ACT Government

MUNICIPAL INFRASTRUCTURE STANDARDS

Part 18 Irrigation

TCCS
Transport Canberra City Services

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Endorsed By:	Karl Cloos	Director, Infrastructure Planning
Approved By:	Ken Marshall	Executive Branch Manager, Roads ACT

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1 IRRIGATION

1.1 General

These standards form part of any project brief issued by the ACT Government that contains an irrigation design component, or for any irrigation system developed by the private sector for ongoing management by the ACT Government.

Irrigation of public landscapes is one of the major consumers of Canberra's reticulated water supply and the ACT Government has a policy to reduce that demand wherever possible by utilising recycled water from treatment works and available reserves of non potable water from local stormwater harvest facilities.

These standards are for the irrigation of urban open spaces. NOTE: for all sports and recreation irrigation requirements refer to *MIS 19 Sportsground design*.

1.1.1 Responsibilities

1.1.1.1 Objectives

The planning and design of irrigation and associated infrastructure will:

- Provide a guiding framework for new developments as well as upgrades;
- Provide easy to maintain irrigation and open space assets to current Industry Best Practise and or TCCS Standards for safety, access and function;
- Encourage inclusive recreational and social interaction, contributing to a strong sense of community and an enhanced lifestyle for community members;
- Provide increased residential and environmental amenity for users and increased activity;
- Provide a safe, functional accessible and attractive environment;
- Minimise social problems by applying principals of Crime Prevention Through Environmental Design (CPTED);
- Encourage active living through the provision of facilities for recreation and outdoor activities; and
- Contribute to improved stormwater quality through the protection of stream flows and adjacent environments through the application of water sensitive urban design (WSUD) principles.

1.1.1.2 Precedence

Where any document, except legislation or the *Territory Plan*, issued referenced in this Municipal Infrastructure Standard (MIS) includes technical requirements that conflict with this MIS, consult with the service authority and TCCS for clarification.

1.1.2 Cross references

1.1.2.1 Commonwealth legislation

Commonwealth Legislation relevant to this Standard includes the following:

Australian Capital Territory (Planning and Land Management) Act

- Specifies areas of national significance to be managed under the National Capital Plan, in accordance with Section 10.

Environment Protection and Biodiversity Conservation Act

National Environment Protection Act

1.1.2.2 ACT legislation

ACT Legislation relevant to this Standard includes the following:

Building ACT

Climate Change and Greenhouse Gas Reduction Act

Discrimination Act

Emergencies Act

Environment Protection Act

> Environment Protection Regulation

Heritage Act

Lakes Act

Legislation Act

Nature Conservation Act

Planning and Development Act

> Provides for the preparation of the Territory Plan, including Suburb Precinct Codes, Precinct Codes, Development Codes , General Codes and Additional Codes relevant to commercial areas, such as:

- Crime Prevention Through Environmental Design (CPTED) General Code
- Lease Variation General Code
- Water Ways: Water Sensitive Urban Design General Code

> Planning and Development Regulation

Public Roads Act

Public Unleased Land Act

Tree Protection Act

Utility Networks (Public Safety) Regulation

Water Resources Act

> Water Resources Regulation

Waste Minimisation Act

Work Health and Safety Act

1.1.2.3 ACT Government strategic documents

Strategic documents prepared by various Directorates of the ACT Government relevant to this Standard include the following:

City Action Plan Government Actions and Investment in the City

Canberra: A Statement of Ambition

ACT Government Infrastructure Plan 2011-2021

Living Infrastructure Strategy

The ACT Planning Strategy – Planning for a Sustainable City

Statement of Planning Intent

The City Plan

The Canberra Spatial Plan

Canberra Plan: Towards Our Second Century

ACT Climate Change Adaption Strategy

Heritage Assessment Policy

ACT Heritage Strategy 2016-2021

ACT Water Strategy 2014-44: Striking the Balance

1.1.2.4 Design Standards

This Design Standard references the following component Standards:

MIS 01	Street planning and design
MIS 03	Pavement design
MIS 05	Active travel facilities design
MIS 06	Verges
MIS 11	Off-street parking
MIS 13	Traffic Control Devices
MIS 14	Public lighting
MIS19	Sportsground design
MIS 20	Street and park furniture and barbeques
MIS 22	Signage for urban parks and open space
MIS 23	Public toilets
MIS 24	Soft landscape design
MIS 25	Plant species for urban landscape projects

1.1.2.5 TCCS reference Documents

The following TCCS reference documents are related to this Standard:

Reference document 6	Design Acceptance submissions
Reference document 7	Operational acceptance submissions
Reference document 8	WAE quality records
Reference document 9	Final acceptance submissions

1.1.2.6 Design Guides

The following Design Guides are related to this Standard:

TCCS codes and design guides for designing and constructing assets

ACT Crime Prevention and Urban Design Resource Manual, ACT Government

Water Supply and Sewerage Standards (Icon Water):

WSA-02	Gravity Sewerage Code of Australia (WSAA)
WSA-03	Water Supply Code of Australia (WSAA)
STD-SPE-G-011	Supplement to WSA-02 2014 (Icon Water)
STD-SPE-G-012	Supplement to WSA-03 2011 (Icon Water)
STD-SPE-M-006	Requirements for property service connections and water meters

1.1.2.7 Further Reading

The following Plans of Management for urban open spaces are available on the ACT Legislation Register (under the Planning and Development Act – Disallowable instruments):

Woden and Weston Creek's Urban Parks and Sportsgrounds;

Belconnen's Urban Parks, Sportsgrounds and Lake Ginninderra;

Inner Canberra's Urban Parks and Sportsgrounds;

Tuggeranong's Urban Parks and Sportsgrounds;

Urban Open Space and Public Access Sportsgrounds in the Gungahlin Region; and

Canberra's Urban Lakes and Ponds

1.1.3 Reference documents

The following documents are incorporated into this Design Standard by reference:

1.1.3.1 Standards

AS/NZS 2032 Installation of PVC pipe systems

AS/NZS 2033 Installation of polyethylene pipe systems

AS/NZS 2845 Water supply – Backflow prevention devices

AS/NZS 3500 Plumbing and drainage

1.1.3.2 Other publications

Other resources relevant to public urban spaces include:

Environment protection policies (ACT Government), including:

- General Environment Protection Policy
- Water Quality Environment Protection Policy
- Wastewater Reuse for Irrigation Environment Protection Policy

ACT EPA Environmental Protection Guidelines for construction and land development in the Act

Active Living Impact Checklist – A tool for developments in the Australian Capital Territory

ACT Heritage Assessment Policy

ACT Heritage Register

ACT Water Sensitive Urban Design General Code

Infrastructure Sustainability Council of Australia

ACT Estate Development Code

Proprietary products: To *TCCS Products previously considered for use list*

1.1.4 Interpretations

1.1.4.1 Abbreviations

General: For the purposes of this Municipal Infrastructure Standard the following abbreviations apply:

AUSTROADS: Association of Australasian Road Transport and Traffic Agencies

CPTED: Crime Prevention Though Environmental Design

DA: Development Application

EPA: Environment Protection Authority, ACT Government and its successors

EPSDD: Environment, Planning and Sustainable Development Directorate, ACT Government and its successors

Ha: Hectares

NCA: National Capital Authority, ACT Government and its successors

TCCS: Transport Canberra and City Services Directorate, ACT Government and its successors

WSUD: Water Sensitive Urban Design

1.1.4.2 Definitions

General: For the purpose of this Municipal Infrastructure Standard, the definitions of terms used to define the components of the road reserve are in conformance with *AS 1348, Glossary of Austroads Terms* and *AGRD03*.

Active living: A way of life that integrates physical activity into daily routines.

Climate change: The *Intergovernmental Panel on Climate Change* defines climate change as "a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity."

Climate Change Adaptation: Actions by individuals or systems to avoid, withstand or benefit from current and projected climate changes and their impacts. Adaptation reduces a system's vulnerability or increases its resilience to the effects of climate change. Various types of adaptation can be distinguished, including anticipatory (proactive), autonomous (spontaneous) and planned (deliberate) adaptation (*IPCC*).

Crime Prevention through Environmental Design (CPTED): Aims to prevent crime by designing spaces and buildings that foster human activity and interaction using four key principles: natural surveillance to limit the opportunity for crime; natural access to encourage the movement of people into spaces that are open and inviting; territorial reinforcement to maintain a sense of ownership by the local community; and target hardening to make it difficult to steal or vandalise property.

Non-potable Water: Water not suitable for human consumption, eg by drinking or cooking

Path: A paved off-road facility of varying width and surfacing for shared use by pedestrians and cyclists. All paths, including paths adjacent to streets, are shared by pedestrians and cyclists in the ACT, differing

from NSW and Victoria where cyclists over 12 years of age are not permitted to ride on paths unless appropriately designated.

Primary treatment: Sewage wastewater treatment that involves sedimentation to remove gross and settleable solids. Sludge is removed and treated separately.

Potable Water: Water suitable on the basis of both health and aesthetic considerations for drinking and culinary purposes.

Playground or Play Space: An area designed for children's play, including the site, natural features, built landscape, and any manufactured equipment and surfacing.

Public Urban Space: Unleased Territory Land within the urban area set aside for public use.

Recycled Water: Water that is treated effluent from the secondary treatment of fluids only or the primary treatment of both fluids and solids to a standard that is appropriate for its intended use.

Secondary treatment: Treatment of primary sewage effluent by biological aerobic processes to remove organic matter. Usually followed by separation of solids from the liquid.

Urban Open Space: Unleased Territory Land within the urban area set aside for public and recreational use.

Water Sensitive Urban Design (WSUD): An approach to urban planning and design that aims to integrate the management of the urban water cycle into the urban development process.

1.2 Planning and design

1.2.1 TCCS planning policy

TCCS encourage contemporary interpretation of the Municipal Infrastructure Standards and Standard Drawing details where appropriate and in accordance with requirements for safety, low maintenance and high durability of materials and function.

Requirement: Liaison with the relevant TCCS approval section (Place management, Roads and Transport, Capital Works, Development Review, etc) during the design phase to seek support for deviations from standards in the design or materials is required.

Tree preservation: Consult with TCCS to identify requirements relating to tree protection and clearing of the site.

1.2.2 Consultation

General: TCCS are committed to a full and thorough collaborative design process involving a participatory form of community consultation to ensure that the best outcomes are achieved for the people involved. Consultation should be undertaken prior to any design work and the information collected should guide the development of the project and design options. Community aspirations, desires and concerns are identified through the consultation process and then design proposals are developed to respond to these.

Requirement: Liaise with stakeholders prior to, and during, the preparation of urban open space design, including the following:

- EPSDD;
- TCCS;
- NCA, as required;
- Project planning, civil and landscape consultants;
- Public and Private sector stakeholders including local businesses and interest groups;
- Public infrastructure asset owners;
- Service utility organisations: and
- Other relevant authorities, as required.

Responsibility: Consult with the TCCS and other relevant authorities during the preparation of design. In addition to the requirements of this Design Standard, identify the specific design requirements of these authorities. Comply with Requirements for Design Acceptance Submissions (if applicable).

1.2.3 Public consultation

Consultation: Engage the community in the planning and design of both new public space facilities and the upgrade or alteration to existing public space facilities. Seek advice from the client (e.g. EPSDD, LDA or TCCS), as to the representative groups to be consulted in an area.

1.2.4 Utilities services plans

Requirement: Obtain service plans from all relevant public utility Authorities and other organisations whose services, trees, important ecological habitats or other assets exist within the area of the proposed development. Plot this information on the relevant drawings including the plan and cross-sectional views. As a minimum, designs should refer to 'Dial-before-you-dig' information that is readily available in most areas.

Responsibility: Confirm service plans accuracy with onsite inspection and also potholing/tracing if deemed necessary.

Requirement: An accurate survey shall be obtained when planning for the development / upgrade of play spaces (contour and feature plan) including full site investigation for underground and overhead services.

Proposed new services: Provide details of any new or relocated services proposed as part of the planned works.

1.2.5 Heritage considerations

Requirement: If required by the Development Application (DA), provide a plan for management of heritage assets in accordance with the DA.

1.2.6 Safety in design

Requirement: Implement safety in design processes in accordance with the *Work Health and Safety Act*.

1.3 General design criteria

1.3.1 Landscape design of irrigated areas

The landscape design of irrigated areas has a high impact on irrigation design. The landscape design of irrigated areas shall:

> Consider the impact of landscape design on irrigation systems, such as:

- Placement and spacing of trees in irrigated grassing shall consider sprinkler locations and coverage so as not to obstruct minimum throw distance (5m);
- Planting beds on slopes to either account for migration of water down slope through plant species selection or irrigation zoning;
- CPTED, locating irrigated areas in visible/overlooked areas where passive surveillance discourages vandalism; and
- Mulch cover and potential wear from desire lines exposing irrigation lines or damaging sprinklers.

