**Land preparation.** It is essential that land preparation gets under way early in the autumn preceding planting. Ripping should be done when the soil is dry or only slightly damp; if done when wet, major soil structural damage can occur. The bulk of soil preparation and weed control is best done before winter; March.

**Application of superphosphate, and gypsum, lime or manure if necessary:** must be done before soils become too wet; March/April.

**Planting of mid row cover crop if appropriate, windbreak for new vines; March/April.**

**Sow cover crop in planting row on steep slopes to stabilise soil; March/April.**

**Irrigation and trellis installation; March–August.**

** Weed control in planting rows, herbicide (or cultivation where no trellis exists); September.**

**Planting: do not plant later than the end of November anywhere, as vines will not make sufficient growth to establish strong root systems in the first year; start in July in warmer areas, through to the end of October (depending on area).**

**Thorough planning of vineyard development and ongoing management is crucial. Vineyards are large capital investments which should be planned and designed so that they remain productive and profitable for many years. It is very important that we practise sustainable viticulture, which demands that we care for the vines as well as our natural resources of land and water.**

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**Scheduling of operations**

**Timing of operations in the development year is critical**

1. Establish source of funds! Organise as early as possible.
2. Design vineyard and determine property layout; 12–24 months before planting.
3. Order rootlings; 18–24 months preceding planting.
4. Establish windbreaks; spring, year before planting.
5. Trellis materials: order in ample time for planting. Early trellis installation allows maximisation of training opportunities; 6–12 months before planting.
6. Soil test/analyses; January or earlier.
7. Drainage installation; January or earlier.
8. Herbicide control of problem weeds; January/February.
9. Mark out vineyard rows precisely; February.
10. Irrigation design; March.

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**Site Planning and Preparation**

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During and after the decision to plant or replant a vineyard, the planning and preparation offer critical steps towards the successful completion of the investment. The process of soil survey and irrigation evaluation are simple, but are far too often overlooked in the need for haste and cost savings. This paper highlights the benefits of both the soil survey and irrigation evaluation and the effects they can have on the development of a vineyard.

**Soil survey**

By my definition a soil survey is a systematic method of defining soil characteristics to enable the determination of potential vine growth. Physically it is a mapped series of holes, generally 2 m backhoe pits on a 75 m × 75 m grid, which enables a trained soil scientist to identify and measure soil characteristics. Obviously not all sites will allow 2 m holes and often auger holes will provide sufficient information. Similarly, on some sites where soil variation is expected to be great, a more detailed grid should be used.

The soil characteristics generally measured are:

- soil types
- horizon depths
- structure
- impeding layers
- pH
- salinity
- other chemicals
- pests and diseases

These characteristics can then be plotted individually or used to calculate other parameters which will have a more significant bearing on potential vine growth. These parameters include:

- Top soil depth and type: a simple observation made according to well defined soil type definitions.
- Depth to an impeding layer: once again an observation for the occurrence of lime, clay and/or water. Besides affecting the potential root zone this is important in determining ripping depth, the type of soil ameliorant and the requirement for drainage.
- Root zone depth: a notional calculation using an experienced evaluation of potential penetration of vine roots into an impeding layer.
- Readily available water (RAW): again a calculation based on the water holding capacity of different soil types and their ability to release water to the vine.
With experience and commonsense the potential vine growth can be assessed and will be influenced by:

- Water holding capacity: this reflects many of the physical soil parameters, and in the absence of any major inhibiting soil character, is the major determinant of potential vine growth.
- Infiltration rate: this will have a major effect on irrigation design as well as vineyard layout and soil preparation.
- Water table and potential drainage: at worst, this will severely affect vine growth, and at manageable levels have a major effect on cost and project viability.
- Soil health: is reflected in fertility and the ability to hold and release nutrients and any physical condition that could influence growth or ultimate end use of grapes.

Besides the soil’s effect on potential vine growth the soil survey should influence a number of other development parameters, which I have listed in no particular order as different sites will have different priorities.

