-farm results for many growers, as a region we were unable to measure and discuss the outputs of our investments because we were not measuring on-farm results systematically. McLaren Vale Sustainable Winegrowing is the vehicle for us to do that.

When I became the Chairman of MVGWTA in 2008, we assembled a working party of local growers and volunteer viticulturalists under Jock Harvey's direction with the goal of developing James' outline into a regional certification system that would become the highest standard of environmental sustainability in Australian viticulture. This project was named Generational Farming.

Because sustainability in viticulture is a global concern, we were fortunate to be able to learn from many systems that went before us, particularly in the United States. In recognition of these efforts, the first rule for Generational Farming was that we would share our system with anyone, anywhere provided attribution and acknowledgement were provided.

Within nine months, our volunteer army exceeded all expectations and delivered a nearly complete viticultural scoring system. Jodie Pain, then the Viticulture Officer at MVGWTA, assembled this program into a workbook for wine growers. In 2010, we began record keeping for Generational Farming with 41 initial participants representing about 20% of the acreage under vine in our region.

Recognizing that we were very close to having a true "triple bottom line" (economic, environmental, social) sustainability system with Generational Farming, we chose to further invest in our system by employing an expert in viticultural management systems to complete our sustainability program.

(continue)

Program History

In 2011, MVGWTA was fortunate to hire Irina Santiago as our Sustainability Coordinator. A PhD research student from Brazil at the University of Adelaide in Sustainable Viticulture, Irina brought the system the level of coordination, analysis and rigor required to make Generational Farming into a recognized, world-class system.

Irina has in turn has had the good fortune to work with still more growers and viticulturalists from McLaren Vale as well as a number of expert reviewers across Australia to refine the system further. Now re-named McLaren Vale Sustainable Winegrowing Australia, the workbook results are a reflection of her efforts to present the data collected in the most useful way possible.

An incredibly important dimension to Sustainable McLaren Vale is that it provides growers with the ability to ascertain how well they are doing on farm both in terms of absolute best practice as well as against their peer group. This approach enables growers to assess their practices and fine-tune their businesses in ways small and large, easy and difficult.

The goal of this long-term project is to provide growers with the information and the flexibility to choose how to individually improve practices. Our new system is fully compliant with the national Entwine environmental documentation system for viticulture that eliminates the need for duplicate record keeping between systems.

The information collected provides each of us with enormous insight into how much we have or have not improved year to year as well as what we need to address to ensure that we continue to be recognized as one of the world's most sustainable viticultural regions.

To mention everyone who has involved at one point or another in the development of McLaren Vale Sustainable Winegrowing would be a daunting task. So many people have freely given their time to make this system a reality that to mention any would mean slighting someone else through omission. The efforts of all of these people are the reason that we have achieved our goal of setting the benchmark for sustainability in viticulture in Australia on a remarkably small budget.

McLaren Vale Sustainable Winegrowing is an example of McLaren Vale at its finest – collaborative, open, forward looking, creative and generous. These are the core attributes of any "living" sustainability system.

Thank you for your participation and support.

Dudley Brown
Former Chair McLaren Vale Grape Wine and Tourism Association (2010-2008)

Foreword

As one of the globally current “buzz - words”, the term “Sustainable” incurs an array of uses, abuse and appropriation by many interests across politics, media, supply – chain and public or consumer interest groups.

To many, it seems that “Sustainable Winegrowing” should be readily amenable to measurement and reporting of a few simple metrics, e.g. water or fuel use and thus be comparable across all production systems; if only it were so simple!

Much of the attraction of wine across the globe is founded in its diversity, with production from highly diverse regional and social geographies interacting with similarly varied economies and markets.

Genuinely sustainable winegrowing must embrace the base “triple bottom line” principles relating to economic, social and environmental considerations and applied within a specific regional context. If continuous improvements in sustainability are desired, then actions cannot simply be reduced to using a universal template for accounting and reporting purposes.

The approach undertaken within the **McLaren Vale Sustainable Winegrowing Australia (MVSWGA)** scheme has been founded squarely on “triple bottom line” principles around which high priority-high impact regional drivers have been identified and incorporated for deliberately targeted action.

Such an approach will deliver significant direct dividends for regional sustainability of the winegrowing industry, the natural resource base on which it depends and the social context within which it operates.

In commending this approach to both its industry participants, external interests, observers and commentators, I note that the program is completely consistent with internationally supported environmental approaches such as:

- FIVS’ (The worldwide trade federation for all sectors of the global alcohol beverage industry, including wine, spirits and beer) Global Wine Sector Environmental Sustainability Principles, see http://fivs.org/wm/strategicInitiatives/fivsForesee.htm , and
- The International Organisation of Vine and Wine (OIV) an intergovernmental organisation for the grape and wine sector, see http://www.oiv.int/oiv/info/enguidesoiv

Future legitimacy and social licence for the wine sector will be dependent on actively addressing identified and agreed high priority sustainability issues and demonstrating continuous improvement of relevance to regions, their producers and the global consumer.

On behalf of the MVGWTA Board, I congratulate the original proponents and champions for this approach and particularly Irina Santiago, our Sustainability Coordinator for her drive and dedication in bring it to this stage.

Peter Hayes
Chair—McLaren Vale Grape Wine and Tourism Association

McLAREN VALE
one thing leads to another

CHAPTER 1
SOIL HEALTH, NUTRITION &FERTILISER MANAGEMENT

AUTHOR : James Hook – DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)

REVIEWER : Dr. Michael McCarthy - SARDI-PIRSA (www.sardi.sa.gov.au/viticulture)

McLAREN VALE
one thing leads to another

In this chapter

Section 1.1	Soil Identification, Management & Analysis	3
Section 1.2	Soil Degradation	11
Section 1.3	Soil Organic Matter & Cover Cropping	15
Section 1.4	Fertiliser Handling & Storage	17
Section 1.5	Weed Control	20

All life is rooted in the soil. Soil health is a central tenet of sustainable agriculture, and it is critical to long term successful farming. It is important to have a soil management strategy to anticipate and manage your soil health, prevent long term nutritional issues and avoid soil degradation.

It is important to base nutrition and fertiliser management on good data. Soil tests can assist you to understand physical and chemical properties of the soil of your vineyard. It is one of the essential tools to monitor and support operational management decision in vineyards. Soil tests can measure fertility, indicates deficiencies, potential toxicity, pH, contaminant content, amongst others.

1.1.1 Soil management strategy

4	3	2	1	0
I have a written soil management strategy that I follow. **AND** Different blocks have different strategies if necessary or applicable **AND** this is reviewed each season with my winery / adviser (or myself or the person in charge of viticulture, if the person in charge has the appropriate education/experience to review the strategy) **AND** it's updated every year based on soil tests, identification of degraded areas (if any) **AND** we refer to that for our management from season to season.	I have a written soil management strategy that is followed. **AND** Different blocks have different strategies if necessary or applicable **AND** this is reviewed each season with my winery / adviser (or myself or the person in charge of viticulture, if the person in charge has the appropriate education/experience to review the strategy).	I have a written soil management strategy that is recorded and followed.	I have a soil management strategy, but it is not written.	I do not have a soil management strategy.

Soil Health - what is it, how do we assess it and how do we improve it?
http://www.gwrdc.com.au/webdata/resources/factSheet/13SoilHealth.pdf

Importance of written records – 'Without written records, farmers have to depend on their memory when making decisions to modify their farm practices. Memories can become unreliable, particularly after a few days, months or years. Some records are compulsory, such as data for taxation purposes, whereas most are advisory. There must be good reasons to collect farm records.' (CSIRO 2011)

1.1.2 Fertiliser application records				
4	**3**	**2**	**1**	**0**
I have records of fertiliser application **AND** Records are made within 24 hours of fertiliser application **AND** My records include product name, rates of nutrients, application rates, operator name, date and block **AND** I keep receipts and contractor invoices attached to these records (if applicable).	I have records of fertiliser application **AND** Records are made within 24 hours of fertiliser application **AND** My records include product name, rates of nutrients, application rates, operator name, date and block.	I have records of fertiliser application **AND** The record is written whenever I have time to do it. There is not a rigid time frame to do it **AND** My records include product name, rates of nutrient within the product applied, application rates, operator name, date, and block.	I have records of fertiliser application **AND** The record is written whenever I have time to do it. There is not a rigid time frame to do it **AND** My records only include total amount of the product applied and the month of application.	I do not have a record of vineyard fertiliser applications.
N/A- I do not use fertilisers of any type.				

Vineyard Fertiliser and Soil Management
http://www.crcv.com.au/resources/Environment/Good%20Environment%20Management%20Guidelines/(1)%20GEM%20Guidelines%20Vineyard%20Fertiliser%20&%20Soil%20Management.pdf
Wine Grape Nutrition and use of fertilisers and other nutritional supplements to sustain production
http://www.gwrdc.com.au/webdata/resources/files/Module15NutritionTechNotes.pdf
Grapevine Nutrition Literature Review
http://www.crcv.com.au/resources/Survey%20Findings/Additional%20Resources/Grapevine%20Nutrition%20Literature%20Review.pdf

1.1.3 Soil management plan and vineyard nutrition				
4	**3**	**2**	**1**	**0**
Our soil management and vineyard nutrition status is based on vine appearance and soil tests **AND** A soil test was taken from representative areas of our vineyard **AND** The soil test was taken within the last 3 years **AND** We have the soil records of changes in our soil tests.	Our soil management and vineyard nutrition status is based on vine appearance and soil tests **AND** A soil test was taken from representative areas of our vineyard **AND** The soil test was taken within the last 5 years **AND** We have the soil records.	Our soil management and vineyard nutrition status is based on vine appearance and soil tests **AND** A soil test was taken from representative areas of our vineyard BUT NOT within the last 5 years **AND** We have the soil records.	Our soil management and vineyard nutrition status is based on what we have done in the past, vine appearance or what other vineyards do.	I do not have a soil management plan regarding plant nutrition.

Soil testing – It is important to understand the difference between soil testing in mid-rows for cover crop/sward nutrition versus testing the under vine bank. If there is no vine activity from roots in the mid-row then soil testing there and using it as a guide for vine nutrition is useless. Soil testing in the mid row is useful for determining what fertilizer is required from planting cover crops.
Petiole Testing compared to Soil Testing - Petioles are considered the best method of monitoring vine nutrition. Soil testing is most useful for pH & salinity issues for vine health. (McCarthy 2011).

Key soil health indicators
Soil pH - Soil pH is the measure of acidity or alkalinity in the soil. Below pH 7 is acid, above is alkaline and pH 7 is neutral, like pure water. Soil acidification is a process by which soil pH decreases over time, and becomes acidic. Excessive fertiliser usage can cause soil acidification.
Exchangeable Sodium Percentage (ESP) - This is a measure of how much sodium is in the soil. In Australia, soil with an ESP greater than 6 % is considered to be sodic. A sodic soil with few stabilizing agents (e.g. humus, or clay) in the topsoil will be susceptible to erosive soil loss during intense rainfall or irrigation.
Sodium adsorption ratio (**SAR**) is a measure of the suitability of water for use in agricultural irrigation as determined by the concentrations of solids dissolved in the water. It is also a measure of the sodicity of soil, as determined from analysis of water extracted from the soil.

1.1.3a Soil Test Results

Soil pH		Record your soil pH from your most recent soil test:
Exchangeable Sodium Percentage (% ESP)		Record your soil Exchangeable Sodium Percentage (% ESP) from your most recent soil test:
Sodium adsorption ratio (SAR)		Record your soil sodium adsorption ratio (SAR) from your most recent soil test:
N/A		We do not have a soil test record.

Grapevine nutrition 1 : Nitrogen Fertilisation
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/01%20Nitrogen%20fertilisation.pdf
Grapevine nutrition 2: Phosphorus fertilisation
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/02%20Phosphorus%20fertilisation.pdf
Grapevine nutrition 5: Soil acidification
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/05%20Soil%20acidification.pdf
Grapevine nutrition 6: Liming
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/06%20Liming.pdf
Grapevine nutrition 7: Trace elements
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/07%20Trace%20elements.pdf
The Use of Soil and Petiole Testing in Wine Grape Viticulture
http://www.dpi.vic.gov.au/agriculture/about-agriculture/publications-resources/horticulture/the-use-of-soil-and-petiole-testing-in-wine-grape-viticulture

Soil type by horizon – Knowing your soil types, and how they are layered by horizon is important as it will impact on drainage and the water holding capacity of your soil.

Soil Mapping & Geology - It is important to base your soil management strategy on good data. The Geology Map provides a key to the complex, constantly unfolding links between geology and modern wine flavours. It is an important tool to assist viticulturists to match the many grape varieties, old and new to the various terranes.

1.1.4 Soil identification				
4	**3**	**2**	**1**	**0**
We have identified the general soil type(s) on our vineyard(s) **AND** have used soil pits or soil mapping to view the soil horizons by depth **AND** identified the base geology from the McLaren Vale Geology Map **AND** have a map of how the soil type / geology changes across our vineyard(s).	We have identified the general soil type(s) on our vineyard(s) **AND** have used soil pits or soil mapping to view the soil horizons by depth **AND** identified the base geology from the McLaren Vale Geology Map .	We have identified the general soil type(s) on our vineyard(s) **AND** have used soil pits or soil mapping to view the soil horizons by depth.	We have identified the general soil type(s) on our vineyard(s).	We have not identified our vineyards soil type(s).

McLaren Vale Geology Map
http://www.mclarenvale.info/projects/mv-geology-map
Key for identifying categories of vineyards soil in Australia
http://www.clw.csiro.au/publications/technical2002/tr30-02.pdf

Soil organic carbon – 'Soil organic matter is material in the soil derived from living species. This includes the decomposing remains of plants and animals in various stages of breakdown, the cells and tissues of soil organisms, and substances made by plant roots and soil microbes.' (CRCV 2006). It is generally measured as the amount of carbon in the soil. It improves the physical properties of soil, increases the cation exchange capacity (CEC) and water-holding capacity of sandy soil. Contributing to the structural stability of clay soils by helping to bind particles into aggregate, it holds a great proportion of nutrients, cations and trace elements that are of importance to plant growth. It prevents nutrient leaching and is integral to the organic acids that make minerals available to plants. It also buffers soil from strong changes in pH.

Consistency of soil testing data - Unless testing is always done by laboratories tested to the same standards, samples are collected at the same time and location from year to year, the results could be meaningless.

1.1.5 Soil organic carbon monitoring				
4	**3**	**2**	**1**	**0**
We have multiple records of our soil organic carbon level **AND** we track changes to our levels over time **AND** we have taken action when the records shown reduction of the organic carbon **OR** I only a have a single record because the vineyard was established less than 3 years ago **AND** I intend to keep tracking the soil carbon.	We have a current record taken within the last 3 years of our soil organic carbon level **AND** We are sure of the consistency of our soil testing **AND** we track changes to our levels over time by comparing them to older multiple records.	We have a multiple records but these are older than 3 years **AND** we track changes to our levels over time by comparing them to older multiple records.	We have a single record from the vineyard establishment period.	We do not monitor soil organic carbon.

1.1.5a

Organic Carbon		If available record your soil organic carbon your from most recent soil test:

Vineyard activities 4: Measuring organic carbon in soil
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/vineyard%20activity%20guides/Vineyard%20activities%2004%20Measuring%20organic%20carbon%20in%20soil.pdf
Measuring soil carbon change
http://soilcarboncoalition.org/files/MeasuringSoilCarbonChange.pdf

1.1.6 Vine nutrition				
4	**3**	**2**	**1**	**0**
We have tested our vines in the past and use this to govern our nutrition practices **AND** We have identified problem blocks for regular testing **AND** We use these results with past trends **AND/OR** Regional recommendations from my winery/ qualified agronomist/ advisor **AND/OR** alternative farming system suggested practice like Biodynamic calendar of applications **IN COMBINATION** with our past soil tests.	We have tested our vines in the past and use this to govern our nutrition practices **AND** We have identified problem blocks for regular testing **AND** We use these results allied with, past trends **AND/OR** Regional recommendations from my winery/ qualified agronomist/ advisor **AND/OR** alternative farming system suggested practice, like Biodynamic calendar of applications.	We have tested our vines in the past and use this to govern our nutrition practices **AND/OR** we use recommendations from my winery/ qualified agronomist/ advisor **AND/OR** alternative farming system suggested practice, like Biodynamic calendar of applications.	We have never tested our vines. We apply nutrients based on the appearance of the vines **AND/OR** Based on the time of the growing season **AND/OR** what I've done in the past.	I have never tested my vines.