> Suitability of plant species to survive if irrigation is turned off after 3-5 years or for extended maintenance periods;
> Good drainage is essential in irrigated planting beds to prevent water logging and decay of mulch. In many cases deep ripping of the subgrade will be sufficient to provide for drainage. If this is not possible, a sub-soil drainage system must be included (refer to *MIS 04 Subsurface drainage*); and
> Irrigated turf areas to be a minimum of 25m^2 and any single side shall not be less than 5m.

1.3.2 Irrigation water supply

1.3.2.1 Options

The project brief and current policy will determine the water supply option to use.

Options currently available are:

> Reticulated supply through a main supply pipe network; and
> Stormwater harvest from a local river, lake, pond, wetland, drain or the like.

For any reticulated water supply:

> Confirm the maximum and minimum working flow & pressure with the Local Authority or Government Agency responsible for the delivery of the reticulated supply; and
> Design the pump and/or irrigation system with the expectation that the flow, pressure or water quality of any reticulated supply may not remain constant or consistent throughout the day, from day to day or over the lifetime of the network.

Water used in the irrigation system should be 'Fit for Purpose'.

'Fit for purpose' means water used by an irrigation system should not:

> Pose any undue or foreseeable public health risk arising from the operation of the system;
> Cause any health risk to personnel involved in the operation or maintenance of the system; and
> Cause premature component failure or reduction in the normal service life of the system.

1.3.2.2 Reticulated supply

Falls into three categories:

- Potable supply;
- Recycled supply; and
- Non potable supply.

Potable supply is the treated water supply from a protected catchment water storage.

Recycled supply is treated effluent from the secondary treatment of fluids only or the primary treatment of both fluids and solids.

Non potable supply is from a stormwater harvest facility.

1.3.2.3 Reticulated supply options

Based on the calculated design flow & pressure required for the irrigation system, there are four options available.

Option 1

If the potable or recycled supply has adequate overall flow and pressure at the point of connection to the network, then a direct connection to the irrigation system may be possible.

Refer to **Figure 18-2 Reticulated Supply – Option RS1 Schematic**

It is current policy, however, to require that further discussion takes place prior to acceptance of this direct connection option.

To ensure the ongoing capacity of the irrigation system to operate at the required flow and pressure, the installation of a suitably sized on site water storage tank(s) with a separate pump connection, or with approval, an "online booster" pump to the irrigation system may still be required.

Refer to **Figure 18-2 Reticulated Supply – Option RS1 Schematic**

Option 2

If the potable or recycled supply has adequate flow but inadequate pressure at the point of connection to the network, then a boosted connection to the irrigation system may be possible.

Probably not suitable for sites with an irrigated area greater than 2Ha without a high flow capacity metered supply.

A specific request through Icon Water or the water supply authority approval would be required.

Refer to Figure **18-3 Reticulated Supply – Option RS2 Schematic**

Option 3

If the potable or recycled supply has inadequate flow (irrespective of adequate pressure or not) at the point of connection to the network, then a direct connection to the irrigation system will not be possible.

The supply should be piped to a suitably sized on site water storage tank(s) complete with a separate pump system and then connected to the irrigation system.

Based on the reliability of a recycled supply and the overall supply network and peak demand for the irrigation system, potable "back up" supply to the water storage tank(s) may also be required, allow to confirm with TCCS. The tank shall be sized for at least one nights irrigation cycle (static volume plus one nights stormwater inflow plus water pump protection). Provide town water back up supply to ensure low water level pump protection.

Also applies to Option 4.

Refer to **Figure 18-4 Reticulated Supply – Option RS3 Schematic**

Option 4

If the reticulated supply is from a remote stormwater harvest facility, it should be piped to a suitably sized on site water storage tank(s) with a separate pump connection to the irrigation system

It is current policy in this situation to have an alternative potable back up supply to be provided to the water storage tank(s). Again the tank shall be sized for at least one nights irrigation cycle supply without any incoming supply where recycled water is used and in addition town water back supply reserve sized against the potable water back up supply such that the tank does not run low or dry should recycled supply not be available at all.

Refer to **Figure 18-5 Reticulated Supply – Option RS4 Schematic**

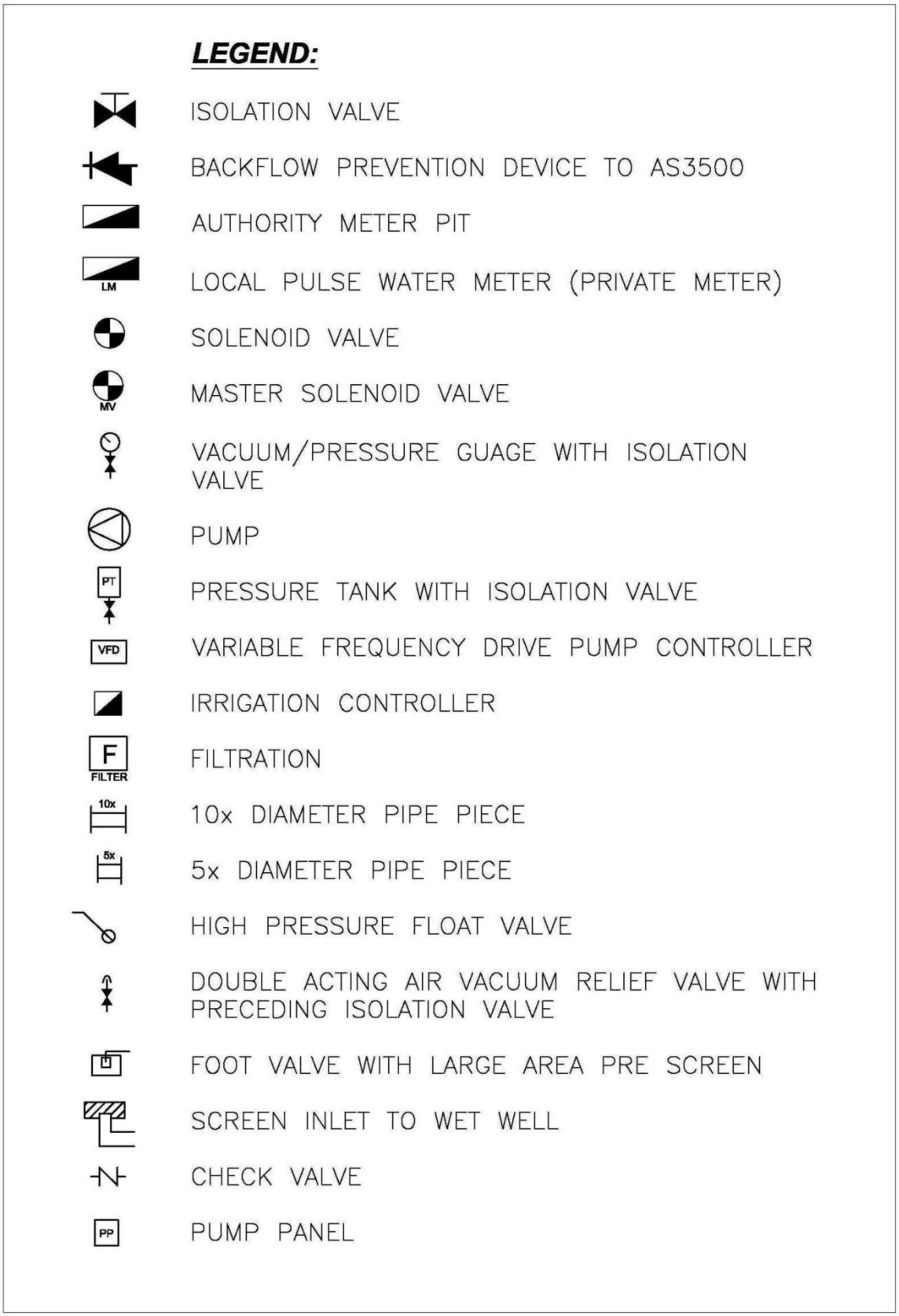


Figure 18-1 Reticulated Supply- Legend

Pump Arrangement			Pump Type					Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
x	x	x	x	x	x	x	x	x	x	✓

