Gathering Information/Site Checklist

The first stage in the development of an irrigation system to gather the necessary site-specific information needed to complete a design.

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
A.1		**Site Layout**				
A.1.1	Map	Obtain a copy of the property map including infrastructure and land features	3.1	This can be covered through a series of labelled aerial and farm maps clearly indicating all aspects as listed. If a section is not applicable (N/A), explain why		
A.1.2	Topography	Identify land features that may affect the design including slope, hills, gullies, waterways	3.1			
A.1.3	Design Area	Identify the areas that the purchaser would like to irrigate	3.1			
A.1.4	Fencing	Identify existing or potential fencing arrangements and the purchaser's preference around relocating, if necessary	3.1			
A.1.5	Shelter and Natural Tree growth	Identify the natural and artificial wind breaks/large trees that are present or will be construction issues	3.1			
A.1.6	Land Restrictions	Identify protected areas or covenants on titles, and the location of any sensitive areas	3.1			
A.1.7	Energy Source	If power is required, locate the nearest supplies and identify any limitations	3.1			
A.1.8	Vandalism	Identify potential for vandalism	3.1			
A.2		**Water Source**				
A.2.1	Water Supply Location	Identify the location of existing suitable water supplies, or potential future water supplies	3.1	Any uncertainties in gaining access to water and any requirements for gaining access (e.g. easements) should be discussed prior to beginning any irrigation design		
A.2.2	Water Quantity/ chemistry	Identify how much water is available, both in terms of flow rate and total volume per season	3.1			
A.2.3	Water Supply Reliability	Determine if water restrictions are a problem that require water storage or extra capacity in the irrigations system for 'catching up'	3.1			
A.2.4	Water Quality	Determine if the water quality is physically and chemically suitable for the proposed irrigation development	3.1			

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
A.3		**Soils Information**				
A.3.1	Soil Type	Identify the types and locations of the soils on the property	3.1	This can be covered through a series of labelled aerial and farm maps.		
A.3.2	Available Water Holding Capacity	Determine the depth of water that is available to plants	3.1			
A.3.3	Effective Crop Rooting Depth	Determine the depth from which roots extract water from the soil	3.1			
A.3.4	Management allowable deficit	Determine how dry the soil can become before it requires watering	3.1			
A.3.5	Infiltration rate	Determine the speed at which the soil absorbs water. This may be affected by other soil features such as pans, drains, or stock treading	3.1			
A.3.6	Drainage	Identify any areas with poor or enhanced drainage. This may include natural or artificial soil drainage	3.1			
A.3.7	Variability	Assess the likely variability of soil properties across the property	3.1			
A.4		**Climate Information**				
A.4.1	Rainfall	Obtain rainfall records for the property, or from the nearest weather station	3.1	A statement should be provided that details where the data has been sourced from and the applicability of this to the farm for each parameter		
A.4.2	Evapotranspiration	Obtain evapotranspiration-related parameters for the property	3.1			
A.4.3	Wind	Determine the prevailing wind directions and normal wind speed for the property	3.1			
A4.4	Building Shadow	Determine climatic changes due to building shadow such as with High Rise Buildings				
A.5		**Regulatory Requirements**				
A.5.1	Existing Regulations and By laws	Check that all the relevant regulations both from Local Authorities and State Government Departments have been identified which may affect the system	3.1	How the relevant conditions or rules are to be met by the design should be stated clearly		
A.5.2	EIS requirements	Determine if new EIS reports will need to be obtained and take this into consideration	3.1			
A.6		**Farm Management Information**				
A.6.1	Animals	Determine if any stock will be grazed in the irrigation areas. If yes, what type and how many?	3.1			