Organic Carbon VitiNote - http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/vineyard%20activity%20guides/Vineyard%20activities%2004%20Measuring%20organic%20carbon%20in%20soil.pdf
Soil Testing VitiNote - http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/vineyard%20activity%20guides/Vineyard%20activities%2001%20Taking%20soil%20samples.pdf
Petiole Analysis VitiNote - http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/grapevine%20nutrition/03%20Petiole%20analysis.pdf

Soil degradation includes erosion, nutrient loss, and compaction.

Soil Erosion - Soil erosion is when the soil is blown away by the wind or washed away by the rain. Soil erosion is common in areas with steep slopes, where trees have been cut down.
Soil erosion by water, wind and tillage may affect both agricultural areas and the natural environment, and is one of the most widespread of today's environmental problems. It has impacts which are both on-site (at the place where the soil is detached) and off-site (wherever the eroded soil ends up).
(Source: Soil Erosion Site)

1.2.1 Degraded or eroded land				
4	**3**	**2**	**1**	**0**
We have identified areas that are highly degraded or eroded **AND** always maintain cover on these areas to prevent erosion **AND** we have been proactive to prevent erosion **AND** we have been tracking the improvements from our corrective actions.	We have identified areas that are highly degraded or eroded **AND** always maintain cover on these areas to prevent erosion **AND** we have been proactive to prevent erosion.	We have identified areas that are highly degraded or eroded **AND** leave this area as is.	We have identified areas that are highly degraded or eroded, but sometimes spray or cultivate these areas.	I don't know if I have degraded areas or not. Identification has never been conducted.
N/A There is no degraded land within my vineyard.				

Soil Erosion
http://soilerosion.net

Salinisation - is the process that leads to an excessive increase of water-soluble salts in the soil. The accumulated salts include sodium, potassium, magnesium, calcium, chloride, sulphate, carbonate and bicarbonate (in McLaren Vale this is mainly caused by sodium chloride either from ground water sources or high underground water tables).

1.2.2 Saline land				
4	**3**	**2**	**1**	**0**
We have identified areas that are saline **AND** use techniques like flushing irrigation and soil amendments **AND** we have been proactive to prevent increasing soil salinity **AND** we have been tracking the improvements from our corrective actions.	We have identified areas that are saline **AND** use techniques like flushing irrigation and soil amendments **AND** we have been proactive to prevent increasing soil salinity.	We have identified areas that are saline **AND** use techniques like flushing irrigation and soil amendments	We have identified areas that are saline **AND** leave this area as is.	I don't know if I have saline areas or not. Identification has never been conducted.
N/A There is no saline areas within my vineyard.				

Bare soil & steep slopes - Bare soil and steep slopes without any vegetative cover are prone to soil erosion from wind and water runoff. Steep slopes have a higher risk of soil erosion than flat land and therefore need special consideration to prevent soil erosion. Winter cultivation or midrow herbicide spraying of soil will leave soil bare and this can contribute to erosion. In your vineyard the soil techniques you chose must maintain or improve soil structure. Cultivation of soils and herbicide use is to be undertaken with care and consideration. Note summer cultivation can be useful as an organic weed control under the vine row as cultivation also provides an alternative to herbicide use.

1.2.3 Steep slope erosion control				
4	**3**	**2**	**1**	**0**
We have identified steep slopes in our property **AND** We haven't cultivated or sprayed out the midrow in our steep slope areas in the last 24 months **AND** We keep permanent cover on the ground throughout the full year.	We have identified steep slopes in our property **AND** We haven't cultivated our soil or sprayed out the midrow in our steep slope areas within the last 12 months but have done so within the last 24 months.	We have identified steep slopes in our property **AND** We cultivate our steep slope areas each season **AND** Establish an annual cover crop system.	We have identified steep slopes in our property **AND** We routinely herbicide or cultivate our steep slope areas.	We haven't identified if we have steep slopes and do not take any steps to manage steep slopes.
N/A There are no steep slopes in my vineyard.				

Heavy Vehicles Operations – for the purposes of McLaren Vale Sustainable Winegrowing Australia a Heavy Vehicle Operation is defined as machineries over 1 tonne. However total weight is not the best measure of the chances of creating compaction. Compaction is influenced by how much pressure is applied to the soil.
A 2 tonne bin with large floatation tyres might cause less damage than a 1 tonne spray cart with narrow tyres.

1.2.4 Heavy vehicle operations				
4	**3**	**2**	**1**	**0**
We keep a record of how many heavy vehicle passes occur each season **AND** we reduce that number by using motorbike equipment **AND** multiple-row gantry machinery where possible **AND** Use equipment with large floatation tires where possible.	We keep a record of how many heavy vehicle passes occur each season **AND** we reduce that number by using motorbike equipment where possible.	We keep a record of how many heavy vehicle passes occur each season **AND** we reduce that number by using multiple-row gantry machinery where possible.	We keep a record of how many tractor passes occur each season.	I do not keep records of how many heavy vehicle operations occur each season.

1.2.4a

Count of your Heavy Vehicle Operations per year:

Soil Compaction - Using machinery on soil when it is wet causes compaction. The risk of soil compaction can be reduced through the use of lighter machinery using lower tyre pressures and wider tyres to give a larger tyre surface in contact with the soil. Caterpillar-tracked machinery provides the least risk of soil compaction but is expensive and less manoeuvrable than standard tractors. Lower tank volumes and broader tyre configurations on spray vats can also help to reduce soil compaction.
In most vineyards where floor management is based on mowing of cover crops, it is possible to replace heavy tractor-slasher combinations with much lighter slashers driven by four-wheeled All Terrain Vehicles (ATVs). ATV-mounted fertiliser spreaders and sprayers may also be practical in some situations. An obvious limitation is the low load capacity of ATVs compared to tractors, when it comes to carrying spray, fertiliser or other materials.
One approach to managing soil compaction on large-scale vineyards is the replacement of standard tractors with multiple-row gantry machinery. A tractor pass equals a machinery operation in your vineyard of greater than one tonne. Take note that double row machinery counts as half a pass as two rows are completed as one.

1.3.1 Machinery operations on wet soil				
4	**3**	**2**	**1**	**0**
Have identified soils in vineyard most at risk from compaction when wet **AND** We avoid tractor operation in the wet **AND** We assess compaction risk before we perform tractor operations **AND** We monitor soil moisture level and compaction risks before we perform tractor operations and select light weight machinery where possible **AND** We only perform operations when absolutely critical and there is no other option or timing to do it as the forecast indicates continuing rain.	Have identified soils in vineyard most at risk from compaction when wet **AND** We aim not to use machinery on wet soil **AND** We have a schedule of soil amendments and ripping to reduce the compaction effects of machinery on wet soil.	Have identified soils in vineyard most at risk from compaction when wet **AND** We aim not to use machinery on wet soil.	At times machinery is used when the soil is wet.	Machinery is used as planned regardless the soil the soil is wet or not.

Protect your soil from compaction
http://www.dpi.nsw.gov.au/agriculture/resources/soils/structure/compaction
Vineyard Vehicle, Machinery and Equipment Management
http://www.crcv.com.au/resources/Environment/Good%20Environment%20Management%20Guidelines/(4)%20GEM%20Guidelines%20Vineyard%20Vehicle,%20Machinery%20&%20Equipment%20.pdf

Loss of soil organic carbon - Organic matter in the soil is related to the productivity capacity of the vineyard. Where farmers have used the land for many years for growing crops, the soils typically have low levels of organic carbon content, due to disturbance, erosion and regular periods when very few organic nutrients have been added to the soil. It has been estimated that Australia's cropping soils have lost a substantial amount of carbon, estimated to be 1050 Mt (mega tonnes), following the introduction of intensive cropping. This signifies that there is significant potential to increase carbon stocks in these carbon-poor soils by improving land management practices.

1.3.2 Organic matter soil amendment (compost, basalt or humates)				
4	**3**	**2**	**1**	**0**
Organic matter is tracked as part of our soil strategy **AND** We have records of our organic matter applications **AND** We use soil tests to measure and assist our decision to apply organic matter soil amendment **AND** We keep track of the effects of our applications.	Organic matter is applied based on the soil and vine appearance, on as need basis **AND** We have a record of our organic matter applications.	We have applied organic matter intermittently in the past **AND** We have a record of past applications.	We have applied organic matter intermittently in the past.	We do not track organic matter content in our soils.

Maintenance of organic matter and soil structure - Cover crops in your vineyard conserve and improve soil structure, and limit the risk of erosion. All cover crops are not created equal, but they are an improvement over bare soil or clean cultivation.

Cover Crops on low vigour sites – Fortunately most of the McLaren Vale Wine Region has vineyard sites that produce vines with moderate to high vigour that can support permanent cover crops; however permanent cover crops may not be suitable in low vigour sites.

1.3.3 Cover crops, organic matter and soil structure				
4	**3**	**2**	**1**	**0**
Permanent cover crop established for at least 5 years **OR** a volunteer sward that has not been cultivated for at least 5 years.	Permanent cover crop established within the last 5 years **OR** a volunteer sward that has not been cultivated in that time.	We establish an annual cover crop system.	We spray herbicide in the mid-row.	We cultivate in the mid-row.

Management of soil structure and mycorrhizal populations in vineyards using cover crops
http://www.crcv.com.au/research/programs/two/2.3.3%20Final%20Report.pdf
Cover crops and compost in vineyards –opportunities for improving soil health
http://www.csu.edu.au/research/nwgic/Docs/M%20Weckert%20Soil%20Biology%20Mudgee%20Region.pdf

Bulk Fertiliser Storage - These days, many fertilisers in McLaren Vale are handled in bulk. The handling and storage of bulk fertiliser in a manner that prevents issues like soil contamination and run off is important to the long term health and safety of you, your workers and the general environment.

1.4.1 Specialist bulk fertiliser handling area				
4	**3**	**2**	**1**	**0**
We have an area on our vineyard where we handle and store fertiliser **AND** our fertiliser storage and loading areas is identified with and sign and/or map location **AND** the site is located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient run off or leaching. Non-compatible fertilisers are identified and stored separately **AND** this is secure to keep animals or people from disturbing it.	We have an area on our vineyard where we handle and store bulk fertiliser **AND** our fertiliser storage and loading areas is identified with and sign and/or map location **AND** the site is located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient run off or leaching. Non-compatible fertilisers are identified and stored separately.	We have an area on our vineyard where we handle and store bulk fertiliser **AND** our fertiliser storage and loading areas is identified with and sign and/or map location.	We have an area on our vineyard where we handle and store bulk fertiliser.	We do not have a specialist handling area on farm and make do with handling and storing fertiliser where we can e.g. vineyard headlands.
N/A We do not handle or use bulk fertiliser on our farm.				

Liquid Fertiliser Storage - Safe storage and handling of liquid fertiliser is necessary to prevent environmental contamination. Any storage sites should be checked for spills, leaks, cracks or seepage of liquids from the structure.

1.4.2 liquid fertiliser handling				
4	**3**	**2**	**1**	**0**
We have an area on our vineyard where we handle and store liquid fertiliser **AND** our fertiliser storage and loading areas is identified with and sign and/or map location **AND** the site is located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient run off or leaching with bunding to control wash water where applicable **AND** this is secure to keep animals or people from disturbing it.	We have an area on our vineyard where we handle and store liquid fertiliser **AND** our fertiliser storage and loading areas is identified with and sign and/or map location **AND** the site is located, constructed and maintained to minimise harm to off target and sensitive areas from nutrient run off or leaching with bunding to control wash water where applicable.	We have an area on our vineyard where we handle and store liquid fertiliser **AND** our fertiliser storage is identified with and sign and/or map location.	We have an area on our vineyard where we handle and store liquid fertiliser.	We do not have a liquid fertiliser store and make do with storing fertiliser where we can.
N/A We do not handle or use liquid fertiliser on our farm.				

Weed Control- Not all plants growing in your vineyard are weeds. Some may be very beneficial or at least do not harm your production.
However weed management is important because weeds may compete with the vines for nutrients and water. Weed management is one of the most challenging issues faced by grape growers. Excessive cultivation or herbicide use have consequences to the long term viability to your soil.
Integrated Weed Management - is an approach to land management combines the use of complementary weed control methods such as:

- Winter grazing by stock
- Herbicide application
- Biological control.

The resulting combinations provide the best possible solutions to weed problems for vineyard managers.

1.5.1 Weed control strategy				
4	**3**	**2**	**1**	**0**
We have identified the main weeds we have growing in our vineyards and target our control to critical times of the year **AND** We manage weeds through an integrated weed control approach using conventional herbicide, or organic weed management tools we have available to us, or in a combination of the two **AND** Our plan kept as a written record.	We have identified the main weeds we have growing in our vineyards and target our control to critical times of the year **AND** We manage weeds through an integrated weed control approach using conventional herbicide, or organic weed management tools we have available to us, or in a combination of the two.	We have identified the main weeds we have growing in our vineyards and target our control to critical times of the year.	We control/manage weeds in our vineyard on an adhoc as needs basis.	We do not control /manage weeds in our vineyard.
N/A We do not control weeds.				

Organic Weed Control Methods - Managers of organic vineyards need to achieve effective control of weeds without using synthetic herbicides and ideally with minimal disruption to the soil. They need to meet this challenge by selecting from a wide range of acceptable techniques to develop weed management programs appropriate to their particular situation.

1.5.2 Herbicide use				
4	**3**	**2**	**1**	**0**
We keep records of undervine herbicide applications **AND** Record this in our spray diary as a written record **AND** we clean our equipment after use to prevent cross contamination and before entering other vineyards to prevent spreading weeds **AND** are developing methods to reduce our reliance on herbicide by integrating other alternative farming practices.	We record the amount of herbicide used per hectare and the date of application **AND** Record this in our spray diary as a written record **AND** We clean our equipment after use to prevent cross contamination and before entering other vineyards to prevent spreading weeds.	We record the amount of herbicide used per hectare and the date of application **AND** Record this in our spray diary as a written record.	We record the amount of herbicide used per hectare and the date of application.	We do not record the amount of herbicide we use or when it is applied.
N/A We do not use herbicide sprays to control weeds.				

1.5.3 Herbicide chemical applications - List of herbicides that are registered for use in vineyards.

Chemical Group	Mode of Action	Active constituent	Trade names	Number of applications
A	Inhibitors of acetyl coA carboxylase. Inhibitors of fat synthesis / ACC'ase inhibitors	Aryloxyphenoxypropionates (Fops) Cyclohexanediones (Dims) Phenylpyrazoles (Dens)	Fusilade®, Fusion® Verdict®	
C	Inhibitors of photosynthesis at photosystem II This group includes the triazines, triazinones, substituted ureas, nitriles, benzothiadiazoles, actamides, uracils, pyridazinones and phenyl-pyridazines.	Simazine Diuron Bromoxynil	Gesatop®, Simazine® Diurex® Jaguar®	
D	Inhibitors of tubulin formation. These herbicides act by inhibiting cell division in the growing points of roots, especially of grasses.	Oryzalin Pendimethalin	Surflan® Stomp®	
G	The inhibition of PPO (photoporphyrinogen oxidase) in chloroplasts leads to cell membrane destruction. Affected leaves will exhibit dessication where the herbicide contacted the plant.	Oxyfluorfen	Goal®	
L	Bipyridyls – inhibitors of photosynthesis at photosystem I. These are contact herbicides which are taken up by the leaves and are non-selective.	Paraquat Diquat, and Paraquat plus diquat	Gramoxone®, Nuquat®, Alliance® Spray.Seed®, Unispray®	
M	Glycines - Inhibitors of EPSP synthase. This chemical group is taken up by leaves, is translocated and is non-selective.	Glyphosate	Roundup® family, Weedmaster Duo®, Wipeout® and various other glyphosates	
N	Inhibitors Glutamine Synthetase Inhibitors Glufosinate is a broad-spectrum postemergence herbicide that has no soil activity.	Phosphinic acid- glufosinate	Basta®, Biffo®, Exile®	

Herbicide Resistance - For a herbicide to kill a plant, the herbicide needs to be absorbed by the plant, be moved to its site of action while remaining intact and inhibit its target enzyme. Plants can develop resistance so that the herbicide is no longer effective.
Herbicide resistance is caused by excessive use of the same herbicide group (as listed in the prior question above), or poor practices like under dosing with a low rate of herbicide or getting poor coverage.