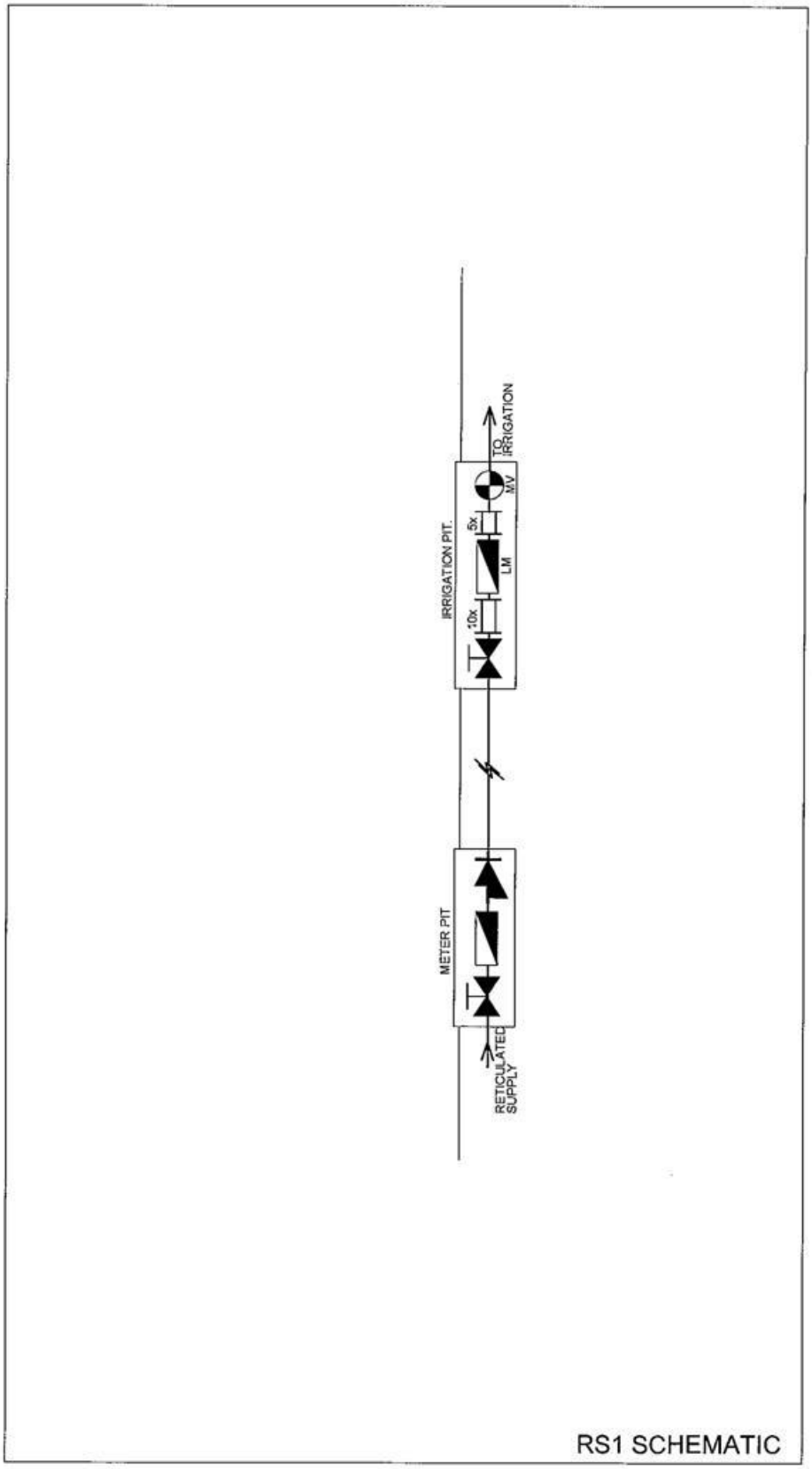


Figure 18-2 Reticulated Supply –Option RS1 Schematic

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	x	✓	x	✓	x	x	✓	✓	✓	✓

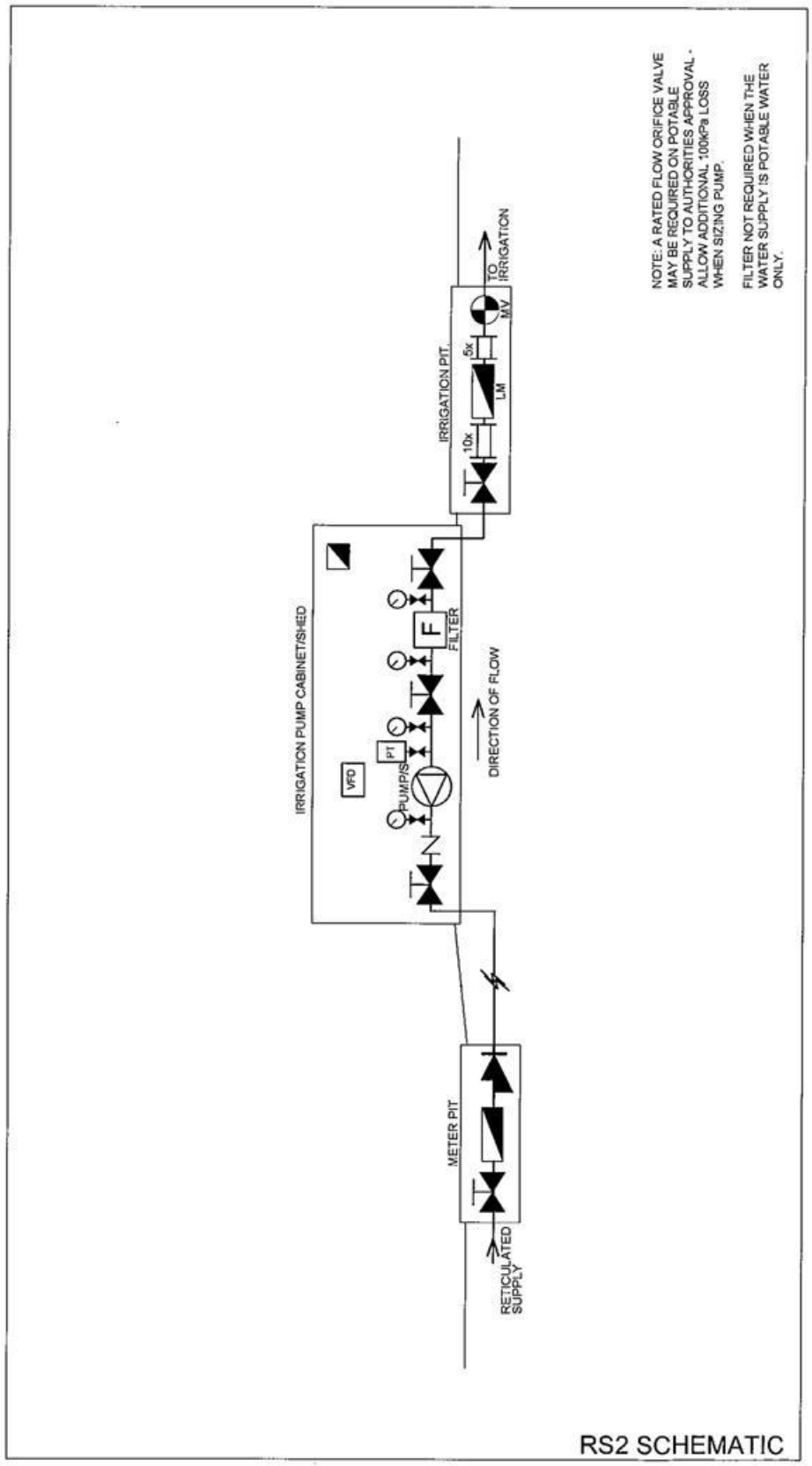


Figure 18-3 Reticulated Supply – Option RS2 Schematic

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	x	✓	x	✓	x	x	✓	✓	✓	✓

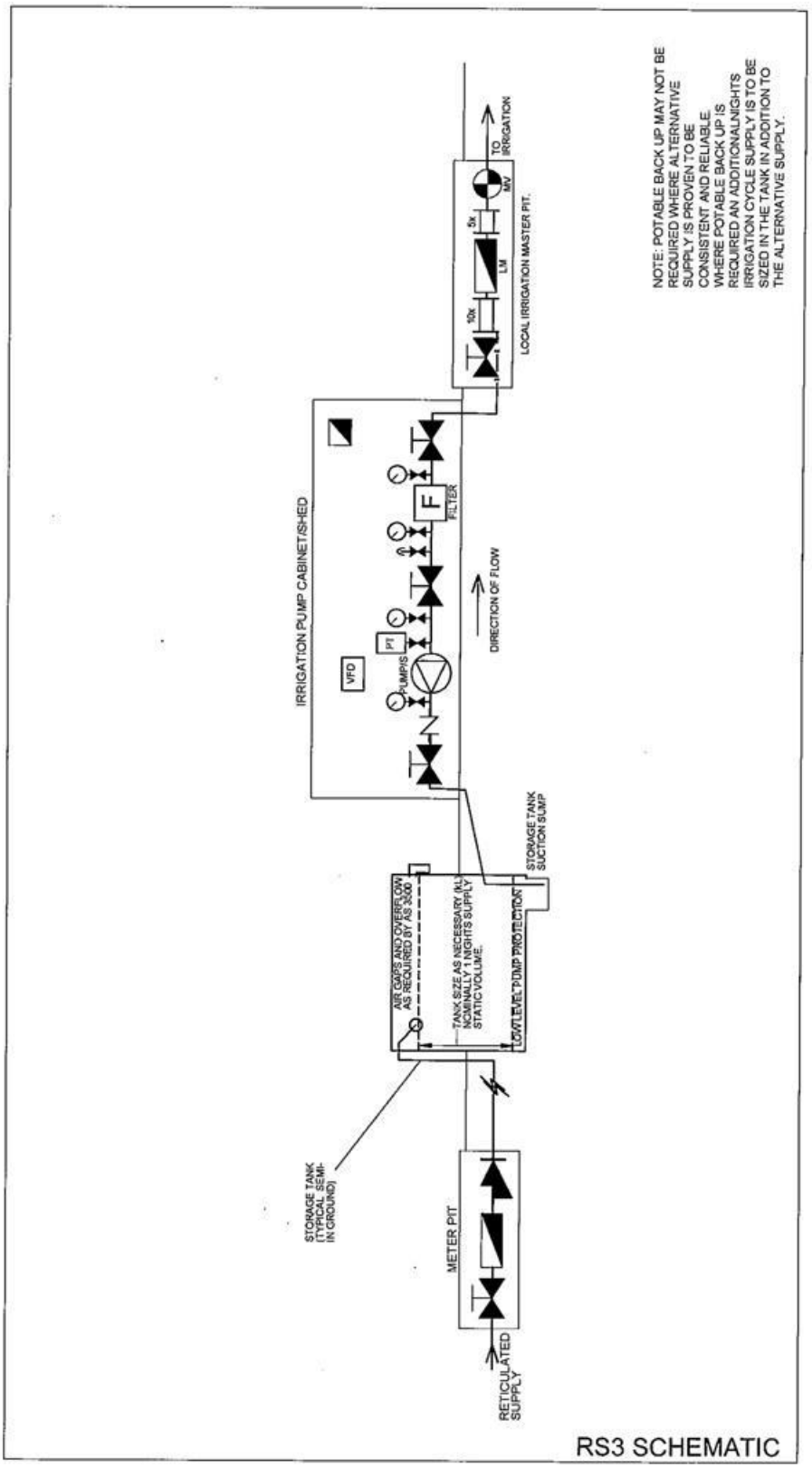


Figure 18-4 Reticulated Supply – Option RS3 Schematic

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	x	✓	x	✓	x	x	✓	✓	✓	✓

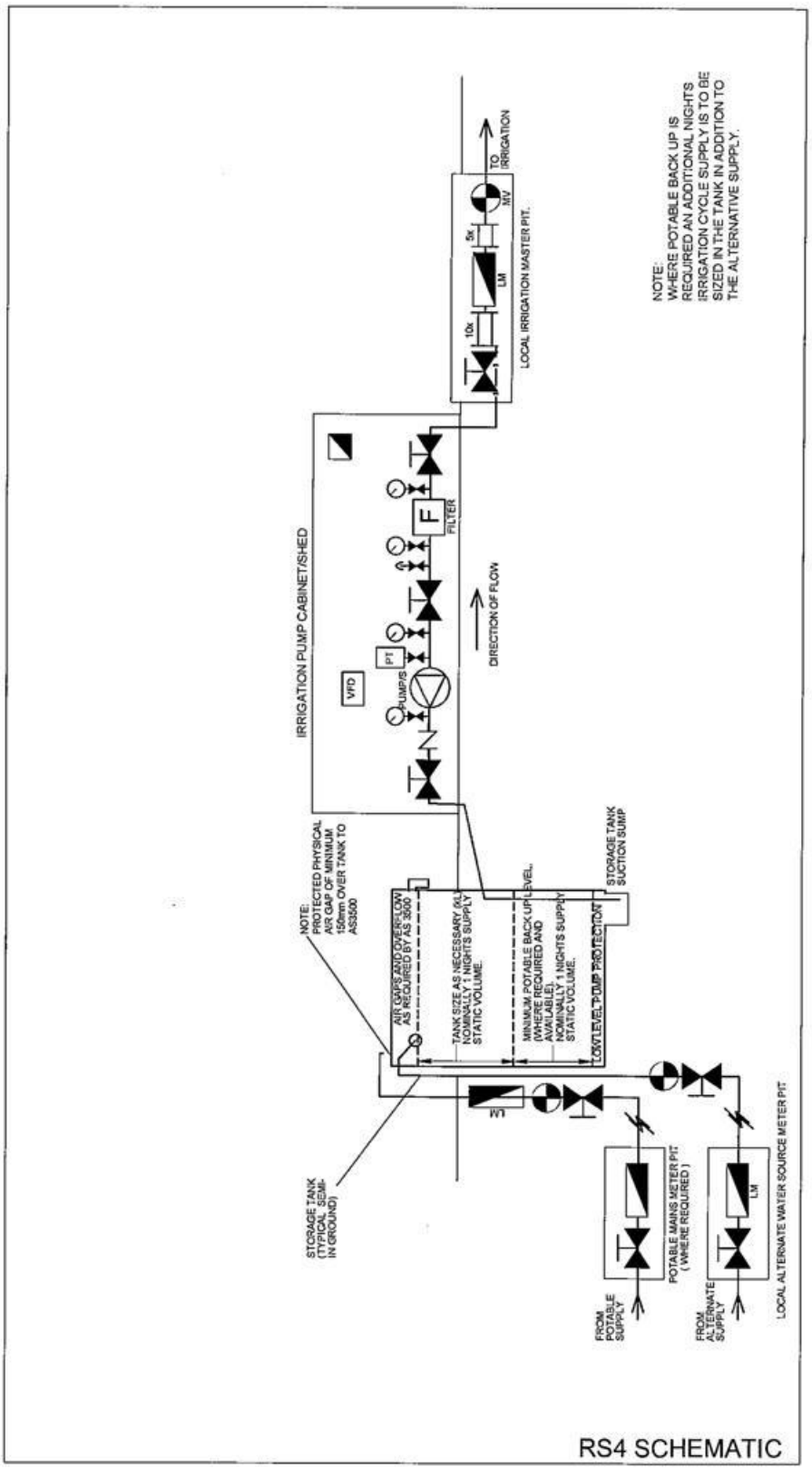


Figure 18-5 Reticulated Supply – Option RS4 Schematic

1.3.2.4 Stormwater Harvest

The project brief and current policy will determine the stormwater harvest facility to be used.

Confirm the reliability or otherwise of the stormwater harvest facility based on a review of:

- Volume of stored water;
- Water abstraction requirements including allowable draw down and yearly volume available for irrigation;
- Seasonal fluctuations in water storage surface levels;
- Catchment recharge ability particularly during peak irrigation demand periods; and
- Levels of contamination from silt, suspended clay, algae or organic matter.

1.3.2.5 Stormwater Harvest Options – Reliable Supply

If the reliability of the stormwater harvest facility is confirmed, the following options may be considered:

Option 1

A direct pumped connection to the irrigation system from a dry well pump station.

The dry well pump station should be located above any design flood levels and within a maximum suction lift of 4m from the intake pipe to the pump inlet pipe.

This is the preferred option for direct pumped connections

Refer to **Figure 18-7 Stormwater Harvest – Option SH1 Schematic**

Option 2

A direct pumped connection to the irrigation system from a gravity fed wet well.

This is not currently a favoured option and should only be considered where Option 1 is not viable or where there may be concerns with the visual impact arising from the use of a dry well pump station in a particular location.

Refer to **Figure 18-8 Stormwater Harvest – Option SH2 Schematic**

1.3.2.6 Stormwater Harvest Options – Non-Reliable Supply

If the reliability of the local stormwater harvest facility is not confirmed, the following options may be considered :

Option 3

Pump water from a gravity fed wet well to a suitably sized on site water storage tank(s) with a separate pump connection to the irrigation system.

It is current policy for an alternative potable back up supply to be provided to the water storage tank(s).

Refer to **Figure 18-9 Stormwater Harvest – Option SH3 Schematic**

Option 4

Collect water from a drain, wetland, bio retention basin or open culvert and pump to a suitably sized on site water storage tank(s) with a separate pump connection to the irrigation system.

It is current policy for an alternative potable back up supply to be provided to the water storage tank(s).