- Irrigation type and design: generally climate will determine the irrigation requirement, but the soil characters will determine the type of irrigation—i.e. drip vs overhead vs undervine vs flood—and the ultimate design in terms of frequency and amounts.
- Drainage: whilst directly affecting vine growth, a potential future drainage problem requires the provision of woodlots and/or drainage basins in the initial design. The timing of the implementation of drainage will have a major effect on the project viability.
- Variety and rootstock will be affected by different soil characters ranging from the physical soil structure and type, the chemical profile and the presence of pests or disease such as Phylloxera and nematodes.
- Planting density will reflect an assessment of vine growth potential as well as perceived end use.
- Vine nutrition relative to soil health will affect both soil preparation and the ongoing vine nutrition program.
- Soil preparation and ameliorants: in conjunction with a contour map of the site will determine:
  - Earthworks: where flood irrigation is preferred, the need for laser levelling. On hilly and steep sites earthworks may be required for re-shaping the site to allow more efficient use. Previous land-use, e.g. quarrying, may require repairs.
  - Ripping the soil survey will highlight impediments to root growth such as clay or limestone that may be altered by shattering. The timing of this operation is critical for useful results. Ripping is also of great assistance in row determination and as an aid for trellis installation.
  - A melioration: the soil survey should highlight the need for gypsum application where clay may be a problem, lime application for soils with low pH and/or phosphorus application in soils inherently low in phosphorus. Other sites in other environments may require other specific additions.

These are all characters, parameters and conditions measured of influenced by the soil survey. It is important to note that when purchasing property for a new vineyard a basic soils survey on a grid of say 150 m x 150 m should be performed to highlight any major inhibiting characters, which all too often are not visible from the surface.

As a developer of either a new or old vineyard, once you have completed your soil survey, the results should be integrated into the irrigation survey or evaluation.

Besides the effect of soil type on irrigation type and design the following parameters need to be considered:

- Climate: as mentioned previously this will influence firstly the need for irrigation and secondly the maximum periodic requirement. Generally one needs to take account of the most severe weather conditions and the most susceptible period for vine growth. For Mildara Blass Limited at Parker’s Field the end of a heat wave in January where Class A pan evaporation is well over 20 mm per day and expected vine requirement towards 80% evaporation is the critical period in the irrigation design. Whilst this is extreme due to the vineyard site, vineyards in more moderate regions will still have a peak requirement period where grape quality and quantity will be affected adversely.
- Climate will also have bearing on frost likelihood and frequency which in turn will lead to appraisal of alternate irrigation systems.
- Water availability and quality: whether the water source is from a river, drain, bore or mains the quality and quantity should be known. The grower needs to consider:
  - the licence type and cost
  - the risk of interruption of supply
  - the peak requirement with respect to source capacity, pump capacity, mainline capacity and filter capacity
- the need for filtration
  - the salinity and the need for flushing
  - the chemical content and the need for other treatments
- Topography: will have its greatest effect on the hydraulic design of the irrigation system
- Power and pumping costs: the availability and existence of different cost rates needs to be considered. The effect of a peak load on a common supply system should be evaluated.
- End-use: the grower should be aware of the expected end-use of the crop which will affect the type and quantity of irrigation.
- Environment: as responsible viticulturists we need to consider the effects of irrigation on our surrounding environment and in many cases where licence transfers are required an environmental impact study is becoming mandatory.
- Authorities (government and private): in licence transfers, many more government authorities have input which necessitates planning for time and resources to fulfill all criteria adequately. In areas where authorities provide the supply, our irrigation system needs flexibility to cater for the ordering of water supply and potential changes in conditions over the life of an irrigation system.

Overall the irrigation evaluation is a complicated series of factors that will determine the final system and speed at which installation and implementation can occur.

In conclusion I would add that no matter what level of preparation is planned for, ensure that you have adequate time to follow all procedures through so that you ensure that the vineyard is long-term and economic.