1.5.4 Herbicide resistance plan

4	3	2	1	0
We assess to see if weeds are emerging before spray application. **AND** We avoid herbicide resistance by not using the same herbicide from year to year without rotation **AND** We check that we are not using a herbicide from the same chemical group **AND** Ensuring we use the correct rate while getting good spray coverage **AND** We apply herbicides at key times to prevent weeds from setting seeds to limit the carry-over from year to year.	We assess to see if weeds are emerging before spray application. **AND** We avoid herbicide resistance by not using the same herbicide from year to year without rotation **AND** We check that we are not using a herbicide from the same chemical group **AND** Ensuring we use the correct rate while getting good spray coverage.	We assess to see if weeds are emerging before spray application **AND** We avoid herbicide resistance by not using the same herbicide from year to year without rotation.	We assess to see if weeds are emerging before spray application. We have altered our herbicide groups occasionally in the past, but generally rely on the same one.	We apply whatever herbicide is available in an as needed basis.
N/A We do not use undervine herbicide weed control.				

1.5.5 Under vine cultivation in weed control				
4	**3**	**2**	**1**	**0**
We use cultivation at key times to prevent weeds from setting seeds to limit the carry-over from year to year **AND** We clean our equipment before moving to other vineyards to limit the spread of weeds between sites **AND** We assess soil moisture levels before undertaking cultivation to ensure we get a good weed control job **AND** Limit compaction to our vineyard **AND** Assess the performance of our weed control.	We use cultivation at key times to prevent weeds from setting seeds to limit the carry-over from year to year **AND** We clean our equipment before moving to other vineyards to limit the spread of weeds between sites **AND** We assess soil moisture levels before undertaking cultivation to ensure we get a good weed control job **AND** Limit compaction to our vineyard.	We use cultivation at key times to prevent weeds from setting seeds to limit the carry-over from year to year **AND** We clean our equipment before moving to other vineyards to limit the spread of weeds between sites.	We use cultivation at key times to prevent weeds from setting seeds to limit the carry-over from year to year.	We do not plan our cultivations and cultivate to keep a bare strip undervine.

Integrated weed management (CSIRO)
http://www.csiro.au/org/IWM.html#1
http://www.csiro.au/Outcomes/Food-and-Agriculture/IWM.aspx
Integrated Weed Management in Australian Crop Systems
http://glyphosateresistance.org.au/manual.htm
Herbicide resistance
http://glyphosateresistance.org.au/IWM%20Manual/CRC%20IWM%20S2_v2_WEB.pdf
Herbicide Resistance: Mode of action groups in Australia
http://cms.grdc.com.au/uploads/documents/GRDC_HerbicideCard.pdf
Grapevine Sensitivity to Herbicides: Avoiding Herbicide Damage
http://berrygrape.org/grapevine-sensitivity-to-herbicides-avoiding-herbicide-damage/

Delta T: Delta T is commonly used by the agricultural industry. It is an important indicator for acceptable spraying conditions. It is indicative of evaporation rate and droplet lifetime. Delta T is calculated by subtracting the wet bulb temperature from the dry bulb temperature. When applying pesticides, Delta T should ideally be between 2 and 8, and not greater than 10.

1.5.6 Spray drift				
4	**3**	**2**	**1**	**0**
We check weather conditions during application **AND** Spray in suitable weather conditions aiming for mild temperatures and higher humidity light winds (3–15 km/h) **AND** Check the Delta T when we spray to avoid spraying during periods of high temperatures (above 27°C) and low humidity or strong winds (greater than 15 km/h) **AND** Check our herbicide cart is set up to have suitable droplet size to limit drift by considering our nozzle size and system pressure.	We check weather conditions during application. **AND** Only spray in suitable weather conditions aiming for mild temperatures and higher humidity light winds (3–15 km/h) **AND** Check the Delta T when we spray to avoid spraying during periods of high temperatures (above 27°C) and low humidity or strong winds (greater than 15 km/h).	We check weather conditions during application **AND** We try to spray when conditions are best for spraying.	We aim to check the weather during application, but cannot always control when we apply herbicide.	We take do not take measures to ensure we do not get spray drift.

Bureau of Meteorology – Delta T calculations
http://www.bom.gov.au/lam/deltat.shtml
Soil and weed management in wine grape crops
http://www.dpi.qld.gov.au/26_8511.htm
Weed Control in New & Established Vineyards
http://viticulture.hort.iastate.edu/info/pdf/domotoweedctrl.pdf
Avoid Spray Drift
http://www.pir.sa.gov.au/__data/assets/pdf_file/0020/23960/spraydft.pdf

CHAPTER 2
PEST &DISEASE MANAGEMENT

AUTHOR : James Hook - DJ's Growers (www.djsgrowers.com.au) and Lazy Ballerina Wines (www.lazyballerina.com)

REVIEWER : Dr. Trevor Wicks SARDI – PIRSA (www.sardi.sa.gov.au/viticulture)

McLAREN VALE

One thing leads to another

In this Chapter

Section 2.1	Pest & Disease Identification, Management & Analysis	28
Section 2.2	Agrochemical Spray Application	34
Section 2.3	Agrochemical Handling & Storage	38
Section 2.4	Phylloxera and other Pests Prevention	40

Managing Pest and Disease - The objective of managing pests and diseases in your vineyard is to keep it in a healthy, productive condition, with the minimum of inputs. You should only treat problems when they arise and to do so in a safe manner.
All McLaren Vale farmers need to have long term sustainable pest and disease practices to maintain our environmental resources and improve the economic standing of our viticulture.

2.1.1 Pest and disease management strategy				
4	**3**	**2**	**1**	**0**
We have a seasonally updated plan using the following information: Past pest and disease problems that have affected my vineyard **AND** Resistance management guidelines **AND** Information from other vineyards through services including Crop Watch McLaren Vale and winery advice **AND** Professional advice on pests and diseases from monitoring reports from my vineyard.	We have an annually updated plan using the following information: Past pest and disease problems that have affected my vineyard **AND** Resistance management guidelines **AND** Information from other vineyards through services including CropWatch McLaren Vale and winery advice.	We have a plan, updated occasionally, based on: Past pest and disease problems that have affected my vineyard **AND** Resistance management guidelines.	We have a plan based on: Past pest and disease problems that have affected my vineyard.	I do not have a pest and disease management strategy.

Integrated Pest Management - Integrated pest management (IPM) is an ecological approach to agricultural pest control that uses limited pesticides. In IPM, one attempts to prevent infestation, to observe patterns of disease when they occur, and to intervene when necessary (CRCV 2006).

2.1.2 Integrated pest management (IPM)				
4	**3**	**2**	**1**	**0**
Our seasonal pest and disease control is governed by: Knowledge of P&D risk gained through weather and disease forecasting, monitoring and identification information **AND** Susceptibility of the grape variety to the particular pest or disease **AND** Cost of the agrochemical control program versus the potential losses though P&D crop damage **AND** Any potential impacts on beneficial organisms.	Our seasonal pest and disease control is governed by: Knowledge of P&D risk gained through weather and disease forecasting, monitoring and identification information **AND** Susceptibility of the grape variety to the particular pest or disease **AND** Cost of the agrochemical control program versus the potential losses though P&D crop damage.	Our seasonal pest and disease control is governed by: Knowledge of P&D risk gained through weather and disease forecasting, monitoring and identification information **AND** Cost of the agrochemical control program versus the potential losses though P&D crop damage.	Our seasonal pest and disease control is governed by: Set spraying intervals **AND** Cost of the agrochemical control program versus the potential losses though P&D crop damage.	I do not use IPM disease control techniques. Set spraying intervals are used.

For information on potential chemical impacts on beneficial organisms visit Invertebrate Management of Potential Agro-Chemical Toxicity website:
http://cesar.org.au/index.php?option=com_collateral_manage

AVCARE has created fungicide resistance management strategies for viticulture to:
- Prevent the build-up of resistant strains in fungal populations.
- Minimise fungicide selection pressure by not overusing fungicides from the same activity group.

The AWRI agrochemical booklet (also known as The Dog Book) follows the fungicide resistance management strategies from AVCARE.

2.1.3 Resistance management guidelines				
4	**3**	**2**	**1**	**0**
We are aware of AVCARE resistance management guidelines **AND** We minimise the development of fungicide resistance by not using fungicides from the same activity group from year to year without rotation. We note that different trade names of fungicide may be from the same chemical group **AND** We ensure we use the correct rate while getting good spray coverage when applying agrochemicals **AND** We apply fungicides at key times to limit disease carry over from year to year.	We are aware of AVCARE resistance management guidelines **AND** We minimise the development of fungicide resistance by not using fungicides from the same activity group from year to year without rotation. We note that different trade names of fungicide may be from the same chemical group **AND** We ensure we use the correct rate while getting good spray coverage when applying agrochemicals.	We are aware of AVCARE resistance management guidelines **AND** We minimise the development of fungicide resistance by not using fungicides from the same activity group from year to year without rotation. We note that different trade names of fungicide may be from the same chemical group.	We have altered our fungicide groups occasionally in the past, but generally rely on the same ones.	We are not aware of resistance management guidelines.

Agrochemicals registered for use in Australian viticulture (Dog Book)
http://www.awri.com.au/industry_support/viticulture/agrochemicals/agrochemical_booklet/booklet.pdf

Record Keeping- Spray diaries are a record of agrochemical applications in the vineyard during the growing season.

Without written records, farmers have to depend on their memory when making decisions to modify their farm practices. Memories can become unreliable, particularly after a few days, months or years.

The list of agrochemicals registered for use in Australian viticulture is distributed free to all grape and wine producers that pay the Wine grapes and/or Grape research levy. If you are a member of the Australian wine industry and would like to receive a copy of the 2011/2012 edition, please contact The Australian Wine Research Institute (AWRI) on phone 08 8313 6600, fax 08 8313 6601, or email: viticulture@awri.com.au

2.1.4 Grapevine fungicide application records				
4	**3**	**2**	**1**	**0**
I have records of grapevine fungicide applications **AND** Records are made within 24 hours of fungicide application **AND** My records include weather conditions during spraying, growth stage, product name, rates of use, spray type, water rates, operator name, date and block **AND** I keep receipts and contractor invoices attached to these records **AND** The fungicide application record is related to nutritional tests (petiole and/or soil).	I have records of vineyard fungicide applications **AND** Records are made within 24 hours of fungicide application **AND** My records include weather conditions during spraying, growth stage, product name, rates of use, spray type, water rates, operator name, date and block **AND** I keep receipts and/or contractor invoices attached to these records.	I have records of vineyard fungicide application **AND** The record is written whenever I have time to do it. There is not a rigid time frame to do it **AND** My records include weather conditions during spraying, growth stage, product name, rates of use, spray type, water rates, operator name, date and block.	I have records of vineyard fungicide application **AND** The record is written whenever I have time to do it. There is not a rigid time frame to do it	I do not have a record of vineyard fungicide applications.

Managing Resistance –
http://www.crcv.com.au/viticare/vitinotes/VitiNotes/spray%20application/Spray%20Application%205%20Managing%20chemical%20resistance.pdf
Targeting Sprays -
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/spray%20application/Spray%20Application%201%20-%20Targeting%20Spray.pdf
AWRI Universal Spray Diary & Information -
http://www.awri.com.au/industry_support/viticulture/agrochemicals/spray_diary/

Pest & Disease Monitoring - Crop monitoring needs to be based on a realistic, but effective system suited to your vineyard.
Effective pest management depends on identifying changes in disease and pest (and beneficial) insect activity in and around your vineyard in time to keep damage levels low. Crop monitoring is the only way to gather information and determine the best response to changes in pest and disease levels, including the option of NOT spraying. It is the backbone of reliable crop protection whether using chemical or non-chemical strategies.

Representative Monitoring – When monitoring, the grower or vineyard scout looks at a representative sample of vineyard to assess the entire crop and determines the presence and intensity of pest infestations/infection or the potential for future pest problems. This is done by selecting rows or sections of the vineyard.
The McLaren Vale Wine Region has variable topography and grows varieties that have differing susceptibility to pests and disease and this needs to be taken into account when selecting what section of the vineyard to monitor.
If your vineyard is not uniform, or you grow varieties with different susceptibility (i.e. Chardonnay has a higher risk of Botrytis compared to Cabernet Sauvignon) or spread over several locations (i.e. vineyards in McLaren Vale, Willunga and Blewitt Springs) it is necessary select parts of your vineyard that are the best representation of your entire vineyard area.

2.1.5 Vineyard monitoring				
4	**3**	**2**	**1**	**0**
Frequent, representative vineyard monitoring backed up with; Using Crop Watch McLaren Vale and other industry information to keep up to date **AND/OR** Regular attendance to workshops on pest and disease **AND/OR** Working closely with other growers to identify problems.	Frequent, representative vineyard monitoring backed up with; Using Crop Watch McLaren Vale and other industry information to keep up to date.	Frequent, representative vineyard monitoring.	Intermittent vineyard monitoring.	No monitoring.

2.1.6 Vineyard monitoring records				
4	**3**	**2**	**1**	**0**
We record: Each P&D monitoring occasion (date, name of monitoring person, P&D target, weather conditions, management response and outcome) **AND** Growth stage **AND** Any observable seasonal or fungicide spray impacts i.e. foliar burn **AND** Cross check records from previous years to determine how our vineyard is progressing compared to previous season/ pest and disease issues.	We record: Each P&D monitoring occasion (date, name of monitoring person, P&D target, weather conditions, management response and outcome) **AND** Growth stage **AND** Any observable seasonal or fungicide spray impacts i.e. foliar burn.	We record: Each P&D monitoring occasion (date, name of monitoring person, P&D target, weather conditions, management response and outcome) **AND** Growth stage.	We record: Each P&D monitoring occasion (date, name of monitoring person, P&D target, weather conditions, management response and outcome).	No monitoring is undertaken or no records are kept.

Spray drift - Limiting spray drift and chemical trespass between farms and residents and guests of our region is vital. Spray drift is a serious issue in McLaren Vale and spraying in windy conditions near roadways or housing harms the regions reputation. Spray drift also decreases the protection afforded against pest and diseases by agrochemical application.

Land owners need to take responsibility for activities that take place on their farm. If you are managing your own spraying, or using an employee or spray contractor you need to acknowledge that you can be thought responsible for their actions and that spray drift is not an acceptable practice in the McLaren Vale Wine Region.

Delta T - is a technical term used by the agricultural industry. It is an important indicator for acceptable spraying conditions. It is indicative of evaporation rate and droplet lifetime. Delta T is calculated by subtracting the wet bulb temperature from the dry bulb temperature. When applying pesticides, Delta T should ideally be between 2 and 8, and not greater than 10.

2.2.1 Spray application - self managed

4	3	2	1	0
We check the application rate, method and application before applying agrochemicals to our vineyard **AND** We check the forecast weather and conditions to assess their suitability for spraying **AND** Check our fungicide spray unit is set up to have suitable droplet size to limit drift by considering our nozzle size and system pressure **AND** Check current weather conditions, i.e. Delta T, when we spray and halt spraying during weather that is likely to cause drift.	We check the application rate, method and application before applying agrochemicals to our vineyard **AND** We check the forecast weather and conditions to assess their suitability for spraying **AND** Check our fungicide spray unit is set up to have suitable droplet size to limit drift by considering our nozzle size and system pressure.	We check the application rate, method and application before applying agrochemicals to our vineyard **AND** We check the forecast weather and condition to assess their suitability for spraying.	We check the application rate, method and application before applying agrochemicals to our vineyard.	We are not aware of what operations occur on our vineyard and leave this to our employees.

N/A – We don't spray our vineyard. We use a vineyard contractor to spray our vineyard.

2.2.2 Spray application - contractor				
4	**3**	**2**	**1**	**0**
We check the application rate, method and application before our contractor applies agrochemicals to our vineyard **AND** That our spray contractor holds all appropriate licences before commencing work on our vineyard **AND** Ask for documentation that our contractors fungicide unit is set up to have suitable droplet size to limit drift considering nozzle size and system pressure **AND** Request our vineyard spray contractor follows a 'cut off' of weather conditions i.e. Delta T or high winds, when they halt spraying because it is likely to cause drift.	We check the application rate, method and application before our contractor applies agrochemicals to our vineyard **AND** That our spray contractor holds all appropriate licences before commencing work on our vineyard **AND** Ask for documentation that our contractors fungicide unit is set up to have suitable droplet size to limit drift considering nozzle size and system pressure.	We check the application rate, method and application before our contractor applies agrochemicals to our vineyard **AND** That our spray contractor holds all appropriate licences before commencing work on our vineyard.	We check the application rate, method and application before our contractor applies agrochemicals to our vineyard.	We are not aware of what operations occur on our vineyard and leave this to our spray contractor.
N/A – We don't use a vineyard contractor to spray our vineyard.				

Spray Coverage - The majority of agricultural chemicals are applied in the form of droplets produced from different types of nozzles mounted on fungicide spray units. To maximise spray efficiency, droplets must be uniformly distributed on the vine surface with minimum loss (usually caused by drift, evaporation and run-off). Poor spray application techniques waste agrochemicals; reduce control of pests and diseases.