Refer to **Figure 18-10 Stormwater Harvest – Option SH4 Schematic**

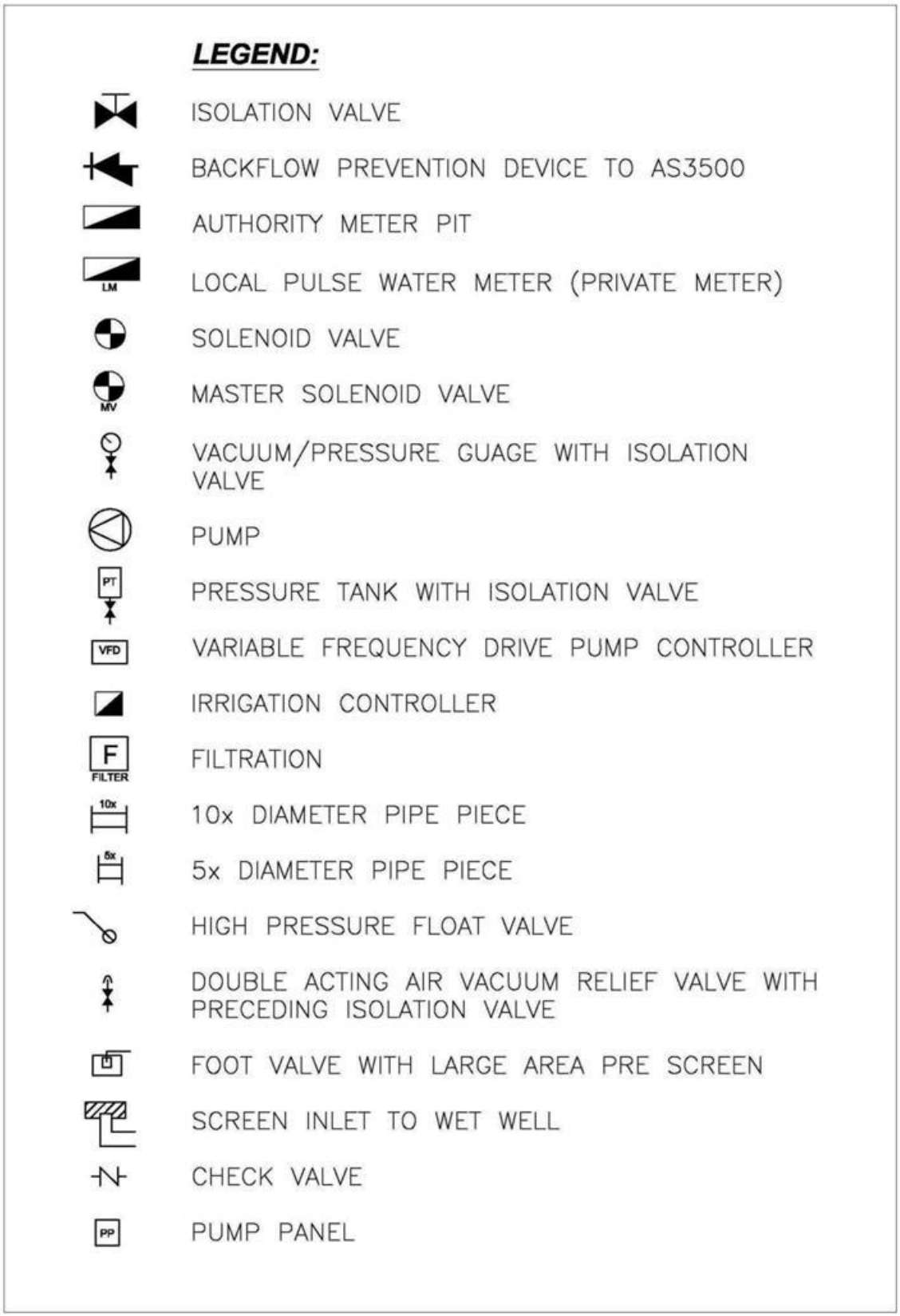


Figure 18-6 Stormwater Harvest – Legend

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	x	✓	x	✓	x	x	✓	✓	✓	✓

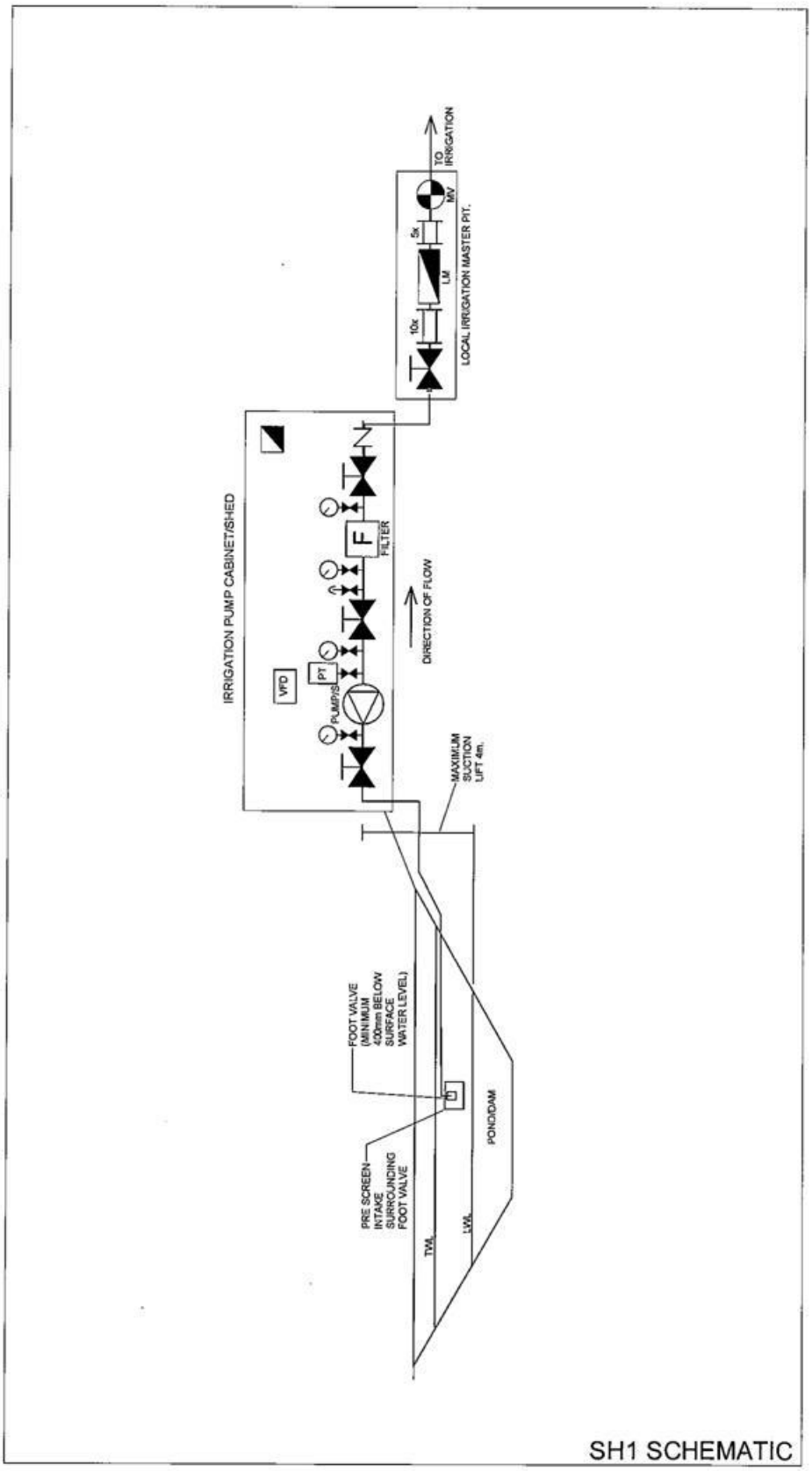


Figure 18-7 Stormwater Harvest – Option SH1 Schematic

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
x	✓	✓	x	x	✓	x	✓	✓	✓	✓

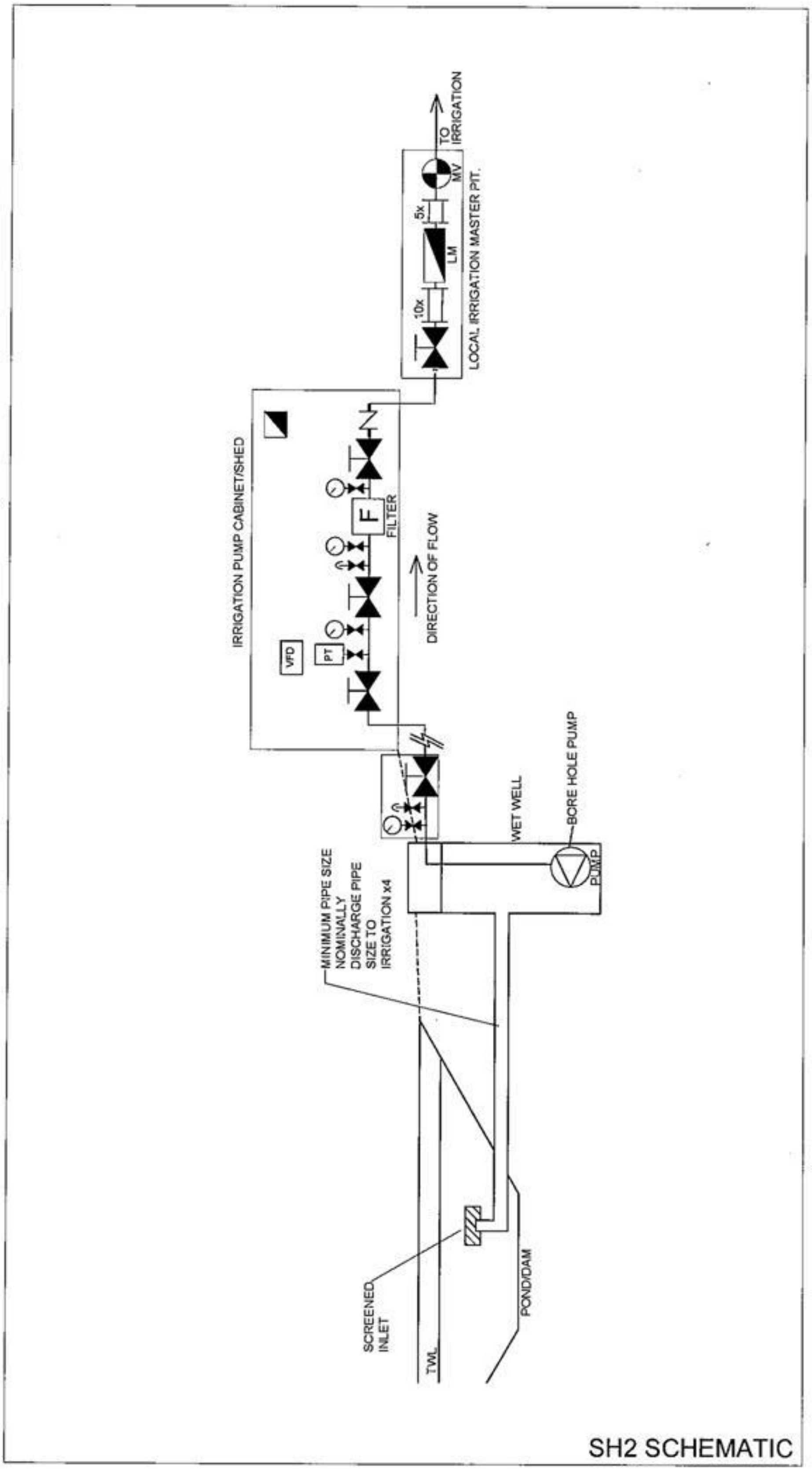


Figure 18-8 Stormwater Harvest – Option SH2 Schematic

Pump Arrangement				Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	✓	✓	x	✓	x	✓	✓	✓	✓	✓