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
A.6.2	Crops	Identify the types of crops to be grown in the short-term and long-term. Determine if crops contracts impose any conditions with respect to irrigation	3.1			
A.6.3	Other Water Needs	Determine if water is required for other purposes (i.e. drinking water for Golf Course, stock water, fruit cooling, frost protection, leaching of salts)	3.1			
A.6.4	Labour	Determine the skill level of the labour available to operate the system	3.1			
A.6.5	Risk Preference	Determine how much risk of not meeting demand the purchaser is prepared to accept	3.1			
A.6.6	System Type	Determine if the purchaser has any preference for irrigation system types	3.1	State the reasons why		
A.6.7	Process Control	Identify the purchaser's preference for automated checks and controls	3.1			
A.6.8	Price Limits	Determine what the purchaser's limitations are on how much money they are prepared to spend	3.1	Possibility of staging / phasing the project to help with initial costs		
A.6.9	Delivery	Determine the date by which the system must be operational	3.1	If phasing the project, state the date for each stage		
A.6.10	Health and Safety	Identify any health and safety issues pertinent to the site	3.1			
A.6.11	Other	Identify any other issues relevant to the purchaser	3.1			

Design Performance Parameters

The second stage in developing an irrigation system is to determine the level of performance of the future system.

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
B.1		**Irrigation Area**				
B.1.1	Location	Determine an appropriate sized and located area	3.1	Aim to irrigate the greatest land area for the greatest benefit		
B.1.2	Project Management	Paddock layout and management factors taken into account	3.1	Take into account covenants on titles or protected areas		
B.2		**System Capacity**				

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
B.2.1	Peak Demand	Decide on the peak water demand which is agreed with the purchaser	3.2	Ideally, the design will meet the peak water demand for each crop in the design area		
B.2.2	Capacity	Determine capacity of the system (W) allowing for agreed water losses	3.2			
B.3		**Application Depth**				
B.3.1	Depth	Application depth range determined	3.3	Show calculations		
B.3.2	Contamination	Identify if any potential contaminants are present	3.3	Care must be taken to avoid leaching		
B.4		**Return Interval**				
B.4.1	Frequency	Calculate the minimum required return interval	3.4			
B.5		**Application Intensity**				
B.5.1	Maximum	Determine the maximum application intensity of the system	3.5	Show calculations		
B.5.2	Infiltration Rate	Application intensity does not exceed infiltration rate of the soil	3.5	Show calculations		
B.5.3	Application duration	Determine the different application intensities for different durations	3.5	Show calculations		
B.5.4	Land Slope	Application intensity reduction for sloping ground	3.5			
B.6		**Other Performance Targets**				
B.6.1	Application Efficiency	Efficiency must be ≥80%	3.7	Show calculations		

System Design

The third stage in designing an irrigation system is to select components and create detailed plans describing how the system will achieve the design specifications.

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
C.1		**Irrigation System Selection**				
C.1.1	Design	Determine the best irrigation system type for the performance targets	3.9	Is it easy to operate? Is it reliable?		
C.1.2	Layout	Take in to account any site-specific constraints	3.9	Take into account sensitive areas or protected areas		
C.1.3	Performance	Compare system to the KPIs.	3.9	Does the system match the soil-climate system? Does this meet the needs of the purchaser?		
C.1.4	Impact Energy	Identify potential problems with stream impact energy. Ensure the irrigation design minimises these problems	3.9	Show selection process		