To achieve the best possible spray coverage you need to consider the following:

- Suitable droplet size and water volume
- Application under the appropriate environmental conditions
- Using clean water of the correct pH
- Correctly calibrated and maintained spraying equipment

2.2.3 Spray coverage				
4	**3**	**2**	**1**	**0**
We monitor the performance of our spray unit ensuring the system is operating at correct pressure and nozzles are operating during application **AND** We consider the canopy set up and design of our vineyard and adjust fungicide spray coverage accordingly **AND** We assess spray coverage during critical times of the season with spray sensitive paper or by other means **AND** Test the quality of the water we use to check we are using clean water of the correct pH **OR** We ask that our spray contractor does so and can provide evidence of the above.	We monitor the performance of our spray unit ensuring the system is operating at correct pressure and nozzles are operating during application **AND** We consider the canopy set up and design of our vineyard and adjust fungicide spray coverage accordingly **AND** We assess spray coverage during critical times of the season with spray sensitive paper or by other means **OR** We ask that our spray contractor does so and can provide evidence of the above.	We monitor the performance of our spray unit ensuring the system is operating at correct pressure and nozzles are operating during application **AND** We consider the canopy set up and design of our vineyard and adjust fungicide spray coverage accordingly **OR** We ask that our spray contractor does so and can provide evidence of the above.	We monitor the performance of our spray unit ensuring the system is operating at correct pressure and nozzles are operating during application **OR** We ask that our spray contractor does so and can provide evidence of the above.	We are not aware of the spray coverage or spray unit system performance when agrochemical applications are undertaken on our vineyard.

2.2.4 Calibration				
4	**3**	**2**	**1**	**0**
Fungicide sprayer set up is calibrated more than once a season **AND** Nozzles are checked to be within 10% +/- of the manufacturers output **AND** Filters are checked to be clean **AND** System pressure gauge is checked to be accurate and operational **OR** We ask that our spray contractor does so and can provide evidence.	Fungicide sprayer set up is calibrated more than once a season **AND** Nozzles are checked to be within 10% +/- of the manufacturers output **AND** Filters are checked to be clean **OR** We ask that our spray contractor does so and can provide evidence.	Fungicide sprayer set up is calibrated more than once a season **OR** We ask that our spray contractor does so and provides evidence.	Fungicide sprayer set up is calibrated annually before the start of the season **OR** We ask that our spray contractor does so and provides evidence.	We do not calibrate or ask for calibration records for agrochemical applications on our vineyard.

Agrochemical storage – Many agrichemicals are toxic and present a significant environmental and health risk, particularly in the event of accidental spills.
Your agrochemical store needs be large enough to accommodate the quantities of agrochemicals planned for storage. It needs to be secure and have good signage and identification.
It should also be well ventilated, to prevent the buildup of vapors and to stop temperatures getting too high, floors should be of smooth, impermeable concrete to avoid absorption of spillages and to allow easy cleaning.

Agrochemical handling - The safe handling of open containers agrochemical requires correct personal safety equipment and appropriate barriers to limit any spillage if it occurs.

2.3.1 Specialist agrochemical storage/ handing area				
4	**3**	**2**	**1**	**0**
We have an area on our vineyard where we handle and store agrochemicals **AND** Our agrochemical storage and handling area is identified with relevant signage and map location **AND** The site is located, constructed and maintained to be secure and bunded to prevent run off or leaching **AND** This is secure to keep animals or people from disturbing it.	We have an area on our vineyard where we handle and store agrochemicals **AND** Our agrochemical storage and handling area is identified with relevant signage and map location **AND** The site is located, constructed and maintained to be secure and bunded to prevent run off or leaching.	We have an area on our vineyard where we handle and store agrochemicals **AND** Our agrochemical storage and handling area is identified with relevant signage and map location.	We have an area on our vineyard where we handle and store agrochemicals.	We do not have a specialist handling area on the farm and make do with handling and storing agrochemicals where we can.

2.3.2 Spill safety				
4	**3**	**2**	**1**	**0**
We have a spill kit and safety kit on hand **AND** We keep accessible MSDS's on file in an easily accessible location **AND** We have a written containment plan to follow in the event of a chemical spillage or safety issue **AND** This containment plan, spill kit and information is checked and updated at least annually before we commence spray operations.	We have a spill kit and safety kit on hand **AND** We keep accessible MSDS's on file in an easily accessible location **AND** We have a written containment plan to follow in the event of a chemical spillage or safety issue.	We have a spill kit and safety kit on hand **AND** We keep accessible MSDS's on file in an easily accessible location.	We have a spill kit and safety kit on hand.	We do not have a spill or safety sit, MSDS's and or a containment plan.

Phylloxera is the world's worst grapevine pest. This insect attacks grapevine roots, slowly causing a decline in vine health and ultimately killing the vine. It destroyed millions of hectares of vineyards in Europe in the 1800s, nearly wiping out the French wine industry. There is no cure or treatment for vines infested with phylloxera. The only control strategy is to remove all vines and replace them with vines grafted onto phylloxera resistant rootstocks.

Most major grape growing regions in the world have now been infested with phylloxera, including France, South Africa, California, Italy and New Zealand. These places still manage to grow grapes profitably through the use of resistant rootstocks; however, the costs of replanting vineyards, including lost production over at least five years, are extremely high.

While most grape growing regions of the world are infested with phylloxera, Australia remains predominantly free of the pest, because of strict quarantine controls that were brought in as soon as the pest was first discovered here. South Australia, Western Australia, Tasmania and Queensland are believed to be free of phylloxera. However, the risk of spreading the pest from phylloxera infested zones is ever present, and the industry is very vulnerable as over 85% of grapevines are planted on their own roots and therefore not resistant to phylloxera. (Phylloxera and Grape Industry Board of South Australia)

Phylloxera & Grape Industry Board of South Australia
http://www.healthyvines.com.au/

Phylloxera prevention is based on two simple strategies: restricted vineyard access (keep unwanted organisms out) and cleaning and disinfestation for any "risk vector" that could be carrying an unwanted organism.

Restricting access to your vineyard is a key method of preventing phylloxera.

Controlled entry point - Have one entry point to your vineyard and forbid unauthorized entry or entry when the property is not supervised. If you have gates, keep them closed.

Signs - Use signs to advise conditions and restrictions on entry to the property (including contact phone number for people to ring if access is required).

Restrict entry - Don't encourage unnecessary visits to the block itself. Prohibit entry to vine rows as much as possible. Sales people can talk to you in your shed or office.

Reported arrival - Require all visitors to report to an office or person on arrival and before moving close to actual vines.

Check recent vineyard visits - Ask all potential visitors about recent visits to vineyards – particularly in other regions, states or countries. Deny access to anyone who has been in or near a vineyard overseas or in a known phylloxera infested zone in the past two weeks, in the same clothes/footwear/vehicle – without thorough cleaning and disinfestation. Consider keeping a **visitor log –** a record of all visitors to the vineyard, including date and purpose of visit.

Control vehicle access - Provide parking for visitor vehicles away from vines – preferably on a hard surface and unshaded (heat is an effective disinfestation against many organisms). Prevent or discourage anyone taking shortcuts through vineyards; they should stick to roads, designated tracks or headlands.

Fences and gates - Physically restrict access to your vineyard as much as possible with fences and (closed) gates – especially along main roads or where people tend to enter the vineyard without authorisation (e.g. to take short-cuts).

Tourist visitors – Tourists coming to McLaren Vale are considered to be a possible way that phylloxera could become established in vineyards. Education to the dangers of phylloxera and limiting access to vineyard rows by the general public are two key recommendations of the Phylloxera Board of South Australia protocols.

2.4.1 Entrance signs				
4	**3**	**2**	**1**	**0**
We do have entrance signs **AND** They advise entrance conditions and restrictions **AND** These are related to the risks of Phylloxera **AND** The sign includes contact number if access is required.	We do have entrance signs **AND** They advise entrance conditions and restrictions **AND** These are related to the risks of Phylloxera.	We do have entrance signs **AND** They advise entrance conditions and restrictions.	We do have entrance signs but these do not advise entrance conditions and restrictions.	We do not have any entrance signs.

2.4.2 Physical barriers for external visitors				
4	**3**	**2**	**1**	**0**
Our vineyard(s) has gates **AND** Has fences and/or natural barriers to avoid entrance of external visitors **AND** The gates are kept closed to limit any external visitor's entry to the vine rows as much as possible **AND** These are complimented with additional measures during times of high visitor numbers to McLaren Vale (e.g. Sea & Vines, Tour Down Under etc.) **OR** This is not applicable to our vineyard operations.	Our vineyard(s) has gates **AND** Has fences and/or natural barriers to avoid entrance of external visitors **AND** The gates are kept closed to limit any external visitor's entry to the vine rows as much as possible.	Our vineyard(s) has gates **AND** Has fences and/or natural barriers to limit entrance of external visitors.	Our vineyard(s) has gates **BUT** Have no other fences and/or natural barriers to avoid entrance of external visitors.	Our vineyard(s) does not have a gate **OR** Have any physical barriers to entry.

Industry visitors - Grape industry contractors, winery personnel or other industry related visitors are one of the most likely vectors for phylloxera entering your vineyard.

2.4.3 Wash-down areas for personnel				
4	**3**	**2**	**1**	**0**
I have a wash-down area or kit for footwear **AND** The wash down area is on a hard surface (gravel, concrete or bitumen) and well away from grapevines **AND** I have a written procedure for scrubbing and washing boots **AND** I provide a footbath area which has a sign indicating the need and procedure to wash boots prior to entering the vineyard **OR** I provide footwear for casual workers and external visitors **AND** I have a written control of all external visitors.	I have a wash-down area or kit for footwear **AND** The wash down area is on a hard surface (gravel, concrete or bitumen) and well away from grapevines **AND** I have a written procedure for scrubbing and washing boots **AND** I provide a footbath area which has a sign indicating the need and procedure to wash boots prior to entering the vineyard **OR** I provide footwear for casual workers and external visitors.	I have a wash-down area or kit for footwear **AND** This area is on a hard surface (gravel, concrete or bitumen) and well away from grapevines **AND** We visually inspect, or instruct that footwear is inspected for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material I ask them to wash their footwear.	I do not have a wash-down area or kit for footwear **BUT** We visually inspect, or instruct that footwear is inspected for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material I ask them to wash their boots **AND** The boot rinsing happens on any available hard surface (gravel, concrete or bitumen) and well away from grapevines.	We do not have a wash down area or kit for personnel.

2.4.4 Vineyard access by industry personnel				
4	**3**	**2**	**1**	**0**
We do have a visitor's policy that asks where visitors have been previous to our vineyard before commencing work, or entering rows **AND** We require notification when someone enters our vineyard **AND** We keep a written log, or record **AND** We record the date and time of entry **AND** We keep this log for future reference in case of an outbreak of phylloxera in McLaren Vale.	We do have a visitor's policy that asks where visitors have been previous to our vineyard before commencing work, or entering rows **AND** We require notification when someone enters our vineyard **AND** We keep a written log, or record **AND** We record the date and time of entry.	We do have a visitors policy that asks where visitors have been previous to our vineyard before commencing work, or entering rows **AND** We require notification when someone enters our vineyard **AND** We keep a written log, or record.	We **DO NOT** have a visitor's policy that asks where visitors have been previous to our vineyard before commencing work, or entering rows **BUT** We require notification when someone enters our vineyard **BUT** We do not keep a written log, or record.	We **DO NOT** have a visitors log or policy.

Wash down facilities for vineyard machinery - One of the most effective deterrents against the spread of phylloxera into a vineyard is a wash down facility. This enables machinery to be cleaned to remove all dirt and plant material before entering the vineyard, which greatly reduces the risk of introducing phylloxera (or other soil-borne pests, diseases and weeds) into the vineyard. (Source: SA vineyard protection protocol from the Phylloxera & Grape Industry Board of SA)

2.4.5 Vehicles hygiene (disinfection and/or cleaning)				
4	**3**	**2**	**1**	**0**
We have a formal written procedure for vehicle disinfection **AND** I have a wash-down area for machinery **AND** This area is on a hard surface (gravel, concrete or bitumen) and constructed to drain well away from grapevines **AND** We visually inspect, or instruct that machinery is inspected, for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material machinery is cleaned in our wash down facility.	I **DO NOT** have a formal written procedure for vehicle disinfection **BUT** I have a wash-down area for machinery **AND** This area is on a hard surface (gravel, concrete or bitumen) and constructed to drain well away from grapevines **AND** We visually inspect, or instruct that machinery is inspected, for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material machinery is cleaned in our wash down facility.	I **DO NOT** have a formal written procedure for vehicle disinfection **BUT** We visually inspect, or instruct that vehicles are inspected, for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material machinery is cleaned **AND** The cleaning happens on any available hard surface (gravel, concrete or bitumen) and well away from grapevines.	I **DO NOT** have a formal written procedure for vehicles disinfection **BUT** We visually inspect, or instruct that vehicles are inspected for mud and plant material before allowing entry onto the vineyard **AND** If there is mud or plant material machinery is cleaned as needed.	I **DO NOT** have facilities or procedures for vehicles disinfection.
N/A – We do not have external machinery entering our vineyard.				

2.4.6 Vehicles movement				
4	**3**	**2**	**1**	**0**
We have an external vehicle policy that asks where vehicles have been prior to our vineyard before commencing work, or entering rows **AND** We require notification when vehicles enter our vineyard **AND** We keep a written log, or record **AND** We record the date and time of entry **AND** We keep this log for future reference in case of an outbreak of phylloxera in McLaren Vale.	We have an external vehicle policy that asks where vehicles have been prior to our vineyard before commencing work, or entering rows **AND** We require notification when vehicles enter our vineyard **AND** We keep a written log, or record **AND** We record the date and time of entry.	We have an external vehicle policy that asks where vehicles have been prior to our vineyard before commencing work, or entering rows **AND** We require notification when vehicles enters our vineyard **AND** We keep a written log, or record.	We **DO NOT** have an external vehicle policy that asks where vehicles have been prior to our vineyard before commencing work, or entering rows **BUT** We require notification when vehicles enters our vineyard **BUT** We do not keep a written log, or record.	We do not have any type of control for external vehicles.

Hot Water Treatment - Hot water treatment is used to control a number of external and internal pests and pathogens in dormant cuttings and rootling's including nematodes, crown gall, Australian Grapevine Yellows (AGY) and Petri disease (black goo).

2.4.7 New vine planting				
4	**3**	**2**	**1**	**0**
I used certified planting material purchased through a nursery or Vine Improvement Society **AND** This material was inspected to be clean of soil and other foreign plant material before we allowed it to be planted **AND** We have receipt for planting material **AND** The material was hot water treated.	I used certified planting material purchased through a nursery or Vine Improvement society **AND** This material was inspected to be clean of soil and other foreign plant material before we allowed it to be planted **AND** We have receipt for planting material.	I used certified planting material purchased through a nursery or Vine Improvement society **AND** This material was inspected to be clean of soil and other foreign plant material before we allowed it to be planted.	I used certified planting material purchased through a nursery or Vine Improvement society.	I do not use certified materials when planting new vines in my vineyard.
N/A – We did not plant vines in the last season.				

2.4.8 Biosecurity protection				
4	**3**	**2**	**1**	**0**
I am aware that there is biosecurity legislation and regulations to protect South Australia from phylloxera **AND** Have a copy of the biosecurity legislation on hand in case we need to move grapevine material or grapes interstate **AND** We are aware of the process or have sent grapes or vine material interstate by applying for permits from PIRSA **AND** Have a copy of the Phylloxera board protocol on hand for additional guidance.	I am aware that there is biosecurity legislation and regulations to protect South Australia from phylloxera **AND** Have a copy of the biosecurity legislation on hand in case we need to move grapevine material or grapes interstate **AND** We are aware of the process or have sent grapes or vine material interstate by applying for permits from PIRSA.	I am aware that there is biosecurity legislation and regulations to protect South Australia from phylloxera **AND** Have a copy of the biosecurity legislation on hand in case we need to move grapevine material or grapes interstate.	I am aware that there is biosecurity legislation and regulations to protect South Australia from phylloxera.	I am not aware of anything related to biosecurity protection.