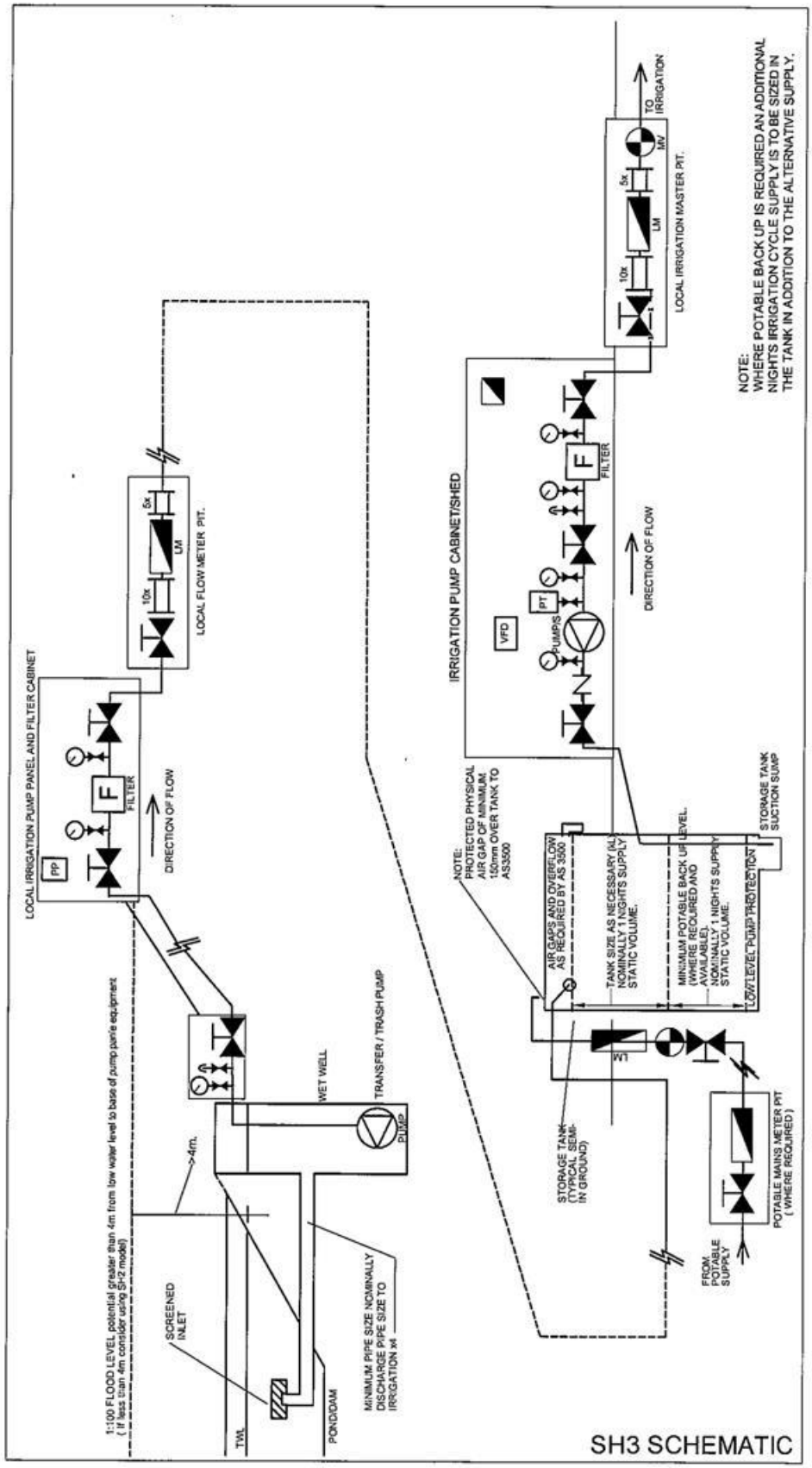


Figure 18-9 Stormwater Harvest – Option SH3 Schematic

Pump Arrangement			Pump Type				Filter			Flow
Dry Well	Wet Well	VFD	End Suction	Vertical Multi Stage	Sub Multi Stage	Sub Trash Pump	Disc 200µ 120 Mesh	Disc 200µ 80 Mesh	Media	Local Flow Meter
✓	✓	✓	x	✓	x	✓	✓	✓	✓	✓

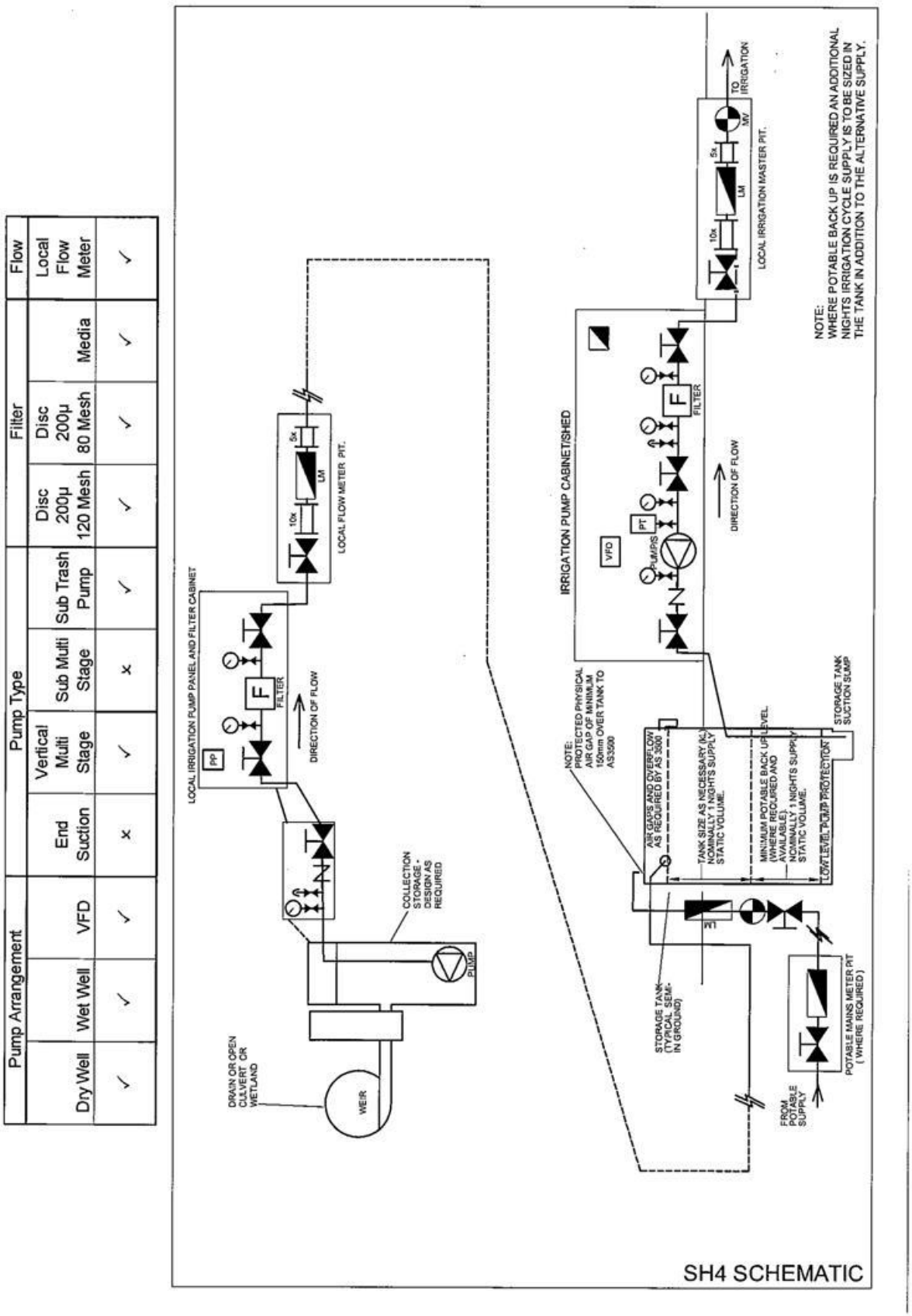


Figure 18-10 Stormwater Harvest – Option SH4 Schematic

1.3.3 Pump system and components

1.3.3.1 Pump System

Confirm current policy for the pump type(s) to be used.

In general, the following pump types will be considered depending on the application:

- Vertical multi stage pump set or a multi stage submersible pumpset (subject to approval) for a direct pumped connection to the irrigation system; and
- End suction pump or submersible trash pump for water transfer from a stormwater harvest facility to on site water storage tank(s).

The design & selection of pumps & filters shall allow for a minimum 20% additional flow & pressure capacity above design flow and pressure.

In addition to the duty pump(s) required for the design flow and pressure, multi stage pump sets shall also include a matching standby pump, with pump operation cycled to ensure even 'wear and tear' across all pumps in the pump set.

The pump control panel shall be compatible with the pump set (i.e. supplied by the pump importer/ distributor with the pump as a "turnkey system". No third party or "local" pump panel to be used).

Additional pumps & components should be incorporated as required to ensure operational compatibility when connecting to existing irrigation systems.

Pump & filter manufacturers shall be directly involved in or have a local dealer network representation, providing spare parts, technical assistance and involvement in on site commissioning following installation of the pump set.

Incorporate a follow up inspection and maintenance program (minimum 12 months) into the pump system installation contract to run concurrent with any defects liability period applicable to that contract.

1.3.3.2 Pump System Components

1.3.3.2.1 Pumps

End suction and vertical multistage pumps are to be supplied:

- As a pre-assembled unit;
- Complete with all associated valves, manifolds & pipework (heavy wall minimum 304 stainless steel or MDPE); and
- Factory tested and certified prior to delivery.

If a Variable Frequency Drive (VFD) is required, they are to be fitted one for each pump.

Current preferred pump manufacturers are:

- Grundfos;
- Lowara; and
- Others to approval subject to compliance with above.

All pumps are to be installed in accordance with the supplier's installation recommendations and to withstand pump system operating forces and dynamic pressures.

1.3.3.2.2 Filters

Where the pumped water supply is either from a direct connect reticulated supply or from a water storage tank with reticulated water, provide either manual 'super angle' disc filters or stainless steel electric self-clean suction scanner type filters. When multiple filters are required they shall be supplied as a pre-packaged unit.

Use a 80 mesh (200 micron) for pop up sprinkler systems and a 120 mesh (130 micron) for drip and micro sprinkler systems.

Current preferred filter suppliers are:

- Arkal;
- Amiad
- Triangle filtration - Filtaworx
- Others to approval subject to compliance with above.

Where the pumped water supply is from a direct connect stormwater harvest, provide an automatic stainless steel long body self cleaning electric suction scanner screen filter.

When an automatic filter is used, ensure adequate flow and pressure is maintained for the backwash cycle and discharge the backwash to an approved source.

Before and after the filter assembly, provide isolation valves and pressure gauges with mini isolation pressure test cocks.

Current preferred screen filter suppliers are:

- Amiad;
- Triangle Filtration - Filtaworx; and
- Others to approval subject to compliance with above.

Where the pumped water supply is from a stormwater harvest facility heavily contaminated with algae and organic matter, use a sand or gravel media filter array with automatically controlled backflush.

Current preferred media filter suppliers are:

- Amiad;
- Odis;
- Toro; and
- Others to approval subject to compliance with above.

All filters are to be installed:

- In accordance with the supplier's installation recommendations;
- Complete with all associated valves, air valve/s, manifolds & pipework (stainless steel or MDPE);
- To withstand pump system operating forces; and
- With sufficient room to access, service, remove and replace all parts.

1.3.3.2.3 Flow Meters

Depending on the final configuration of the pump system install a flow meter:

- On any reticulated supply prior to pump station or discharge into water storage tank;
- On any stormwater harvest supply prior to pump station or discharge into water storage tank; and
- On any potable back up supply prior to discharge into water storage tank.

Flow meters are to have:

- Ultra Sonic, Tangential paddle wheel or turbine type operation;
- Robust cast metal body;
- Pressure and temperature rating to suit the system working pressures and temperatures;
- Hermetically sealed flow register to provide clear, condensation free readings over the service life of the meter;
- Pulse output capability;
- Horizontal, vertical or inclined mounting capacity into system pipework;
- Size flow meters to suit system design flows;
- Install an in-line strainer;
- Use flanged connections to adjoining pipework;
- Provide isolation valve and straight pipe length (10 x pipe diameter) immediately before the flow meter and straight pipe length (5 x pipe diameter) immediately after the meter; and
- Provide conduit with draw wire from flow meter to pump house for connection to a Supervisory Control & Data Acquisition (SCADA) system.

1.3.3.2.4 Wet Wells

Wet wells shall be cast in situ concrete with lockable hinged galvanised steel cover(s).

Finish top of wet well 200mm minimum / 400mm maximum above the surrounding ground level.

Wet wells shall be able to be isolated from water source for maintenance and sullage removal. The isolation method shall be a knife gate valve.

1.3.3.2.5 Storage Tanks

Storage tanks shall be:

- Cast in situ concrete;
- Engineered for in ground installation and for a 'pedestrian traffic' rated lid loading; and
- Single or multiple tanks to suit calculated on site storage capacity.

The top of each tank should finish 300mm minimum / 600mm maximum above surrounding ground levels with all tops level in a multiple tank installation.

For minimum tank sizing refer to **Irrigation Water Supply**

Each tank installation shall include:

- Two lockable access hatches cast into the lid
  - NOTE : Locate one hatch above the inflow pipe assemblies and the other one above the pump suction line with access to level sensor installations;
- Internal access ladders; and
- Overflow flush with underside of lid.

In multiple tank installations, one tank shall be the primary storage tank.

Interconnect the secondary storage tanks to the primary storage tank with a 1.5% graded balance / drain pipe with a flanged sluice valve connection at the floor level of each tank.

Each single tank installation or primary storage tank in a multiple tank installation shall include as required:

- Non potable water supply inflow pipe discharging into a stilling pipe within the storage tank;
- Potable water supply inflow pipe discharging through a physical air gap (either internally or externally depending on the installation type) into a stilling pipe within the storage tank
  - NOTE : Stilling pipes shall be a minimum 300mm diameter, shall be securely fixed internally to the storage tank wall or lid and incorporate slots or holes designed to minimise air and wave action from the discharge of water within the storage tank;
- Pump suction sump minimum 2.5m x 2.5m x 1.0m deep built into the floor of the storage tank and finished with a raised hob or lip to prevent fine silt entering into the sump.
  - NOTE : The pump suction sump shall be located on the opposite side of the tank to the water supply inflow pipe(s);
- Pump suction line with foot valve from the sump to the pump system;
- Current water level control system including hydrostatic pressure transducers and multichannel controller with data logging capability
  - NOTE : Confirm protocols regarding fill sequence when more than one water supply inflow is to be used; and
- External solenoid valve(s) to control flow(s) into the tank when multiple supplies are to be installed.