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
C.2		**Sprinkler/Emitter Layout**				
C.2.1	Uniformity	Application uniformity meets standard	3.6	If constraints dictate a system with lower uniformity than standard, the designer must clearly explain why		
C.2.2	Intensity	Application intensity meets or exceeds design specification	3.5	Show calculations		
C.2.3	Pressure	Incorporate elevation variations into calculations	4.2	Pressure range kept within manufacturers recommendation		
C.2.4	Water Quality	Take into account when selecting emitters/sprinklers	4.2	Consider level of filtration and use of fertilisers		
C.2.5	Wind	Take into consideration the frequency and direction of prevailing winds	4.2	Show considerations		
C.2.6	Alignment	Travelling irrigators and linear move systems should operate in straight rows	4.2			
C.3		**Hydraulic Design**				
C.3.1	Water Velocity	Both maximum and minimum flow velocities should meet standards	4.1	Strike a balance between water velocity and pipe cost		
C.3.2	Pressure	Minimise pressure variation between water outlets; must meet standards	4.2	Show considerations		
C.3.3	Pipe Friction	Friction must meet standard	4.3	Take in to account the effect of pipe type		
C.3.4	Surges and Pressure Relief	Must meet standards. Air release valves and thrust blocks must be specified	4.3			
C.3.5	Filtration	Match to the water quality and system type	4.3	Statement required		
C.3.6	Filter	Filter size must meet standard making sure velocity does not exceed 0.5m/s through screen	4.3			
C.3.7	Efficiency	Both hydraulic efficiency and distribution efficiency must meet standards (≤95%)	4.3	Show calculations		
C.4		**Pumping Stations**				
C.4.1	Design	Determine the best system for the design	4.4	There are many parameters that must be considered, i.e., flow rate, power required, speed, servicing/cleaning		

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
C.4.2	Duty	Determine the pump flow rate(s). Add the safety factor. What is the most economical solution?	4.4	State rate and show calculations		
C.4.3	Pump Efficiency	Determine the best design, they should operate near or at their maximum efficiency, based on the standards	4.4	Show calculations using pump curves for clarity		
C.4.4	Motors	Select a motor that meets or exceeds the efficiency standards	4.4	Should be matched to pumps so they operate >95% max efficiency		
C.4.5	Centrifugal Pumps	Specify the total suction lift, flexible couplings and a method for priming	4.4	Design to prevent cavitation		
C.4.6	Submersible Pumps	Include allowances for drawdown in the well and fluctuations in groundwater level over time	4.4			
C.4.7	Pump Electrics	Systems must be designed to meet local and national electrical standards and requirements	4.4			
C.4.8	Intakes	Exclude fish, and apply local or national standards if available	4.4	May need to have an infiltration system/ screen to exclude debris too		
C.4.9	Suction Lines	Must comply with the standards	4.4	Show NPSHa vs NPSHr calculations		
C.4.10	Headworks	Allow for easy control and monitoring of system operation	4.4	Show calculations		
C.4.11	Fertiliser	Allow for possible fertiliser injection into the system via fittings in headworks	4.4			
C.4.12	Backflow Prevention	Must be installed on all systems where contamination is possible	4.4			
C.4.13	Pump Sheds	All pumping systems must have a shed that complies with standards	4.4	Show considerations		
C.5		**Control**				
C.5.1	Control	The design must meet the purchasers needs and meet the standards	4.5	Show considerations, set out control philosophy		
C.6		**Measurement and Monitoring**				
C.6.1	Flow	Measuring devises must be installed. Determine if your consent requires specific conditions	4.6	Records flow rate and total volume		
C.6.2	Pressure Gauges	Must be installed on all systems. Must comply with standards	4.6	Design should specify where gauges or sampling points are to be installed		

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
C.6.3	Water Level monitoring and control	Must be installed in the production well and monitoring wells. Must comply with standards	4.6			
C.6.4	Water Quality	Access point needed	4.6	Sampling tap at headwords is recommended		
C.6.5	Soil Moisture	Discuss monitoring options with purchaser	4.6	Show how this relates to control philosophy		
C.6.6	Power Consumption	Monitoring operational power consumption	4.6	Show long term cost calculations		
C.7		**Performance Targets**				
C.7.1	Finalisation	Prior to finalising the design, check it matches the KPI's set at the start of the process				

Final Specification and Quotation

The last stage in designing an irrigation system is to provide the purchaser with a design report and plan which summarises the final system specifications.

Number	Item	Description	Section of CoP	Comments	Design 1	Design 2
D.1		**Final Design Report**				
D.1.1	Documentation	Design report and Plan	5.1	Must be adequate to show client the key features of the system, departures from CoP and the KPI's		
D.1.2	Quotation	Bill of Materials	5.2	A bill of materials for major components		