Vineyard protection and phylloxera prevention protocol
http://www.healthyvines.com.au/Portals/1/DOCUMENTS/RESOURCES/SA%20vineyard%20protection%20protocol%202011.pdf
Sustainable long-term strategies for phylloxera management under Australian conditions
http://www.gwrdc.com.au/webdata/resources/project/DNR0303.pdf

CHAPTER 3
BIODIVERSITY MANAGEMENT

AUTHOR: Richard Leask – Leask Vineyards

REVIEWER: Dr. Linda Thomson - University of Melbourne (www.zoology.unimelb.edu.au)

McLAREN VALE
One thing leads to another

In this chapter

	Introduction to Biodiversity	52
Section 3.1	Biodiversity Management & Audit	53
Section 3.2	Biodiversity Audit	57
Section 3.3	Bushfire Management	63

Introduction

"As an island nation, Australia has a high proportion of species that occur nowhere else on earth. Within the large expanse of South Australia we have an impressive range of diverse ecosystems, from water-dependent swamps, to our spectacular arid lands in the Red Centre, and everything in between. The value of biodiversity extends beyond the intrinsic value of the conservation of species and the need to maintain ecosystem services. It also provides us with the resources for major activities such as tourism and recreation, nature conservation, pastoralism, agriculture, horticulture and forestry, which all benefit from healthy ecosystems." (Source: Conservation Council SA)

In vineyards, biodiversity is important because producing quality grapes, and therefore wine, requires a practical understanding of not only vineyard operations but how this fits into the surrounding environment. We can have a positive or negative impact on this ecosystem depending on how we manage the diverse number of interactions occurring within our vineyard sites. Biodiversity therefore takes into consideration the complex interactions between the flora (plant life) and fauna (animal life) inside this natural ecosystem. The more diverse these two categories the more robust and sustainable the ecosystem will be.
(http://www.conservationsa.org.au/biodiversity-in-a-changing-climate.html)

The first step in any biodiversity management planning is to understand your farm and your available resources. This not only includes the land area itself (vineyard production area and vineyard surrounds) but also refers to the participants involved in implementing the management plan and other resources available to you, for example financial resources, human resources, external information resources and equipment.

3.1.1 Biodiversity management plan				
4	**3**	**2**	**1**	**0**
I have information about the land area of my property **AND** There is a designated person in charge of the biodiversity management (if no employees, yourself or someone from your family is responsible for the biodiversity management) **AND** I have a defined budget and understanding of all necessary resources to begin my biodiversity management plan **AND** The plan is written and it is updated with yearly targets and records of biodiversity enhancement	I have information about the land area of my property **AND** We have been developing some initiatives to improve biodiversity **AND** There is a designated person in charge of the biodiversity management (if no employees, yourself or a family member is responsible for the biodiversity management) **AND** I have a defined budget and understanding of all necessary resources to begin my biodiversity management plan **AND** The plan is written, but not annually updated.	I have information about the land area of my property **AND** We have been developing some initiatives to improve biodiversity **AND** There is a designated person in charge of the biodiversity management (if no employees, yourself or a family member is responsible for the biodiversity management) **AND** I have a defined budget and understanding of all necessary resources to begin my biodiversity management plan.	I have information about the land area of my property **AND** We have been developing some initiatives to improve biodiversity.	I don't have a biodiversity management plan.

A biodiversity audit provides a base line of data at a given point of time that can be referred back to over a number of years to measure the effectiveness of any Biodiversity Management Plan. It can be done annually, seasonally or monthly depending on the level of detail required.

3.1.2 Potential for biodiversity enhancement				
4	**3**	**2**	**1**	**0**
I know the total size of the production area of my vineyard (vines, mid row and under vine areas) and the total area of the vineyard surrounds (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing) **AND** I know the individual sizes of all the above areas **AND** I have a map indicating each of the above areas **AND** The map also indicates the major activities on adjacent land areas to my vineyard.	I know the total size of the production area of my vineyard (vines, mid row and under vine areas) and the total area of the vineyard surrounds (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing) **AND** I know the individual sizes of all the above areas **AND** I have a map indicating each of the above areas.	I know the total size of the production area of my vineyard (vines, mid row and under vine areas) and the total area of the vineyard surrounds (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing) **AND** I know the individual sizes of all the above areas.	I know the total size of the production area of my vineyard (vines, mid row and under vine areas) and the total area of the vineyard surrounds (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing).	I don't know where biodiversity could be enhanced.

3.1.3 Biodiversity Audit (BA)				
4	**3**	**2**	**1**	**0**
I monitor my vineyard for pests and potential beneficial insects during the growing season **AND** I have personally recorded flora and fauna species in the vineyard and headland section of my property including a written description **AND** I have done the same in the areas surrounding the vineyard (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing) **AND** I have had a professional audit of every section of my property including a written description as defined in the resource base.	I monitor my vineyard for pests and potential beneficial insects during the growing season **AND** I have personally recorded flora and fauna species in the vineyard and headland section of my property including a written description **AND** I have done the same in the areas surrounding the vineyard (headlands, borders, non-producing areas around infrastructure and land unsuitable for productive grape growing).	I monitor and have monitoring records of pests and potential beneficial insects during the growing season. **AND** I have personally recorded flora and fauna species in the vineyard and headland section of my property including a written description.	I have not done a biodiversity audit (BA) of any of my property as defined in Section 1 but I monitor and have monitoring records of pests and potential beneficial insects during the growing season.	I have not done a biodiversity audit (BA) of any of my property as defined in Section 1 **AND** I don't monitor the biodiversity of my property.

A Biodiversity Action Plan (BAP) is a structured approach and can be used to identify priorities and plan a strategy for biodiversity conservation. A BAP should aim to conserve and maintain viable examples of the range of ecosystems normally found within the region. It should also encourage the strategic use of flora species when restoring degraded areas. It should also protect and enhance any remnant flora and fauna habitats on the property as defined from the findings of the Biodiversity Audit in previous topic (3.1.3 Biodiversity Audit).
Research shows positive influence of vegetation on abundance and diversity of natural enemies- adding vegetation in identified areas can be cost effective in pest control

3.1.4 Biodiversity Action Plan (BAP)				
4	**3**	**2**	**1**	**0**
I have a BAP including a written description for my vineyard and headland zone as defined here. **AND** I have a BAP including a written description for all other zones as defined here.	I have a BAP including a written description for my vineyard and headland zone as defined here.	I have attended biodiversity workshops and / or training e.g. 'Vineyard Biodiversity and Insect Interactions' or 'Enhancing Biodiversity in Vineyards' but have not yet written a BAP.		I have not done a BAP for any of my property as defined in here.

3.2.1 Trees*				
4	**3**	**2**	**1**	**0**
I have identified the main types of trees in my vineyard **AND** there are > 20 trees/ha (average of total property) **AND** the identification is written (in my biodiversity audit).	I have identified the main types of trees in my vineyard **AND** there are 10-20 trees/ha (average of total property) **AND** the identification is written (in my biodiversity audit).	I have identified the main types of trees in my vineyard **AND** there are < 10 trees/ha (average of total property) **AND** the identification is written (in my biodiversity audit).	I have identified the main types of trees in my vineyard **BUT** I don't know the amount per hectare **AND** the identification is not written anywhere.	I have never assessed tree types or amounts within my vineyard.

*Tree is defined as a plant having a permanently woody main stem or trunk, ordinarily growing to a considerable height, and usually developing branches at some distance from the ground.

Habitat trees "are mature to old aged trees which provide numerous living places (habitats and micro-habitats) for many kinds of animals and plants. These trees have lots of hollows, cracks and crevices of various sizes, where animals may live, breed or shelter. Old and dead trees are an essential part of all natural native forests" (Source: Moreton Bay City Council 2011).
"It has been estimated that, in Australia, 42 per cent of mammals, 28 per cent of frogs, 28 per cent of reptiles and 17 per cent of birds are dependent on tree hollows."
(Source: Australian Rainforest Conservation Society 2011)

3.2.2 Habitat Trees				
4	**3**	**2**	**1**	**0**
I have identified the Habitat Trees within my vineyard and/or in adjoining land to my vineyard **AND** there are > 5 trees/ha **AND** the identification is written (in my biodiversity audit).	I have identified the Habitat Trees within my vineyard and/or in adjoining land to my vineyard **AND** there are 3-5 trees/ha **AND** the identification is written (in my biodiversity audit).	I have identified the Habitat Trees within my vineyard and/or in adjoining land to my vineyard **AND** there are < 2 trees/ha **AND** the identification is written (in my biodiversity audit).	I have identified the Habitat Trees within my vineyard and/or in adjoining land to my vineyard **BUT** I don't know the amount per hectare **AND** the identification is not written anywhere.	I have never assessed tree types or amounts within my vineyard

Habitat trees and their importance
http://www.esc.nsw.gov.au/site/planning/factsheets/habitat_tree.pdf
Old trees become Habitat Trees: Precious living places for our wildlife
http://www.moretonbay.qld.gov.au/uploadedFiles/common/forms/environment/Habitat-Trees.pdf
Forest facts – Habitat Trees
http://www.rainforest.org.au/Habitat_trees.pdf

"In nearly all cases, the impact of weeds is associated with a decline in native species richness or diversity. Beneficial impacts of weeds were determined only infrequently and mostly occurred on land already degraded, where weeds acted as 'nurse plants' for the regeneration of native overstorey components. Where ecosystem level functions are altered by weed invasions, habitat conditions or resource availability can be affected adversely for a broad range of species".
(Source: Weeds in Australia, Government of Australia 2011)

3.2.3 Weeds and biodiversity

4	3	2	1	0
I have identified the dominant weed species within my vineyard **AND** determined the potential risk to the biodiversity on my property **AND** I have an understanding of the weed's growth behaviour to help me manage them in a systematic way within my farm to try to reduce crop and biodiversity losses on my property **AND** I have a written plan based on monitoring and potential crop and biodiversity loss versus cost to manage and/or eradicate weed species from my property.	I have identified the dominant weed species within my vineyard **AND** determined the potential risk to the biodiversity on my property **AND** I have an understanding of the weed's growth behaviour to help me manage them in a systematic way within my farm to try to reduce crop and biodiversity losses on my property.	I have identified the dominant weed species within my vineyard **AND** Determined the potential risk to the biodiversity on my property.	I have identified the dominant weed species within my vineyard.	I have never assessed weed types or amounts within my vineyard.

Impact of environmental weeds on biodiversity
http://www.weeds.gov.au/publications/books/bioimpact.html
The Impact of Environmental Weeds on Biodiversity: A Review and Development of a Methodology http://www.weeds.gov.au/publications/books/pubs/bioimpact.pdf
http://chah.gov.au/cpbr/program/sc/inv_weed.htm
Weed Management Society of South Australia
http://www.wmssa.org.au/weeds.htm
No Species Loss: A Biodiversity Strategy for South Australia 2006-2016
http://www.premcab.sa.gov.au/roundtable/files/nospeciesloss_stratplan_draft1.pdf

Knowing the impact of chemicals on insects within your vineyard is highly beneficial. Control of insect and mite pests in vineyards is provided both through applications of chemicals and through the action of natural enemies of pests including numerous invertebrate predators and parasitoids. However these methods of control are not necessarily compatible because the application of many chemicals can have a negative impact on natural enemies present within a vineyard. Knowing the relative impacts of chemicals used in the Australian viticulture industry on natural enemies can assist in achieving control of pests while limiting impacts on beneficials. Information to assist in assessment of the potential impact of different types of chemicals on natural enemies can be found at IMPACT for Viticulture.

Invertebrate Management of Potential Agro-Chemical Toxicity: maximizing your beneficial bugs
http://cesar.org.au/index.php?option=com_collateral_manage)

3.2.4 Insects				
4	**3**	**2**	**1**	**0**
I have identified the main insect species within my vineyard **AND** I have identified the main beneficial insects and non-beneficial insects among the population of my vineyard and their potential role in either controlling pests and/or creating pest problems **AND** I have an understanding of the food sources, habits and insect behaviour to help me managing them in a systematic way within my farm to try to reduce crop losses **AND** I have a written plan based on monitoring and potential crop and or quality loss versus cost to manage invertebrates.	I have identified the main insect species within my vineyard **AND** I have identified the main beneficial insects and non-beneficial insects among the population of my vineyard and their potential role in either controlling pests and/or creating pest problems **AND** I have an understanding of the food sources, habits and invertebrate behaviour to help me managing them in a systematic way within my farm to try to reduce crop losses.	I have identified the main insect species within my vineyard **AND** I have identified the main beneficial insects and non-beneficial insects among the population of my vineyard and their potential role in either controlling pests and/or creating pest problems.	I have identified the main insect species within my vineyard.	I have never assessed insect species.

3.2.4a Presence of beneficial insects

Insect	Yes/No
Spiders	
Ladybird Beetles	
Green Lacewings	
Other (Specify)	

http://cesar.org.au/index.php?option=com_collateral_manage

3.2.5 Birds				
4	**3**	**2**	**1**	**0**
I have identified the main bird species within my vineyard **AND** I have identified the insectivorous birds among the bird population of my vineyard and their potential role in controlling pests **AND** I have an understanding of the food sources, habits and bird behaviour to help me manage them in a systematic way within my farm to try to reduce crop losses **AND** I have a written plan based on monitoring and potential crop and/or quality loss versus cost to manage birds.	I have identified the main bird species within my vineyard **AND** I have identified the insectivorous birds among the bird population of my vineyard and their potential role in controlling pests **AND** I have an understanding of the food sources, habits and bird behaviour to help me manage them in a systematic way within my farm to try to reduce crop losses.	I have identified the main bird species within my vineyard **AND** I have identified the insectivorous birds and/or territorial birds among the bird population of my vineyard and their potential role in controlling insect pests and bird pest problems.	I have identified the main bird species within my vineyard.	I have never assessed the bird species or amounts within my vineyard.

Managing bird damage to fruit and other horticultural crop:

http://www.dpi.nsw.gov.au/agriculture/horticulture/pests-diseases-hort/multiple/managing-bird-damage

Bushfires might cause significant loses to biodiversity.
Bushfire management can be separated into two categories:

- Fire fighting—emergency actions taken to prevent bushfires damaging life or property.
- Fire prevention—preventative actions taken to prevent or reduce the risk of severity of fires before a fire occurs.

3.3.1 Bushfire management				
4	**3**	**2**	**1**	**0**
I am aware of the risk level regarding bushfire within my property and surrounding areas that might impact on my property (general, medium or high risk) **AND** I have a bushfire management plan **AND** Everybody in the farm has been exposed to the plan and know what to do **AND** We have been implementing measures to reduce the risk of bushfire and its potential impacts on the biodiversity of the property.	I am aware of the risk level regarding bushfire within my property and surrounding areas that might impact on my property (general, medium or high risk) **AND** I have a bushfire management plan **AND** Everybody in the farm has been exposed to the plan to know what to do.	I am aware of the risk level regarding bushfire within my property and surrounding areas that might impact on my property (general, medium or high risk) **AND** I have a bushfire management plan.	I am aware of the risk level regarding bushfire within my property and surrounding areas that might impact on my property (general, medium or high risk).	I am not aware of the risk level regarding bushfire.

Bushfire management and national environment law
http://www.environment.gov.au/epbc/publications/bushfire.html

CHAPTER 4
WATER MANAGEMENT

AUTHOR : Rachel Steer – Chapel Hill Wines (www.chapelhillwine.com.au)
REVIEWER : Dr. Michael McCarthy - SARDI-PIRSA (www.sardi.sa.gov.au/viticulture)

In this chapter

Section 4.1	Water Source & Quality	66
Section 4.2	Irrigation Planning & Application	69
Section 4.3	Irrigation System & Maintenance	77

If you **do not** irrigate your vineyard please skip this chapter and go to Chapter 5, Waste Management

RECLAIMED WATER is available in McLaren Vale through the Willunga Basin Water Company (WBWC). Reclaimed water is waste water which is captured, treated and reused instead of flowing out to sea. Water resources available for reuse include treated waste water and industrial effluent, domestic 'grey water' from bathrooms and laundries and agricultural drainage water. South Australia has a long history of using reclaimed water and is the national leader in water reuse, delivering high environmental value to the community by reducing the discharge of treated effluent to the Gulf St Vincent and replacing water that would otherwise be taken from a stressed groundwater resource and the River Murray (WBWC, 2011).

4.1.1 Water Source for Vineyard Irrigation				
4	**3**	**2**	**1**	**0**
I use reclaimed water.	I use a combination of reclaimed and mains, bore or surface runoff water.	I use bore or surface runoff water (e.g. dam, creek).	I use mains water.	I am unsure of the source of my irrigation water.