All external exposed pipework shall be protected with a painted vandal proof shroud securely fixed to the storage tank.

To minimise the visual impact of the storage tank(s):

- Reshape levels around tank(s) to merge with adjoining landforms;
- Apply a paint or other approved finish to all exposed surfaces; and
- Use screen planting.

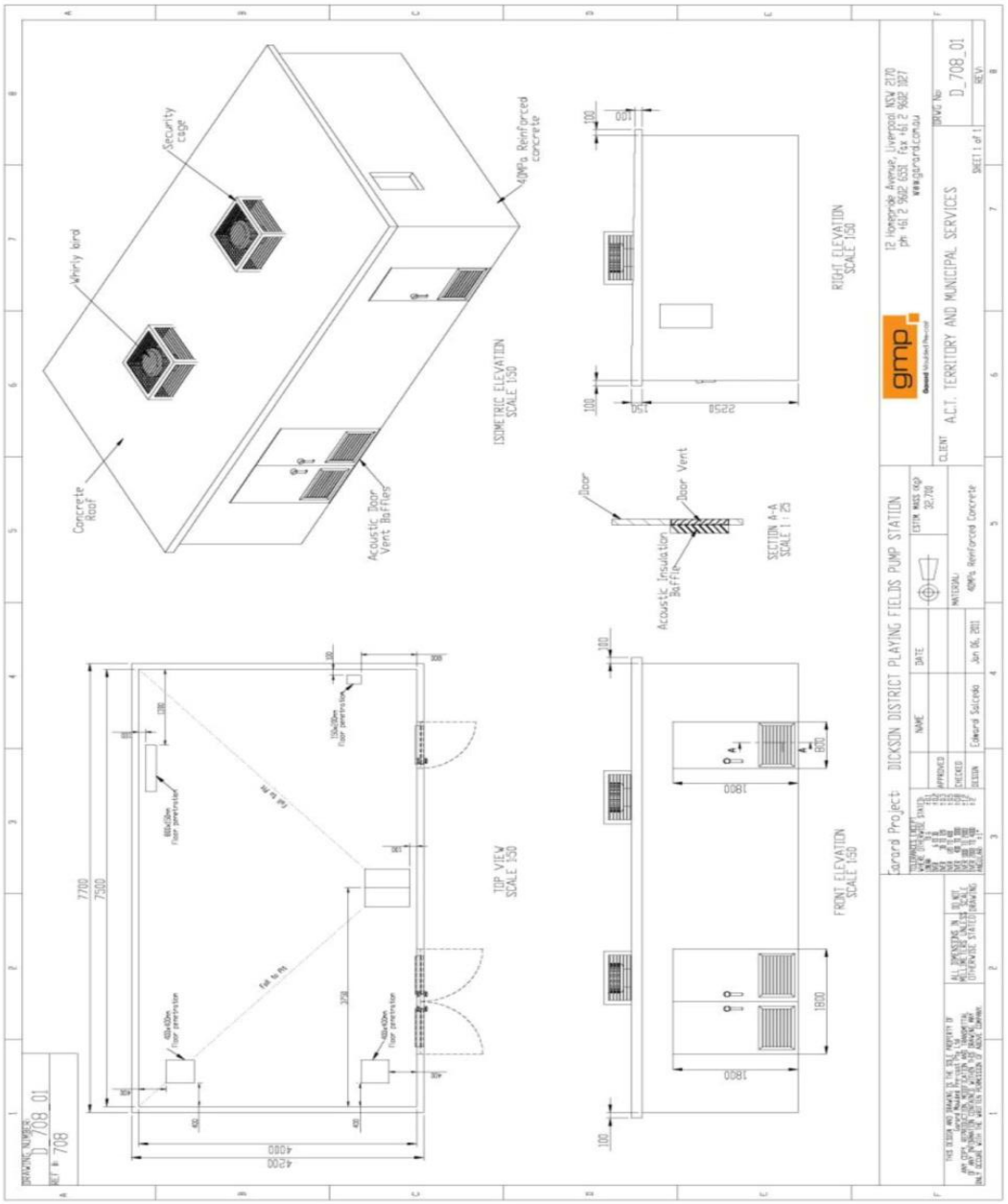
Prior to installation on site prepare and gain endorsement of the final layout and detail drawings of the tank(s) installation.

1.3.3.2.6 Pump Station

Pump stations are to be:

- Sized to allow easy service access to pump components and control cabinets;
- Secure & vandal proof;
- Ventilated;
- Fitted with noise suppressant baffles;
- Surge protected from lightning strikes; and
- Compliant with current *Workplace Health & Safety regulations*.

Typical building design shown below. Final shop drawings are to be produced by the contractor for approval in principle by TCCS. The contractor shall seek all other approvals from required authorities prior to final construction. Buildings to be core filled concrete blockwork with concrete roof or where permissible colourbond and must be sealed from bird and general vermin activity. Precast portable buildings may also be acceptable.



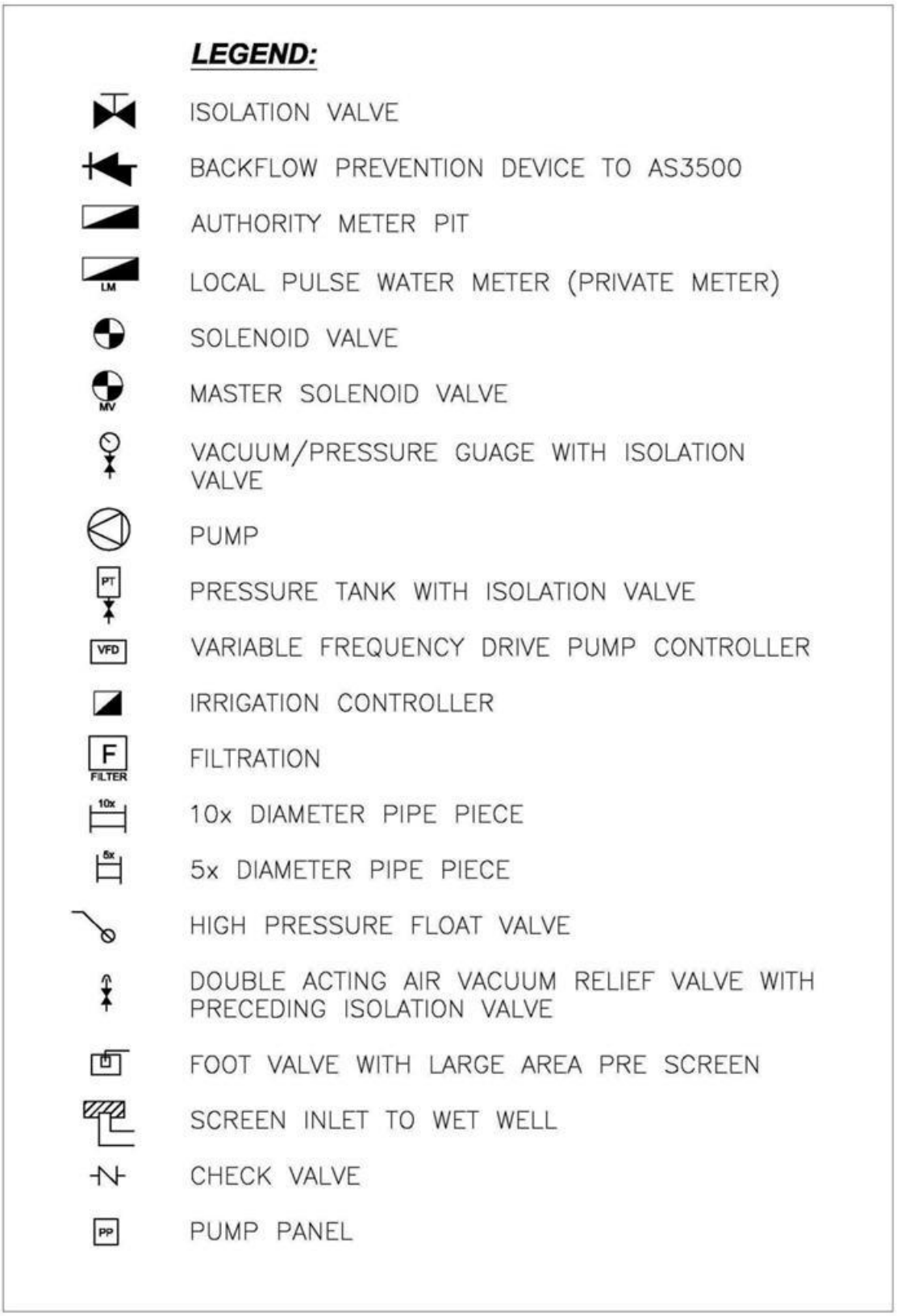


Figure 18-11 Pump Station Schematic Layout - Legend

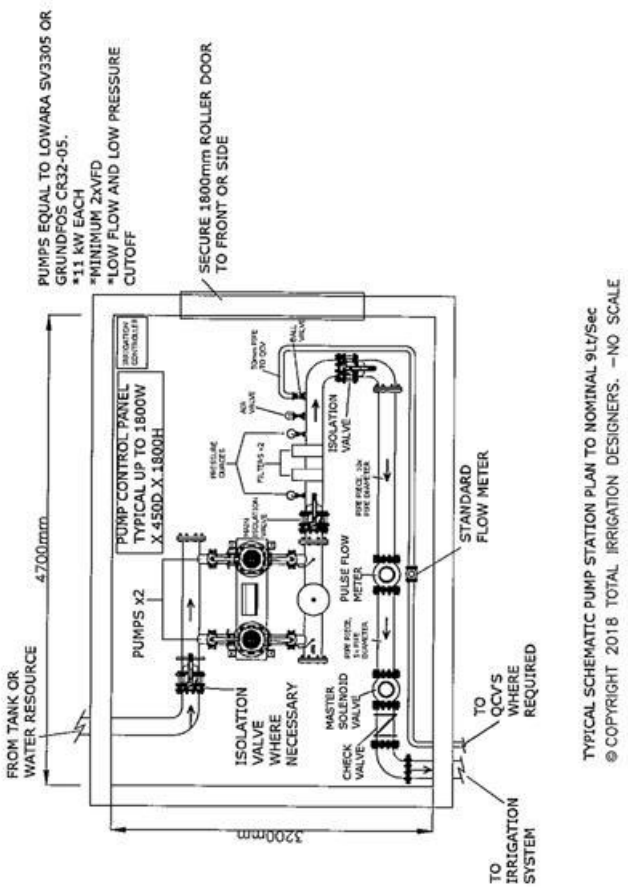


Figure 18-12 Pump Station Schematic Layout – flows up to 9 Lt/sec

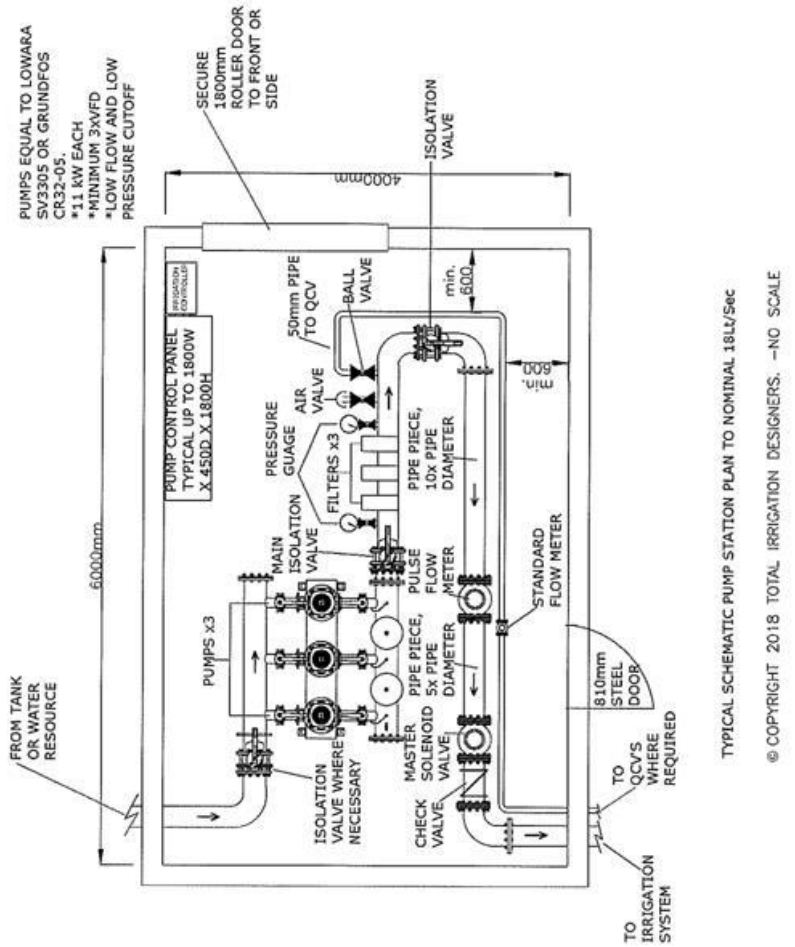


Figure 18-13 Pump Station Schematic Layout – flows between 9 to 18 Lt/sec

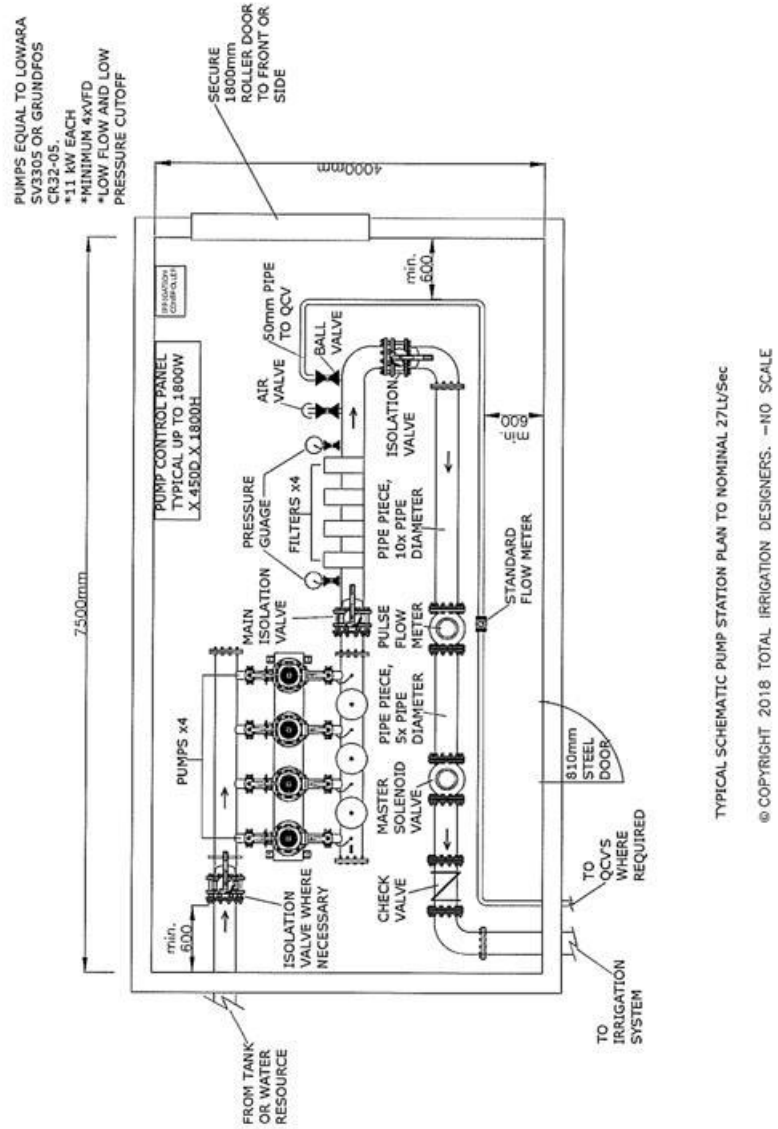


Figure 18-14 Pump Station Schematic Layout – Flows between 18 to 27 Lt/sec

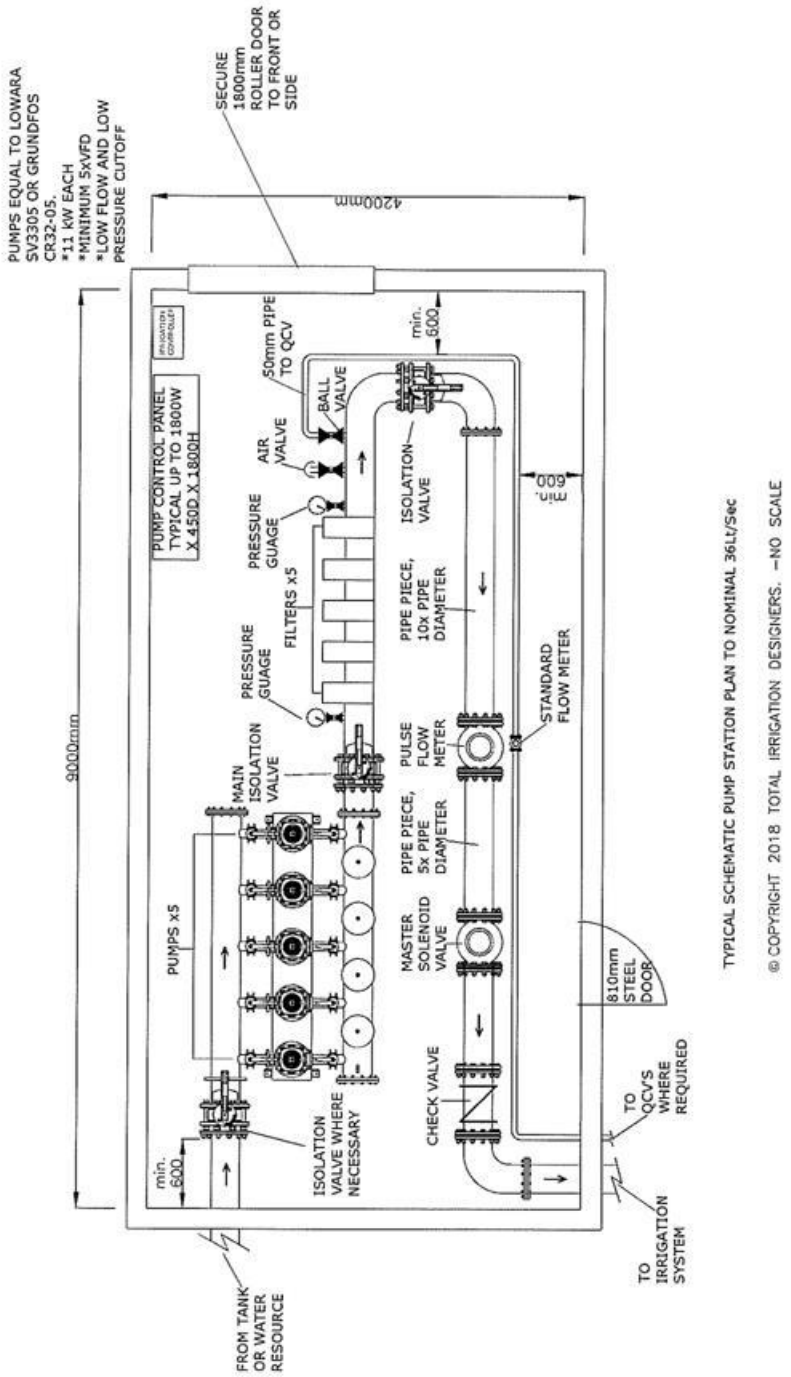


Figure 18-15 Pump Station Schematic Layout – Flows between 27 to 36 Lt/sec

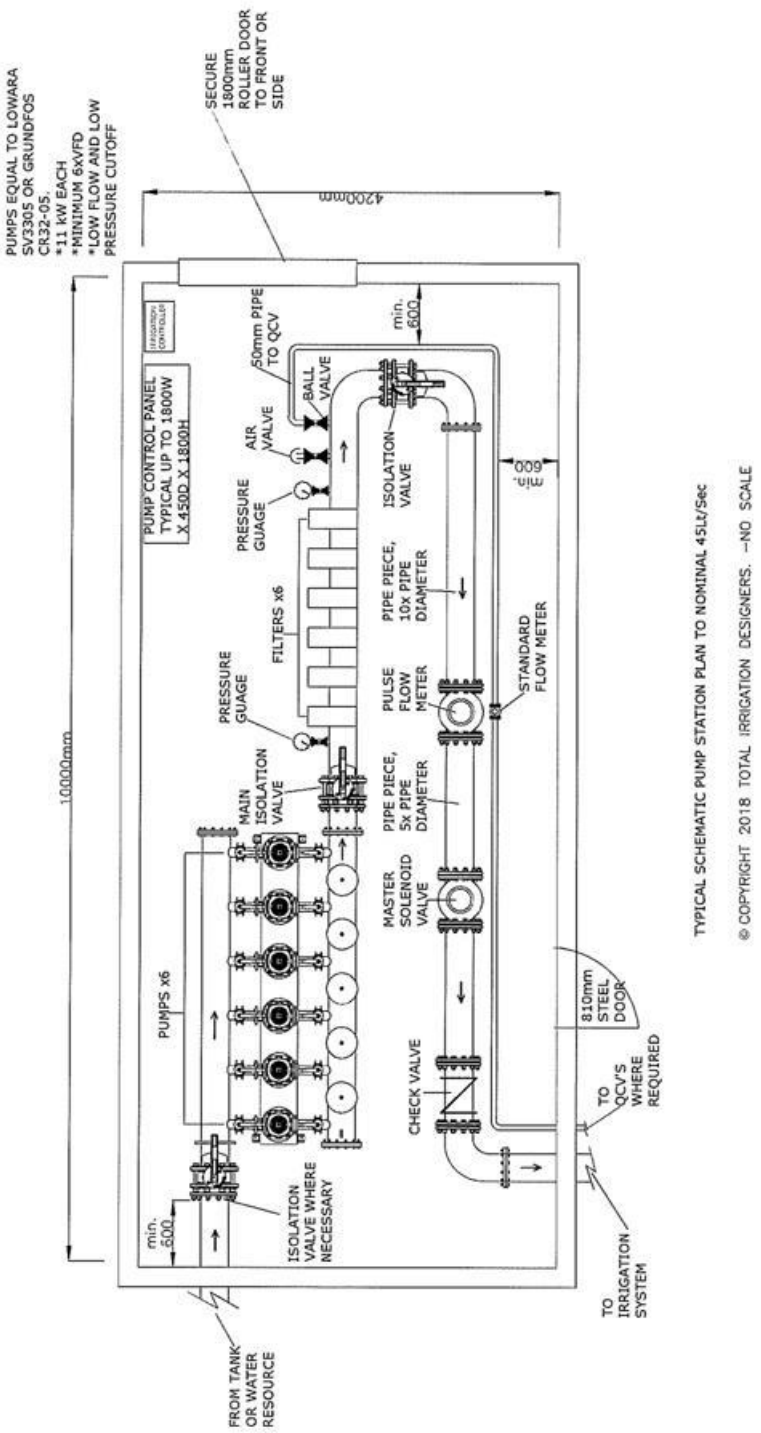


Figure 18-16 Pump Station Schematic Layout – Flows between 36 to 45 Lt/sec

1.4 Irrigation system components

1.4.1 Irrigation system

1.4.1.1 Type

Generally, Drip irrigation is to be avoided and would only be considered for mass planting establishment for two to three years.

Drip irrigation systems are high maintenance and prone to blockage. Drip irrigation shall only be considered in consultation with the authority responsible for place management. The designer shall confirm current policy for the installation and maintenance of irrigation systems in the area to be developed and seek in principle approval prior to undertaking design of drip irrigation.

In general, for irrigated parks, recreation areas, building surrounds and car parks, systems are to use:

- Automatic pop up gear driven sprinklers for all high use turf areas;
- Automatic pop ups or shrub sprays for the establishment and long-term irrigation of plant material; and
- Manual quick coupling valve systems installed for the establishment of non-irrigated areas and plant material or for survival watering independent of the automatic system.

1.4.1.2 Draw Off Rates & Watering Times

Based on current policy for turf management, irrigation systems require, for each hectare watered:

- Weekly watering application of 33mm/wk average peak summer;
- Applied at night over 3 nights (preferred) or 4 nights (maximum) a week between 10pm and 6am;
- Desirable Total weekly watering time of 21 hours; (3 nights for 7hrs)
- Instantaneous delivery of nominal 4.4 Lt/s/ha; and
- Total volume of water used of nominal 110KL/ha/irrigation night.

1.4.1.3 Operating Pressure

System operating pressure shall be determined based on the operating pressure required at the farthest sprinkler head to comply with the manufacturers recommendations for mid range sprinkler operation with a standard nozzle fitted (nominal minimum 415Kpa).

Maximum head loss should not exceed 15% over the length of any feeder main, branch main and lateral to which sprinklers or emitters are to be connected.

Friction loss through any valve should not exceed 35kPa.

Allowance should be made for friction loss through other system meter pit or pump set components, in particular any back flow device, orifice valves, master vales, meters and or filter etc

Typical minimum supply pressure at flow would need to be around 600-650kPa and is subject to confirmation by the system designer and contractor.

1.4.1.4 Velocity

The velocity in any pipe should not exceed:

- 1.5 m/s for mainline pipes 80mm NB and above; and
- 2.0 m/s for pipes less than 80mm NB.

1.4.1.5 Precipitation Rates

Precipitation rate for gear drive sprinklers should not exceed 15mm/hour.

Obtain approval for required precipitation rates above 15mm/hour.

1.4.1.6 Layout

Typically based on either equilateral triangle or square set out.

Spaced to not exceed head to head coverage (triangle pattern) or nominal 45% diameter of throw (square pattern). Ideally designs shall use computer modelling to prove system design performance such as "SpacePro" especially for larger open turf spaces. Computer modelling program and data referenced on design drawings,

Minimum Distribution Uniformity of ≥85% when modelled on computer

Scheduling Co-efficient not greater than 1.3 (1.2 desirable and 1.1 highly desirable).