Best Irrigation Management Practices for Viticulture in the Murray Darling Basin
http://www.crcv.com.au/resources/Irrigation%20and%20Water/Additional%20Resources/MDB%20Irrigation%20Booklet.pdf
Willunga Basin Water Company - WBWC
http://www.wbwc.com.au/
Irrigation Australia: Information and links
http://www.irrigation.org.au/index.cfm?/resources/irrigation-information-and-links
Using recycle water for irrigation
http://lwa.gov.au/files/products/national-program-sustainable-irrigation/pn30123/pn30123.pdf

4.1.2 Water Availability and Licences				
4	**3**	**2**	**1**	**0**
I use only reclaimed water on my vineyard and know how much water I have available for vineyard irrigation **AND** I have the appropriate water licence **AND** I always follow the rules of usage and understand the penalties that apply for misuse.	I know how much water I have available for vineyard irrigation from various water sources **AND** I have the appropriate water licences **AND** I do not exceed my allocation **AND** I plan my water usage to reduce my reliance on the more 'at-risk' resources such as mains, bore and surface runoff water **OR** I use only reclaimed water on my vineyard and I have the appropriate water licence.	I know how much water I have available for vineyard irrigation from various water sources **AND** I have the appropriate water licences **AND** I do not exceed my allocation.	I know how much water I have available for vineyard irrigation from various water sources **AND** I have the appropriate water licences.	I do not know how much water I have available for vineyard irrigation.

4.1.3 Reclaimed Water				
4	**3**	**2**	**1**	**0**
I would change to reclaimed water if it was available to my vineyard as I believe it is the most sustainable water source.	I would change to reclaimed water if it became available to my vineyard and was a cost effective option.		I would consider changing to reclaimed water if it became available to my vineyard and was a cost effective option.	I would not change to reclaimed water if it became available to my vineyard.
N/A – I am already on reclaimed water.				

SALINITY is the measure of all salts in water and/or soil and is considered to be the biggest problem with water quality (CRCV, 1998). High salt levels in irrigation water can adversely affect plant growth, soil structure and infrastructure. Salinity can be measured by using an electrical conductivity (EC) meter or by measuring the total dissolved salts (TDS) in the water. **SODICITY** is the breakdown of soil structure as a result of the replacement of calcium in the soil by sodium. Irrigating with water high in sodium can promote this problem (PIRSA, 2007). The sodium absorption ratio (SAR) is used to determine the impact that sodium in the water will have on the soil (CRCV, 1998).

4.1.4 Water Quality				
4	**3**	**2**	**1**	**0**
I test the quality of my irrigation water annually at an accredited laboratory **AND** I have records of salinity (TDS or EC), sodium absorption ratio (SAR), pH, bicarbonate, suspended solids and other nutrients appropriate for the site **AND** I have an amendment plan if problems are identified.*	I have tested the quality of my irrigation water within the last 3 years at an accredited laboratory **AND** I have records of salinity (TDS or EC), sodium absorption ratio (SAR), pH, bicarbonate, suspended solids and other nutrients appropriate for the site **AND** I have an amendment plan if problems are identified.*	I have tested the quality of my irrigation water within the last 3 years for salinity (TDS or EC) with an appropriately calibrated salinity meter **AND** I have used the information to determine whether I have a problem with salinity in my water.	I have tested the quality of my irrigation water within the last 3 years for salinity (TDS or EC) but I am unsure of how to use the information.	I have never tested the quality of my irrigation water.
N/A – I am using mains or reclaimed water from WBWC and I am aware of the quality of the water they deliver.				

Australian Academy of Sciences: Salinity: Useful sites
http://www.science.org.au/nova/075/075sit.htm
Measuring soil salinity
http://www.crcv.com.au/viticare/vitinotes/Viti-Notes/Vineyard%20Activity%20Guides/Vineyard%20activities%2003%20Measuring%20soil%20salinity.pdf
Managing salinity with restricted allocation in the South Australian Riverland
http://www.pir.sa.gov.au/__data/assets/pdf_file/0011/56486/Managing_salinity_with_restricted_allocations_in_the_South_Australian_Riverland.pdf
Salinity – Soil Health and Fertility from the Primary Industries Agriculture - NSW
http://www.dpi.nsw.gov.au/agriculture/resources/soils/salinity
Sodic soils and their management
http://www.fao.org/docrep/x5871e/x5871e05.htm
Sodic soil management
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/127278/Sodic-soil-management.pdf

An **IRRIGATION PLAN** is essential to allow us to best utilise the water available to us to reach yield and/or quality targets. The amount of irrigation needed on a block is influenced by a number of factors including the season, soil type and plant water usage and end use of the grapes.

4.2.1 Irrigation Plan				
4	**3**	**2**	**1**	**0**
I have a flexible, seasonal irrigation plan which best utilises the water available to me to reach specific yield and/or quality targets which are negotiated with my winery/buyer **AND** I review and adjust my plan weekly to account for seasonal variation **AND** I review the success of my irrigation plan annually with my winery/buyer and make improvements where necessary.	I have a flexible, seasonal irrigation plan which best utilises the water available to me to reach specific yield and/or quality targets which are negotiated with my winery/buyer **AND** I review and adjust my plan weekly to account for seasonal variation.	I have a weekly/fortnightly irrigation plan which best utilises the water available to me to reach specific yield and/or quality targets.	I have a weekly/fortnightly irrigation plan.	I do not have an irrigation plan.

Vineyard irrigation: Interactions between irrigation, salinity, leaching efficiency, salinity tolerance and sustainability
http://www.sardi.sa.gov.au/__data/assets/pdf_file/0010/46729/vineyard_irrigation.pdf

4.2.2 Volume of Water Applied per Irrigation				
4	**3**	**2**	**1**	**0**
The volume of water I apply per irrigation is determined by my irrigation plan which takes into account water availability and quality, soil type, plant water usage, forecast weather conditions and the appearance of the vine **AND** I use monitoring data (e.g. soil moisture, leaf water potential, local evapotranspiration data) to ensure the correct amount of irrigation is applied.	The volume of water I apply per irrigation is determined by my irrigation plan which takes into account water availability, soil type, plant water usage, forecast weather conditions and the appearance of the vine.	The volume of water I apply per irrigation is determined by water availability, the forecast weather conditions and by the appearance of the vine.	The volume of water I apply per irrigation is determined by water availability.	I do not know the volume of water I apply per irrigation.

The **TIMING OF IRRIGATION** is important as irrigating at night can reduce water lost to evaporation and utilise off-peak electricity rates for pumping.

4.2.3 Timing of Irrigation				
4	**3**	**2**	**1**	**0**
I schedule all irrigation of my vineyard at night to reduce evaporation and electricity costs for pumping **AND** my irrigation system has the capacity to allow me to do this.	Where possible I schedule irrigation of my vineyard at night to reduce evaporation and electricity costs for pumping.	Where possible I schedule irrigation of my vineyard to avoid the hottest part of the day to reduce evaporation.		I irrigate my vineyard when it suits me.

The definition of a **HEATWAVE** will vary according to region, partly due to vines acclimatising to certain conditions but also due to vineyards and irrigation systems being designed and managed to cater for 'normal' conditions. The definition used by the South Australian Regional Office of the Bureau of Meteorology is either 5 consecutive days with maximum daily temperatures above 35°C or 3 consecutive days with maximum daily temperatures above 40°. Heatwaves can have a devastating effect on both fruit yield and quality. The impact of heatwaves on grapevines can be reduced by applying irrigation prior to the forecast heat. (GWRDC, 2012)

4.2.4 Forecast Heatwaves				
4	**3**	**2**	**1**	**0**
I follow the weather forecasts **AND** I prioritise blocks based on their value and susceptibility to damage and aim to apply extra irrigation to these blocks prior to a forecast heatwave event **AND** my irrigation system has the capacity to allow me to do this **AND** my seasonal irrigation plan has water allocated for this purpose.	I follow the weather forecasts **AND** I prioritise blocks based on their value and susceptibility to damage and aim to apply extra irrigation to these blocks prior to a forecast heatwave event **AND** my irrigation system has the capacity to allow me to do this.	I follow the weather forecasts **AND** I aim to apply extra irrigation to any blocks that need it, **prior** to a forecast heatwave event.	I follow the weather forecasts **AND** I apply more irrigation to blocks **during** a heatwave event.	I do not take the forecast weather into account when applying irrigation.

Managing grapevines during heatwaves – Innovators network – Factsheet January 2012
http://www.gwrdc.com.au/webdata/resources/files/Manging_grapevines_during_heatwaves.pdf

Soil water holding capacity is the ability of a soil to hold water. However not all water held in the soil is readily available to plants. **READILY AVAILABLE WATER** (RAW) is water which can be easily obtained and used by plants and corresponds to the amount of water stored in the soil between field capacity (5-10KPa suction) and the point of soil dryness at which vegetative growth will be reduced (about 60KPa suction for grapevines). **DEFICIT AVAILABLE WATER** (DAW) is the water held in the soil between 60 and 200KPa suction and is less easily extracted by the vines. When the vine is utilising DAW it is likely to be experiencing some degree of stress, hence this is the critical range for optimising quality. RAW and DAW are expressed in mm of water (as with rainfall and irrigation) and can be estimated using soil texture charts and root zone depth. Precise RAW and DAW can only be achieved through soil moisture monitoring.

4.2.5 Readily Available Water				
4	**3**	**2**	**1**	**0**
I have estimated my RAW and DAW by using soil pits to determine soil texture and root zone depth **OR** I have used long term soil moisture monitoring data coupled with visual observation to determine RAW and DAW for my soil **AND** I use soil moisture monitoring to optimise the vines use of DAW in an effort to improve grape quality.	I have estimated my RAW using soil pits to determine soil texture and root zone depth **OR** I have used soil moisture monitoring data coupled with visual observation to determine RAW for my soil **AND** I use this information to help plan irrigation.	I have estimated my RAW based on soil texture charts and approximate root zone depth **AND** I use this information to help plan irrigation.	I have estimated my RAW based on soil type.	I do not know the RAW in my soil.

Readily available water (RAW) - Water wise on the farm
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/164602/raw.pdf
Water Management for Wine Grapes in a Drying Environment
http://www.perthregionnrm.com/media/7986/swan%20valley%201%20water%20management%20for%20wine%20grapes%20in%20a%20drying%20environment%20lr.pdf
Irrigating Grapevines with Limited Water Supplies
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/184328/Irrigating-grapevines-with-limited-water-supply.pdf

4.2.6 Infiltration				
4	**3**	**2**	**1**	**0**
Water infiltration under vine is good **AND** I have been proactive in addressing any soil permeability issues via increased organic matter, soil amendments, pre plant deep ripping or other management practices.	Water infiltration under vine is adequate **AND** I address soil permeability issues as they arise via increased organic matter or soil amendments.	Water infiltration under vine is poor **AND** I have adjusted irrigation length and/or frequency to suit **AND** I am addressing soil permeability issues via increased organic matter or soil amendments.	Water infiltration under vine is poor **AND** I have adjusted irrigation length and/or frequency to suit.	Water infiltration under vine is poor and I have not taken any corrective action.

DEEP DRAINAGE can be caused by over irrigation which results in excess water being lost out the bottom of the rootzone. Irrigation application depth should match the water holding capacity of the soil to avoid deep drainage.

4.2.7 Irrigation Deep Drainage				
4	**3**	**2**	**1**	**0**
I know the water holding capacity of my soil and my irrigations are calculated so as to prevent the loss of water to deep drainage **AND** I use soil moisture monitoring to ensure this is the case.	I know the water holding capacity of my soil and my irrigations are calculated so as to prevent the loss of water to deep drainage.			I do not know if I am over irrigating resulting in deep drainage.

SOIL MOISTURE MONITORING can be performed in many different ways, depending on the size of your vineyard and available resources. Irrigation monitoring can be as simple as visual observation using a dig stick or as advanced as a continuous soil moisture monitoring system. There are many other options including gypsum blocks and capacitance probes.

4.2.8 Soil Moisture Monitoring				
4	**3**	**2**	**1**	**0**
I have a continuous soil moisture monitoring system **AND** I review the data regularly and use it to refine my irrigation plan as the season progresses.	I regularly monitor my soil moisture using gypsum blocks or capacitance probes **AND** I keep a record of the results to refine my irrigation plan as the season progresses.	I occasionally monitor my soil moisture using gypsum blocks or capacitance probes. **OR** I regularly monitor my soil moisture using basic techniques such as a dig stick and the 'ribbon test'.	I occasionally monitor my soil moisture using basic techniques such as a dig stick and the 'ribbon test'.	I do not monitor soil moisture.

4.2.9 Irrigation records				
4	**3**	**2**	**1**	**0**
I keep irrigation records showing block, date, time, length of shift, metered volume of water applied per shift and growth stage of the vine **AND** I make note of any significant rainfall events and any problems or anomalies.	I keep irrigation records showing the block, date, length of shift and the metered volume of water per shift **AND** I make note of any significant rainfall events.	I keep irrigation records showing the block, date and hours of irrigation applied.		I do not keep any irrigation records.

Irrigation Record Booklet – Rural Solutions SA
ftp://central.pir.sa.gov.au/Iresfiles/Templates/Irrigation%20Record%20Booklet.pdf

4.3.1 Irrigation System				
4	**3**	**2**	**1**	**0**
I have an engineered surface or subsurface drip irrigation system which includes flow meters, filtration and pressure compensation **AND** the system is automated.	I have an engineered surface or subsurface drip irrigation system which includes flow meters, filtration and pressure compensation.		I have a non-engineered drip irrigation system in my vineyard.	I have a flood or sprinkler irrigation system in my vineyard.

4.3.2 Irrigation Layout				
4	**3**	**2**	**1**	**0**
I have a detailed and up to date plan of my irrigation layout showing location and sizes of mainlines and sub-mains, solenoids, irrigation sections etc.	I have the initial plan of my irrigation layout showing mainlines, sub-mains, solenoids, irrigation sections etc. but it has never been updated.	I am familiar with the layout of my irrigation system and have drawn a basic plan.	I am familiar with the layout of my irrigation system but do not have a plan.	I am unsure of the layout of my irrigation system.

4.3.3 Irrigation System Maintenance				
4	**3**	**2**	**1**	**0**
I clean my irrigation filters and flush my lines at the beginning of each irrigation season **AND** I monitor the quality of the irrigation water and clean filters and lines during the season to prevent pressure and uniformity problems **OR** my irrigation system is auto flushing and self-cleaning and I check it regularly.	I clean my irrigation filters and flush my lines at the beginning of each irrigation season **AND** I clean my irrigation filters and lines during the season when I notice a problem.	I clean my irrigation filters and flush my lines at the beginning of each irrigation season.	I clean my irrigation filters and flush my lines occasionally.	I never clean my irrigation filters or flush my lines.

4.3.4 Irrigation Checks				
4	**3**	**2**	**1**	**0**
I have an automated system and regularly check water volumes, flow and block pressures to ensure there are no anomalies **AND** I regularly perform visual inspections within blocks whilst the irrigation is running, either on foot or on a quad bike.	I regularly perform visual inspections within blocks whilst the irrigation is running, either on foot or on a quad bike AND I keep accurate records of water volumes per shift to determine if there are problems.	I occasionally do a visual inspection of blocks whilst the irrigation is running, either on foot or on a quad bike.	I occasionally do a 'drive by' whilst the irrigation is running to check that the water has made it to the correct block.	I do not check my irrigation for problems whilst it is running.

4.3.5 Distribution Uniformity				
4	**3**	**2**	**1**	**0**
I check the distribution uniformity of my irrigation system at the beginning of the growing season by performing dripper output tests **AND** I make any necessary adjustments **AND** during the season I keep records of water flow rates and volumes and/or system pressure to determine when problems arise.	I check the distribution uniformity of my irrigation system at the beginning of the growing season by performing dripper output tests **AND** I make any necessary adjustments.	I occasionally check the distribution uniformity of my irrigation system by performing dripper output tests.		I do not test the distribution uniformity of my irrigation system.

4.3.6 Pump Maintenance				
4	**3**	**2**	**1**	**0**
I have a preventative maintenance schedule (e.g. I keep detailed records of usage and operational conditions and use them to predict when a pump may be likely to fail and I act prior to this point being reached).	I service my pump/s routinely to prevent problems occurring (preventative maintenance requires you to act just prior to failure).		I service my pump/s only when I have a problem (reactive maintenance).	I have never had my pump/s serviced.
N/A – I am on reclaimed water which is delivered at pressure and does not need to be re-pumped.				

Pump Maintenance
http://www.pir.sa.gov.au/pirsa/nrm/water_management/pump_maintenance

CHAPTER 5
WASTE MANAGEMENT

AUTHORS: Gulio Dimasi – d'Arenberg Wines (www.darenberg.com.au)
Irina Santiago – McLaren Vale Grape Wine & Tourism Association (www.mcalrenvale.info)
REVIEWER: Lynda Wedding - City of Onkaparinga – Waste & Recycling Education

McLAREN VALE
One thing leads to another

In this Chapter

Section 5.1	Waste Management Planning	82
Section 5.2	Waste Management & Training	84
Section 5.3	Waste Collection & Recycling	86
Section 5.4	Dispose of Chemicals and Containers	93

A responsible waste management program will ensure efficient resource use and minimal environmental impact. Monitoring of the amounts of waste generated, reused, recycled, stored or disposed of will allow for improvement in waste management programs.