Adjust spacing to take account of prevailing wind direction, shape of the watered area and sprinkler precipitation rates.

Avoid overspray onto footpaths, cycle paths and roads.

For drip irrigation in mass planted areas when approved:

- 1.6 – 2.3 L/hour/dripper; and
- Typically 0.5m rows x 0.4m emitter spacing or where sparkly planted spaced to suit plant set out. Newly planted trees of 20lt pots or larger to have additional multiple dripper "rings" around each tree where planted in irrigated mulched gardens.
- Note ALL drip zones to include a table of the station flow data once the station is installed as a reference flow and the controller programmed to suit calculated application rates.

1.4.1.7 Sprinkler Performance

For all high use turf areas verify the sprinkler performance at the proposed set out, spacing and operating pressure by use of a computer modelling program (e.g. Space Pro).

1.4.2 Irrigation components

1.4.2.1 Pipes & Fittings

Current policy is to use medium density polyethylene (MDPE) for all mainline and lateral pipework as a first preference.

MDPE shall be PE100 and minimum PN12.5 or SDR 13.6 for mains or higher rating to suit supply and or design operating pressures.

For irrigation systems using a recycled or non potable water supply, MDPE pipe shall have a continuous purple stripe integral with the pipe.

Solvent weld Class 12 uPVC can be used for small diameter lateral pipework (typically 50mm and less) in smaller areas where the use of MDPE may not be cost effective

Form joints in MDPE using a butt weld or electro fusion process in accordance with the supplier's recommendations for all mainlines and large diameter pipes 90mm and above. Mechanical joints maybe used in 75mm pipe and less.

Butt weld or electrofusion joints shall be made by suitably trained and certified personnel.

Form lateral pipework connections to the main with electrofusion joints or PN16 tapping saddles.

Use purpose made reducers and fittings for flanged joint connections to isolating valves and mechanical joint connections to solenoid valves.

All threaded connections used for the installation of valves, articulated risers, sprinklers and other components (25mm diameter or greater) shall have both male and females BSP threads.

Use concrete anchor or thrust blocks as required.

Lay main line pipes in trenches surrounded by minimum 100mm thick coarse sand with minimum 350mm / maximum 600mm cover.

Run pipes located under paved surfaces through a suitably sized heavy duty stormwater or electrical conduit (at least 50mm larger in diameter than the outside diameter of the pipe).

Avoid changes in direction in pipework (T or elbow joints) under paved surfaces.

Place a tracer wire 200mm above all mainlines with one end terminated in a meter pit.

Flush out all pipework prior to fitting sprinklers, low volume emitters and end caps.

The ends of buried low volume polyethylene pipe should be marked to allow their location for flushing.

1.4.2.2 Control Valves

Control valves are to be automatic electric solenoid valves suitable for 24 VAC 50 HZ operation or where decoder systems are used specific decoder and compatible coils are to be used.

Control valves are to have:

- Body with moulded in and anchored studs for bonnet attachment & removal;
- Flow control adjustment;
- Variable pressure adjustment where sprinklers with significant pressure difference are used on the same system; and
- Full Stainless-Steel Ball valve installed immediately upstream for maintenance isolation.

Current preferred solenoid valves to be used are:

- Hunter ICV
- Toro P220
- Rainbird PEB or
- Irritrol Century 100 series.
- Hunter are preferred and most commonly used.

1.4.2.3 Isolation Valves

Use full bore full stainless steel ball valves for isolation on pipelines up to 80mm diameter and 80mm resilient seat flanged gate valves for isolation on pipelines 80mm diameter and above. In 80mm either valve option maybe used.

Ball valves are to have:

- Manual control;
- Stainless Steel body, stem & handle;
- Chrome plated metal ball;
- Teflon seat;
- Markings to indicate direction of operation for closure; and
- BSP threaded ends.

Gate valves are to have:

- Manual control;
- Metal body with bolted metal bonnet;
- Rising or non-rising metal stem to suit installation;
- Resilient seat;
- Clockwise closing
- Markings to indicate direction of operation for closure; and
- Flanged ends for bolted connection to pipework.

1.4.2.4 Valve Boxes

House valves in a plastic or concrete box with a secure lid.

Fully support box to prevent impact on pipework from subsidence.

Generally, locate in inconspicuous locations to avoid vandalism.

Isolation valve boxes are to be:

- Located away from access gates in park situations to avoid damage by vehicles.
- Solenoid valved to be buried 200mm below finished surface level in grassed areas; and
- Buried below the mulch layer in planting beds.

Bolt a metal plate to the inside of the lid where concealed below the finished surface level.

Isolating valve boxes are to be exposed at the finished surface level with a lockable lid.

1.4.2.5 Sprinklers

Note: turf areas to be irrigated shall not be less than 5m in any single direction and minimum 25m2 in each station zone or irrigated area,

Rotary sprinklers shall be gear driven with a rubber cap, stainless steel turret (where available) and capable of both full and part circle operation.

Sprinklers installed on a system using recycled or non potable water shall have a purple coloured cap

Minimum manufacturer's warranty shall be :

- 12m or greater radius 5 years
- 7 to 12m radius 5 years
- 5-7m radius 5 years

Connect to lateral pipework with articulated PVC risers finished at 30° to the horizontal

Provide built in check valves on gear drive sprinkler heads to prevent low point drainage

Current preferred sprinkler heads for urban irrigated parks are: 12-18m Range:

- Toro 640;
- Hunter I41; and
- Rainbird 8005. Stainless Steel model

Current preferred sprinkler heads for urban irrigated parks are: 5-12m Range:

- Hunter I20 stainless steel model.
- Rainbird 5000 stainless steel model
- Toro T5 stainless steel model

Current preferred sprinkler heads for urban irrigated parks where special approval may be granted for less than 5m Range: (Generally these are to be avoided where possible)

- Toro 300
- Hunter PS
- Toro 570
- Rainbird 1800.

Other sprinkler heads should be industry standard recognised models supplied by Toro, Hunter or Rainbird.

Sprinkler heads shall have:

- Built-in check valve;
- Screw-on cap;
- Removable nozzle; and
- A pop-up height of at least 100mm or if located in gardens 150-300mm as suitable
- Stainless steel riser where available.

1.4.2.6 Wiring

Wiring is to be supplied and installed in accordance with relevant Australian Standards for extra low voltage (24 VAC 50 HZ) wiring.

Size cables to suit valve power draw off and length of cable runs.

Nominally (based on 0.4amp solenoid valve) use 1mm multicore, multistrand active control cable for cable runs up to 400m and 1.5mm multicore, multistrand control cable for cable runs up to 1000m. Greater than 1000m 2.5mm cable to be used.

A twin wire multistrand cable to be used for the common cable of 1.5mm up to 1000m and 2.5mm over 1000m. Where more than one solenoid valve is to be operated at the one time the common cable upsized to meet the electrical loads of the system design.

Systems operating decoder shall use decoder cable sized as required and supplied only by the manufacture of the control system and the decoders.

Run cable in continuous lengths from controller to valve.

Formed cable joints in a valve box with an approved propriety moisture resistant system designed for direct bury installation. Typcaily DBY/R or "Gel Tite" for conventional wired systems using less than 1.5mm may to be used.

Provide an additional 1m of cable at all changes of direction greater than 45°, branch junctions and in all solenoid valves pits for future service and maintenance without the requirement for extra joints in the cable.

Lay cables in a light duty comms or MDPE conduit when in common trench with the pipe reticulation system either below or beside the pipework.

Lay cables in a suitably sized heavy duty electrical conduit (40mm dia. or larger) where not in a common trench with the pipe reticulation system or where located under footpaths, bike paths, roadways, car parks or other paved surfaces.

1.4.2.7 Controllers

COMPUTERISED IRRIGATION MANAGEMENT SYSTEM

Confirm if the irrigation is to be controlled by an ACT Government operated Computerised Irrigation Management System (CIMS).

If connection to a CIMS is confirmed, the controller is to be compatible with the Rainbird IQ cloud based CIMS in use or as other wise as directed by the authority responsible for place management.

The controller to be complete with rain sensor wireless or hard wired and vandal proof, generally use a master valve and a Rainbird flow sensor is to be provided connected and "learned flows" calculated and entered into the data base or program of the system. TCCS shall supply any required Sim card.

The controller should have:

- Permanent 240v power connection with surge protection and grounding as necessary
- Four independent programs;
- Capability to run two programs concurrently;
- Independent day schedule options for each program;
- Cycle & soak capability by station;
- Rain sensor override; and
- Remote control operation
- Fitted complete with vandal proof wired or wireless rainsensor and flow meter. The flow meter shall be a pulse type and where available connected to the controller.

Where approved the current preferred stand-alone controller is:

- Hunter I Core.
- Small area street scapes and carparks that maybe of 1-4 stations with no ability for expansion and no readily available power supply may be a Hunter Hybrid Battery operated unit.

1.4.2.8 Controller Housings

Mount the controller in a pump house (if available), in a building service cupboard or other existing housing with external access (if available) or otherwise in a freestanding cabinet not less than 1200 high and generally not greater than 1800 high.

Locate controller housings in unobtrusive locations:

- Easily accessible for maintenance and operation;
- Clear of sprinkler overspray; and
- Providing the operator with a substantial view of the watered area from the controller.

Controller housings should be:

- Constructed of brushed stainless steel or powder coated steel with ventilation to the sides and to be vandal resistant complete with double or triple locking "hidden" swing padlock style leaver handle; and
- Sized to allow for the controller and other components to be operated & maintained from a standing position (or as otherwise required by current *Workplace Health & Safety regulations*).
- When freestanding it shall be on a suitable concrete plinth clear of the surrounding ground level and protruding minimum 150mm beyond the cabinet base with a bevel edge to ensure water does not run under or pool in the base of the cabinet. Spare conduits to be included when free standing and all accesses plugged to prevent vermin entry.

Incorporate a suitable line surge protector to provide lightning protection for controllers, master valves and valve wiring.

1.4.2.9 Component Pits

Construct large component pits (50mm and larger) in ground with reinforced concrete floor and walls to ICON standards. Medium and small (25mm-40mm) may be in other approved commercial valve pits or prefab concrete pits with suitable bolt down or lockable covers.

Drain pit to nearest stormwater line (preferred) or to a soakage pit.

Finish pit at ground level with 8mm thick galvanised chequered plate covers hinged off a cast in galvanised angle surround and incorporating a hand hold and turn lock device in each cover.

Assemble water meter pit components in accordance with current *ICON Water Supply and Sewerage Standards* and provide a small hinged flap to allow the water meter to be read without lifting the covers. Refer *ICON Water Supply and Sewerage Standards.*

Provide, install, field test and maintain backflow protection devices in accordance with relevant Australian Standards.

1.5 Approvals

Agencies that may require approvals for irrigation works include, but are not limited to ACT Environment Planning and Sustainable Development Directorate – Planning, TCCS Place Management City Presentation, TCCS Roads ACT, TCCS Development Review and Coordination [gifted assets], TCCS Capital Works Urban, ICON water, NCA, and EPA.

1.6 Documentation

Requirements: Comply with *TCCS Reference document 6 Design Acceptance submissions.*

1.6.1 Working drawings

Working drawings should show system layouts at an appropriate scale and include comprehensive system information for:

- Design operating pressures, flows & discharge rates;
- Draw off rates from reticulated supplies or stormwater harvest facilities;
- Watering times;
- Sprinklers used in high volume irrigation with nozzle size and spacing;
- Emitters used in low volume irrigation with litres per hour and spacing;
- Component installation details;
- Controller type with number of stations;
- Station valve size and final total instantaneous flow rate.
- Buried station valved and other buried components to include triangular measurements from above ground fixed points;
- Pipe type and sizes; Conduit locations; and
- Any proposed pumps filters etc with brand and model numbers
- Pump control panel and power requirements (motor size/s)
- Station sequence map.

All drawings shall be provided at A1 size and be capable of clear reproduction at A3 size.

Symbols and notations used on the drawings should comply with *ACTEW standard drawing WSS 001 Design Symbols and Notations.*

1.6.2 Work as executed documents

On completion of the work on site, Work as Executed documents are to be provided in accordance with *TCCS Reference document 8 – WAE quality records.*

- Operation & Maintenance manual(s) and plans are to be provided. The plan to clearly show the date of completion the contractor responsible for the installation and all changes made that differ from the proposed plan and are to include the items as mentioned in **Working Drawings** upgraded to WAE status to accurately reflect the work completed on site and such manuals and copies of plans are to be included in the Operational Acceptance submission
- To enable scheduled maintenance to take place, full details and specifications of all the installed components should be provided.
- To enable their easy location on site, all in ground buried components are to be shown on the drawings with triangulated dimensions from fixed visual reference points.
- For work which is upgrading from old or amending existing systems, “redundant pipework” which is not removed should be so marked on the WAE drawings.
- Provide a waterproof set of the irrigation drawings to be located in the irrigation controller housing which are also to show general coverage of each station by different hatch styles or colours.

TCCS
Transport Canberra City Services

September 2021