The Environmental Protection Authority (EPA), Zero Waste SA and the City of Onkaparinga regulate recycling or disposal of many waste types. Growers should familiarise themselves with the requirements of those bodies.

5.1.1 Council and EPA regulations				
4	**3**	**2**	**1**	**0**
I am aware of Council and EPA regulations regarding solid waste management AND I follow their guidelines to dispose wastes from my vineyard.			I am aware there are council and EPA regulations regarding Solid Waste Management but I don't really follow their guidelines to dispose wastes from my vineyard.	I am not aware of the Council and EPA regulations.

5.1.2 Waste management program for the vineyard				
4	**3**	**2**	**1**	**0**
I have a detailed and up to date waste management program **AND** I have targets to reduce the amount of waste currently produced **AND** I've attend at least one training event on waste and recycling in the last 12 months (e.g. workshops offered by the City of Onkaparinga Waste and Recycling team, waste management seminars, etc.).	I have a detailed and up to date waste management program **AND** I have targets to reduce the amount of waste currently produced.	I understand waste management and recycling but I do not have an up to date waste management program. I collect solid wastes and take actions on as needed basis.		I don't do anything to manage wastes in my vineyard.

5.1.3 Waste management program for households within vineyards				
4	**3**	**2**	**1**	**0**
I separate and recycle domestic waste materials using the kerbside bin systems **AND** I have targets to reduce the amount of waste currently produced **AND** I've attend at least one training event on waste and recycling in the last 12 months.	I separate and recycle domestic waste materials using the kerbside bin systems **AND** I have targets to reduce the amount of waste currently produced.			I don't do anything to manage waste from the house(s).
N/A – No household within the vineyard.				

5.2.1 Training on waste management				
4	**3**	**2**	**1**	**0**
My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have attended at least one formal training event on waste management in the last 12 months **OR** We have employees and all are trained in waste management. Casual/seasonal workers are exposed to our waste management program during their induction & permanent employees are required to attend a formal training session within their first 12 months **AND** There is a nominated person in charge of waste management who is up to date with current practices and implements new industry practices.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have attended at least one formal training event on waste management **OR** We have employees **AND** Our management program is available in the office for employees upon request **AND** Our management program is given to every new employee when they start working for us **AND** Permanent employees (only) are trained on waste management & are required to attend, within the first 12 months of work, a formal training session.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** Waste collection is incorporated in our daily routine to keep our landscape clean **AND** We have never attended formal training but we read and save all informative materials **OR** We have employees **AND** Our management program is available in the office for the employees upon request **AND** Our management program is given to every new employee when they start working for us **AND** The employees are not trained on waste management.	My vineyard has no employees. All work is done by me and/or my family and seasonal contractors **AND** We are aware of the need to collect solid wastes (e.g. glasses, plastics, metals, packing materials, etc.) **AND** We have never attended formal training but we have been reading about waste management **OR** We have employees **AND** Our management program is available in the office for the employees upon request **AND** The employees are not trained on waste management.	My vineyard has no employees. All work is done by myself and/or my family and seasonal contractors **AND** We have never discussed waste management among us nor with the contractors **AND** No one was ever trained on waste management **OR** My vineyard has employees **AND** There is no training or procedures in place for waste management **AND** We have never discussed waste management among us nor with the contractors.

Zero Waste SA:
http://www.zerowaste.sa.gov.au

5.2.2 Waste management monitoring				
4	**3**	**2**	**1**	**0**
I have a detailed and up to date waste management program **AND** The waste management program is monitored (written) to allow improvements in my waste management program **AND** I have targets to reduce my waste.	I have a detailed and up to date monitoring system **AND** The waste management program is monitored to allow improvements in my waste management program.	I have a written monitoring spread sheet **AND** I record my waste.	I have a written monitoring spread sheet **BUT** My monitoring is not up to date.	I don't have monitoring procedures for waste.

Organic waste composting:
As a means of reducing the amount of organic matter that goes to landfill and reducing the production of greenhouse gas emissions, we support our communities and businesses to participate in composting. Composting is a very worthwhile pursuit as it produces useable compost, worm castings and worm tea which are very beneficial for our soil and plants. These products add nutrients, microbial diversity and increase the water holding capacity of your soil. You will start seeing food scraps and garden waste not as rubbish but as a resource to be recovered and used in your home compost systems. (Source: City of Onkaparinga Waste and Recycling website)

5.3.1 Hard waste collection from households in vineyards.

4	3	2	1	0
I do the best I can regarding disposal of hard waste from the house, putting everything together in a designated area **AND** I remove or recycle my hard waste at least once a year (when there is available waste to recycle) **AND** I am aware of the "Council's Pre-booked Hard Waste Collection Service" for domestic households and I use it when I need to dispose items that are not useful in the house anymore such as old furniture, fridges, wires, etc.			I do the best I can with regard to disposal of hard waste from the house, putting everything together in a designated area **BUT** I have no plans for removing or recycling my hard waste.	I neither collect nor separate hard wastes from my property.

N/A – No household within the vineyard.

Organic waste composting:
As a means of reducing the amount of organic matter that goes to landfill and reducing the production of greenhouse gas emissions, we support our communities and businesses to participate in composting. Composting is a very worthwhile pursuit as it produces useable compost, worm castings and worm tea which are very beneficial for our soil and plants. These products add nutrients, microbial diversity and increase the water holding capacity of your soil. You will start seeing food scraps and garden waste not as rubbish but as a resource to be recovered and used in your home compost systems. (Source: City of Onkaparinga Waste and Recycling website)

5.3.2 Composting (other than grape mark)				
4	**3**	**2**	**1**	**0**
I compost garden and non-vine vegetation **AND** I compost all vineyard wastes (when they are classified as waste and need to be removed from the field, such as pruning's, grass cuttings, weeds, etc.).		I compost garden and non-vineyard vegetation only.		I don't compost organic matter.
N/A – No Household within the vineyard.				

5.3.3 Grape marc composting				
4	3	2	1	0
Grape marc is composted on site **AND** Any excess is sent to a composting facility (e.g. Peat's Soils).	Grape marc is spread directly to the vineyard **OR** Sent to a composting facility (e.g. Peat's Soils).		Grape marc is stored on site for landfill or appropriate disposal.	Grape marc is spread randomly.
N/A – I don't crush any grapes on site.				

http://www.onkaparingacity.com/onka/living_here/waste_recycling.jsp

5.3.4 Waste collection and recycling containers and/or bins				
4	3	2	1	0
I collect all waste that is produced in the vineyard **AND** I separate all waste into appropriate recycling containers/bins.	I collect all waste that is produced in the vineyard **AND** I place it in a recycling container/bin.		I collect most waste that is produced in the vineyard **AND** I place it in a recycling container/bin.	I don't have separated recycling containers/bins.

Many vineyard waste products have the potential to cause air, soil and water pollution if they are not handled or disposed of correctly.

5.3.5 Creosote or CCA timber posts (timber treated with copper chrome arsenate)				
4	**3**	**2**	**1**	**0**
I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways **AND** I have identified and put in practice some re-use options (e.g. fence posts, landscape timber, parking lot bumpers, guardrail posts, composting bins, planter boxes, shipping crates, walkway edging, etc.) **AND** When it is not possible to recycle on site, the posts are sold to companies that recycle them or given away to employees for fencing or similar usage.	I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways **AND** I have identified and put in practice some re-use options (e.g. fence posts, landscape timber, parking lot bumpers, guardrail posts, composting bins, planter boxes, shipping crates, walkway edging, etc.).	I stock pile my posts in a reserved area within the site **AND** The reserved area is away from wetlands and waterways.	I stock pile all my posts in a reserved area within the site.	The broken and/or old posts are spread out anywhere.
N/A – I do not have timber posts.				

5.3.6 Machinery & vehicle metal spare parts (not tyres)				
4	**3**	**2**	**1**	**0**
Machinery and vehicle spare parts are collected **AND** They are stored in a designated area for reuse or recycling (when possible) **AND** Waste is only disposed as a last resort through appropriate disposal.	Machinery and vehicle spare parts are collected **AND** They are stored in a designated area for reuse or recycling (when possible).		Machinery and vehicle spare parts are collected for disposal to landfill.	Machinery and vehicle spare parts are spread out anywhere.
N/A – I do not own any machinery, all machinery belongs to contractors.				

Waste oil is classified as a Hazardous Waste. For more information regarding disposal please contact the EPA or the City of Onkaparinga

http://www.epa.sa.gov.au/environmental_info/waste/how_can_i_dispose_of_waste/waste_oil
http://www.onkaparingacity.com/onka/living_here/waste_recycling/hazardous_waste.jsp

In landfill, used oil will slowly leach into surrounding land, underground water and infrastructure. In the sewerage, its effects will be even more immediate and catastrophic. It only takes one litre of oil to contaminate 1,000,000 litres of water (that's about half the water in an Olympic swimming pool). Oil-polluted stormwater and sewage is the biggest single source, causing extensive, immediate and long-term damage to coastal and marine habitats and ecosystems, seabirds, mammals, fisheries and people. (Source: Zero Waste SA website)

5.3.7 Oils				
4	**3**	**2**	**1**	**0**
Oils are collected in designated containers and recycled appropriately **AND** I have a written maintenance program for all machines in the vineyard to avoid unnecessary oil usage due to lack of servicing.	Oils are collected in designated containers and recycled appropriately.			Oils are not collected.

Waste tyres as whole units cannot be disposed to landfill in South Australia. This is because the tyres do not compact and can flex back to the surface after burial. Waste tyres stored in large quantities can present a fire hazard and harbour disease vectors such as mosquitoes and vermin (source: Zero Waste SA website).
For more information regarding storage or disposal options please contact the EPA or the City of Onkaparinga.

5.3.8 Tyres				
4	**3**	**2**	**1**	**0**
Tyres are collected **AND** Tyres are stored in a designated area for reuse (where possible) or recycling /disposal through appropriate channels.			Tyres are collected **AND** Tyres are stored in a designated area.	Old tyres are not collected. They are spread out anywhere.

5.3.9 Paper and cardboards				
4	**3**	**2**	**1**	**0**
Paper and cardboard are collected and stored in a designated area and are recycled appropriately (e.g. Kerbside bin system, SA Paper & Cardboard or Peat's Soils) **AND** Cardboard is recycled within the farm as mulch and/or compost.	Paper and cardboard are collected and stored in a designated area and are recycled appropriately (e.g. Kerbside bin system, SA Paper & Cardboard or Peat's Soils).			Paper and cardboard are not collected. They are spread out anywhere.

ChemClear is a national program that collects and disposes of unwanted agricultural and veterinary chemicals. Many of these rural chemicals have accumulated in communities and particularly on farming properties.

ChemClear collects two categories of chemicals, Group 1 and Group 2. Eligible Group 1 chemicals are collected free of charge. ChemClear provides a collection and disposal service for Group 2 chemicals, these chemicals incur a fee for disposal. Please refer to the Chemical Group Categories tab on this website for more information on eligibility.

A chemical becomes a waste when it has:

1. Served its purpose and is no longer of use;
2. Is left over or surplus;
3. Reached its expiration date;
4. Deregistered;

There are 3 ways you can register for the program

Phone 1800 008 182

Complete the Inventory Form available on this website and wither fax it to the number displayed, or, mail it to us.

5.4.1 Dispose of unusable chemical

4	3	2	1	0
Unusable chemicals are stored, dated and labelled 'not for use' **AND** I have an inventory of all unwanted chemicals **AND** My inventory includes manufacturer and product name, size of the container, estimation of the remaining quantity in the container **AND** They are disposed through Chemclear.	Unusable chemicals are stored, dated and labelled 'not for use' **AND** I have an inventory of all unwanted chemicals **AND** My inventory includes manufacturer and product name, size of the container, estimation of the remaining quantity in the container.	Unusable chemicals are stored not for use **AND** I have an inventory of all unwanted chemicals.	I store all unusable chemicals **BUT** I do not have procedures to dispose of them.	We don't collect unusable chemicals. There is no procedure to dispose of them.

Inventory Form for Registrations
http://www.chemclear.com.au/res/File/ChemClear/27284%20AGSAFE%20Chemclear%20Inventory%20Pad_4.pdf
Chemical User Fact Sheet
http://www.chemclear.com.au/res/File/Fact%20Sheet%20General%20Info%20Users%202009.pdf
Product Registration Guide
http://www.chemclear.com.au/res/File/ChemClear/Fact%20Sheet%20Product%20Registration%20Guide.pdf
Chem Clear web
http://www.chemclear.com.au/index.php

5.4.2 Disposal of empty chemical containers				
4	**3**	**2**	**1**	**0**
I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: 1.drums larger than 1 litre/Kg and up to 205 L/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) 2.drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill **AND** I dispose drums larger than 1L/Kg through drumMUSTER. **AND** I only purchase chemicals that have drumMUSTER approved drums (with drumMUSTER logo).	I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: 1.drums larger than 1 litre/Kg and up to 205 L/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) 2.drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill **AND** I dispose drums larger than 1L/Kg through drumMUSTER.	I collect and store all unusable empty chemical containers **AND** I separate drums in two groups: a) drums larger than 1 litre/Kg (eligible to be collected through drumMUSTER, when logo is on the drum) b) drums smaller than 1 litre/Kg **AND** I use appropriate rinsing methods to wash all my containers (e.g. following drumMUSTER guidelines for pressure rinsing or triple rinsing **AND** I dispose drums smaller than 1 litre/Kg to landfill.	I collect and store all unusable empty chemical containers.	I don't collect empty chemical containers.
N/A – I do not use any chemical sold in containers.				

Source for methods to properly rinse containers:
http://www.drummuster.com.au/content.php?id=30

CHAPTER 6
SOCIAL RELATIONS

AUTHORS : Dee Hoad – d'Arenberg Wines (www.darenberg.com.au) (Employees & Contractors Relations)
Irina Santiago - McLaren Vale Grape Wine & Tourism Association (www.mclarenvale.info) (Community Relations & Winery Relations)

REVIEWERS : Dee Hoad - d'Arenberg Wines (www.darenberg.com.au) (Employees & Contractors Relations & Community Relations)
Paul Georgiadis - Paul Georgiadis Consulting and Paulmara Estate Wine (www.paulmara.com.au) (Winery Relations)

In this chapter

Section 6.1	Employees & Contractors Relations	97
Section 6.2	Community Relations	106
Section 6.3	Winery Relations	109

Human Resource Management is the process of attracting, developing and maintaining a quality workforce. Recruitment strategies for employees and/or contractor selection are essential to assist you obtain suitably experienced and qualified staff to carry out their role.

6.1.1 Recruitment of employees				
4	**3**	**2**	**1**	**0**
An existing employee or I fill the role of recruitment **OR** A recruitment agency is used **AND** There is a written recruitment plan with a standard job description for each position in the organization **AND** I have a benchmark for the time required for developing each role **AND** A variety of advertising methods is used to recruit employees **AND** The recruitment plan includes selection criteria.	I recruit as required **BUT** I have an informal recruitment strategy in place that is not written **AND** I have a list of potential casual employees that I can use **AND** I contact them in advance to plan the task I'll need to perform.	An existing employee or I fill the role of recruitment **OR** A recruitment agency is used **AND** I have a list of potential casual employees that I can use **AND** A recruitment strategy is developed as required when planning new tasks/contracting new employees.	I recruit as required **BUT** I have an informal recruitment strategy in place that is not written **AND** I have a list of potential casual employees that I can use **AND** I contact them in advance to plan the task I'll need to perform.	I don't have a recruitment plan. I recruit as required.
N/A – I do not have any employees. If I ever hire someone, it would be done through a contractor.				

Job interviews are part of the process of hiring employees. A job interview is a method to help to evaluate and select potential employees. It is useful to help the employer to evaluate if the potential candidate is or isn't suitable for the job. Interview techniques help the employer to ensure they place the right candidate in the role.

6.1.2 Interviewing for hiring

4	3	2	1	0
There is a structured interview based selection criteria **AND** A written letter (or email) of offer to the successful candidate is provided **AND** A letter (or email) to unsuccessful applicants is also sent out **AND** The candidate is reference checked.	There is a structured interview based on the job description **AND** A written letter (or email) of offer to the successful candidate is provided **AND** A letter (or email) to unsuccessful applicants is also sent out.	A generic interviewing process is in place **AND** A written letter (or email) of offer to the successful candidate is provided **AND** I do not advise all unsuccessful applicants of the outcome.	I have an informal interview process conducted by myself or the Supervisor **AND** Job offers are verbal.	I don't have an interview process in place.

N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.

6.1.3 Contractor selection				
4	**3**	**2**	**1**	**0**
I choose my contractor based on a combination of the lowest quote to perform the job and their potential to develop a quality job **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experiences **AND** It is also based on their ability to bring innovative solutions to the operations that can minimise negative impacts, improve quality and/or save money **AND** The licences and certificates necessary to perform the proposed task are taken into consideration when selecting contractors.	I choose my contractor based on a combination of the lowest quote to perform the job and their ability to complete the job satisfactory following my instructions and requirements **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experience **AND** It is also based on their ability to bring innovative solutions to the operations that can minimise negative impacts, improve quality and/or save money.	I choose my contractor based on a combination of the lowest quote to perform the job and their ability to complete the job satisfactory following my instructions and requirements **AND** I also choose my contractor based on references from other vineyards that have already used their services or my own past experiences.	I choose my contractor specifically based on the lowest quote to perform the job.	I do not have any criteria to hire contractors. I hire as required.
N/A – I do not use independent contractors.				

6.1.4 Contractor hiring				
4	**3**	**2**	**1**	**0**
There is a written contract for all the contractors specifying, the cost, location, operation to be performed, responsibilities of each party, starting date, finishing date and special requirements **AND** All necessary licenses to perform the tasks are checked by me or someone from my vineyard.	There is a written contract that is signed prior the beginning of the job **AND** the expectations of performance and timing to complete the job are established.	There is a written commitment on the task to be performed **AND** the expectations of performance and timing to complete the job are established.	There is a verbal commitment on the task to be performed **AND** the expectations of performance and timing are established.	There is only a verbal commitment on the task to be performed.
N/A – I do not use independent contractors.				

Difference between Employee and Contractors (Fair Work Ombudsman - Australian Government)
http://www.fairwork.gov.au/resources/fact-sheets/workplace-rights/pages/independent-contractors-and-emplyees-fact-sheet.aspx
Is the person performing the work for you an employee or a contractor (Employee/Contractor decision tool)
http://www.ato.gov.au/businesses/content.aspx?doc=/content/00095062.htm&pc=001/003/018/003/001&mnu=35879&mfp=001/003&st=&cy=1
About.com - Human Resources (variety of topics related to human resources)
http://humanresources.about.com
Australian Human Resources Institute
www.ahri.com.au

Employee Orientation and Training are necessary to ensure staff can carry out their role effectively and safely.

6.1.5 Induction and training				
4	**3**	**2**	**1**	**0**
There is a formal induction in place for new employees, which is documented **AND** The induction is signed off **AND** There is on the job training and mentoring in place **AND** Structured internal and external training is provided **AND** Training records are maintained **AND** I have written SOPs (Standard Operational Procedures) **AND** My SOPs are available for my employees **AND** Further training needs identifying and scheduled as part of a structured program.	There is a formal induction in place for new employees, which is documented **AND** The induction is signed off **AND** There is on the job training and mentoring in place **AND** Both internal and external training are provided as required **AND** Training records are maintained **AND** I have written SOPs (Standard Operational Procedures) **AND** My SOPs are available for my employees.	There is a formal induction in place for new employees, which is documented **AND** There is on the job training and mentoring in place.	There is an informal induction conducted where the job, the tools, equipment and procedures are demonstrated as well as what is expected from the employee **AND** There is some on the job training provided **BUT** It is not documented.	There is no induction and/or training program in place.
N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.				

Remuneration should reflect the responsibilities of the role and attract a suitably qualified employee. Incentives, such as 'pay for performance' might help the vineyard to save money in its operations. 'Incentive pay', also known as "pay for performance" is generally given for specific performance results rather than simply for time worked. While incentives are not the answer to all personnel challenges, they can do much to increase worker performance' (source: Gregorio Billikopf Encina from the University of California)

6.1.6 Remuneration				
4	**3**	**2**	**1**	**0**
Remuneration reflects skills and qualifications **AND** Company Grading System provides guidelines **OR** I have a 'pay for performance' system to reward more efficient employees **AND** There are also some other benefits to motivate and retain employees.	Remuneration reflects skills and qualifications **AND** Company Grading System provides guidelines **OR** I have a 'pay for performance' system to reward more efficient employees.	I pay above industry award rates to attract suitably qualified staff when necessary **BUT** I don't have any plan or system in place.	I pay basic award rates to my employees when they commence, irrespective of experience.	I don't have a remuneration plan.
N/A – I don't have any employees. If I ever hire someone, it would be done through a contractor.				

SafeWork SA from the Government of South Australia
www.safework.sa.com.au
Labour Management in Agriculture
http://www.cnr.berkeley.edu/ucce50/ag-labor/7labor/001.htm
South Australian Legislation
http://www.legislation.sa.gov.au/index.aspx

Performance Appraisals allow for both employee and employer comments, and joint action plans. 'Performance appraisal in its simplest form is the process in which the employer decides how well the employee is doing in relation to the employer's expectations and the employee's expectations. This goes on whether there is a formal process or not and whether the employee is informed as to how he/she is doing. The employer should formalize the process and use it as a means of improving the performance of the employee. The process also helps the employer and employee address the employee's satisfaction with the job.' (Source: Performance Appraisal of Farm Employees from Ohio State University)

6.1.7 Performance appraisals				
4	**3**	**2**	**1**	**0**
I conduct performance appraisals regularly following a structured process enabling both employer and employee inputs **AND** The outcomes are documented **AND** I use the results of the performance appraisal for career development planning and further training.	I conduct performance appraisals regularly following a structured process enabling both employer and employee inputs **AND** The outcomes are documented.	I conduct performance appraisals as required **AND** The outcomes are documented **BUT** There is no structured process in place.	I conduct performance appraisals when requested by an employee.	I don't conduct performance appraisals.

It's important to communicate company strategies, practices, policies, standard operating procedures and **legislative requirements** to employees. A good communication process helps the employee to perform better; the employees understand what is expected from them, their rights and obligations. Toolbox meeting is an interesting process to increase safety involvement and awareness at grass roots level. Toolbox meetings are usually run in small work groups. The meetings are short, about 5 to 10 minutes, and informal. The basic idea is to provide a direct method of communication and exchange of information between management, supervision and the shop floor with the purpose of improving safety and health by directly involving workers in issues that are important to them. Using tool box meetings is an ideal way to get employees involved in matters relating to their own safety, finding solutions to problems, as well as building a committed and productive team. (Source: Achieve Safety)

6.1.8 Employee relations and communication				
4	**3**	**2**	**1**	**0**
Scheduled monthly meetings are in place **AND** Minutes of Meetings are taken **AND** Toolbox meetings are held regularly **AND** Memos and/or Minutes are distributed, emailed or placed on notice boards.	I schedule regular meetings **AND** Minutes of Meetings are taken **AND** Toolbox meetings are held as required.	I hold meetings as required to advise of any company practices, policies, standard operating procedures and legislative requirements.	I rarely have meetings **BUT** I recognise the need to keep employees informed.	I don't have meetings with employees to discuss work matters.

Organisations have a duty of care to provide their employees with a safe working environment

6.1.9 Employees' safety				
4	**3**	**2**	**1**	**0**
Formal and informal OH&S training is conducted regularly **AND** Scheduled Safety Audits are conducted* **AND** An Incident/Accident Reporting system is in place **AND** PPE (Personal Protective Equipment) is required or supplied to perform tasks **AND** There is an OH&S Committee who make recommendations.**	Formal and informal OH&S training is conducted regularly **AND** Scheduled Safety Audits are conducted* **AND** An Incident/Accident Reporting system is in place **AND** PPE (Personal Protective Equipment) is required or supplied to perform tasks.	Informal OH&S training is conducted regularly **AND** Safety Audits are conducted as required.*	I endeavour to follow safe practices, and follow legislative requirements.	I don't have concerns about safety training.
N/A – I do not have employees.				

*If you are a small vineyard, visual inspections are acceptable

**Applicable only for large vineyard

The community surrounding your vineyard is also important for the sustainability of your vineyard.

6.2.1 Knowledge and support on community initiatives				
4	**3**	**2**	**1**	**0**
I am aware of some community initiatives **AND** I have helped to promote these initiatives (e.g. telling friends to support/attend, sending invitation emails, etc.) **AND** I have volunteered to help the development of community initiatives **AND** I encourage my employees or other family members to be part of community initiatives.	I am aware of some community initiatives **AND** I have helped to promote these initiatives (e.g. telling friends to support/attend, sending invitation emails, etc.) **AND** I have volunteered to help the development of community initiatives.	I am aware of some community initiatives **AND** I have helped to promote these initiates (e.g. telling friends to support/attend, sending invitation emails, etc.).	I am aware of some community initiatives.	I am not aware of any community initiatives.

6.2.2 Neighbours' relations				
4	**3**	**2**	**1**	**0**
I know who my neighbours are **AND** I regularly exchange information with them regarding vineyard matters **AND** We support each other when necessary (e.g. vintage, help to find specialised service, equipment hire, loan, tip, etc.).	I know who my neighbours are **AND** I often exchange information and ideas with them regarding vineyard matters.	I know who my neighbours are **AND** We exchange information regarding vineyard matters on an as needs basis.	I know who my neighbours are **BUT** I do not have any contact with them.	I do not know who my neighbours are.

6.2.3 McLaren Vale Sustainable Winegrowing Australia support				
4	3	2	1	0
I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program **AND** I have attended at least one of the events of the program (e.g. launching of the program, launching of the results) **AND** I have volunteered to help the program development (e.g. as author, reviewer, promoter in presentations, etc.).	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program **AND** I have attended at least one of the events of the program (e.g. launching of the program, launching of the results).	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator **AND** I have helped to bring at least one new member into the program.	I am a member of McLaren Vale Sustainable Winegrowing Australia **AND** I have sent at least one written feedback to the program coordinator.	I don't know what McLaren Vale Sustainable Winegrowing Australia means.

6.2.4 Local seminars and workshops related to viticulture				
4	**3**	**2**	**1**	**0**
I, or someone in my vineyard, attended at least one seminar; organized by local associations or organisations in the last 12 months **AND** I have been providing feed-back on my training requirements.	I or someone in my vineyard attended at least one seminar, organised by local associations or organisations in the last 12 months.	I, or someone in my vineyard, have attended at least one seminar, organised by local associations or organisations in the last 24 months.	I, or someone in my vineyard have attended locally organised workshops and or seminars **BUT** Nobody has attended any seminars or workshops in the last 24 months.	I don't go to local seminars and/or workshops.

6.2.5 Participation in committees and volunteer work				
4	**3**	**2**	**1**	**0**
I think committee participation and volunteer work are important **AND** I or someone in my vineyard are ongoing members of a committee/s **AND** participate in voluntary work on a regular basis.	I think committee participation and volunteer work are important **AND** I, or someone in my vineyard, have been part of a committee in the last 12 months **AND** have volunteered at least once in the last 12 months.	I think committee participation and volunteer work are important **AND** I, or someone in my vineyard, have been part of a committee in the last 24 months **OR** have volunteered at least once in the last 24 months.	I think committee participation and volunteer work are important **BUT** Have not had the opportunity to be part of a committee or be a volunteer.	I don't think committee participation and volunteer work are important.

6.3.1 Contracts				
4	**3**	**2**	**1**	**0**
I always sell my grapes with contracts **AND** The contracts specify, at least, Term of Agreement, vineyard location, variety, prices, tonnes, payment terms and delivery location **AND** The contracts also specify expected quality for the fruit (growing to specification) **AND** It also has a reward system for quality (bonus) **AND** My contract has quality control standards (penalty or rejection) clauses (higher or lower expected quality and/or tonnage reduction or over production) **AND** My contracts also specify other possible winery requirements, estimates and acceptance advice, need for certifications, etc. **AND** My contracts also specify other requirements for block details, tonnage, variety, area, clones and rootstocks, irrigation system.	I always sell my grapes with contracts **AND** The contracts specify, at least, variety, prices, amounts, payment conditions and delivery location **AND** The contracts also specify expected quality for the fruit (growing for specification) **AND** It also has a reward system for quality (bonus) **AND** My contract has quality control standards (penalty or rejection) clauses (higher or lower expected quality and/or tonnage reduction or over production).	I usually sell my grapes with contracts **AND** The contracts specify, at least, variety, prices, amounts, payment conditions and delivery location.	I do not sign written contracts **AND** When I sell my grapes, I have handshake agreements.	I do not have contracts to sell my grapes.
N/A – I am also the winemaker from the grapes produced by my own vineyard or our grapes are totally allocated to our own winery.				

6.3.2 Communication with the winery				
4	**3**	**2**	**1**	**0**
I think communication with the winery is important **AND** I always have an on-going dialogue with the winery on the overall situation in the vineyard that might impact on fruit quality or yield throughout the year. (This assists both the winery and the grower to manage expectations) **AND** My communication reinforces my contract to assure meeting specifications targets (emails, etc.).	I think communication with the winery is important **AND** During the growing season, I have an on-going dialog with the winery on the overall situation in the vineyard that might impact on fruit quality or yield throughout the year.	I think communication with the winery is important **AND** Prior to harvest I inform them at least once on the overall situation in the vineyard that might impact on fruit quality or yield.	I think communication with the winery is important	I avoid communicating with the winery as much as I can.

6.3.3 Grape grading				
4	**3**	**2**	**1**	**0**
The grading of my grapes is based on a winery system **AND** The winery has explained the grape grading process **AND** I participate in vineyard assessment (benchmarking) workshops with my winery **AND** They hold comparative tastings to show me how my wines compare to other growers/grades **AND** If there is a different perception of quality between my winery and I, there is an option for dispute resolution (e.g. independent/external expert to assess my grape quality to benchmark against the winery grading and to help me to improve my operations).	The grading of my grapes is based on a winery system **AND** The winery has explained how they grade my grapes **AND** I participate in vineyard assessment (benchmarking) workshops with my winery.	The grading of my grapes is based on a winery system **AND** The winery has explained how they grade my grapes.	The grading of my grapes is based on a winery system **AND** I have an overall understanding of the system.	I don't know how my grapes are graded.

6.3.4 Grape production, quality and vineyard operations				
4	**3**	**2**	**1**	**0**
Operations of my vineyard that might impact on the grape quality are discussed with the winery at critical phenological stages to meet the winery requirements **AND** I participate in the decision on harvest date and grape maturity with my winery to meet the specifications (produce the best wine possible).	Operations of my vineyard that might impact on the grape quality are discussed with the winery on critical phenological stages to meet the winery requirements.	My vineyard operations are solely defined by me to achieve the grape production and quality I to meet the winery requirements.	My vineyard operations are solely defined by me to achieve the grape production and quality I understand I can produce in my site.	I do not have an understanding of which practices might impact on the grape quality.

6.3.5 Grape chemistry testing				
4	**3**	**2**	**1**	**0**
We or the winery perform grape chemistry tests to follow up the grape maturity **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH **AND** We use historical data of the grape chemistry test to help us on our operational decisions in the vineyard.	We or the winery perform grape chemistry tests to follow up the grape maturity **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH.	We or the winery perform grape chemistry tests at least once before harvest **AND** The tests include at least TSS (Total soluble solids to measure sugars), TA (Titratable Acidity) and pH.	We only perform grape chemistry tests if requested by the winery.	We do not perform chemical tests for the grapes.

6.3.6 Record keeping for the winery				
4	**3**	**2**	**1**	**0**
I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits **AND** I regularly send out a short report, emphasizing the key operational issues in the vineyard (e.g. sprays, irrigation, rainfall, heat degree days, etc.) that might impact on the wineries' requirements.	I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits **AND** I send out a short report prior to harvest, emphasizing the key operational issues in the vineyard (e.g. sprays, irrigation, etc.) that might impact on the wineries' requirements.	I have my records available for the winery **AND** I have them organised so I can check/answer questions from the wineries during their visits.	I have my records available for the winery upon request.	I do not keep or organise any of my records to have available for the wineries.

6.3.7 Wine produced from your grapes				
4	**3**	**2**	**1**	**0**
There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes **AND** I have met all the specifications of my winery for my grapes **AND** I make wine from my blocks to benchmark the wines.	There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes **AND** I have met all the specifications of my winery for my grapes.	There is a transparency between my winery & myself that allows me to know what wine is produced from my grapes.	I have an overall idea of what type of wine the wineries produce from my grapes.	I do not know what sort of wine is produced from my grapes.