

Town of
Port Hedland



IRRIGATION SYSTEM SPECIFICATION

Review 11-2018

CONTENTS

1	INTRODUCTION	6
2	DESIGN, AND OPERATION OF IRRIGATION SYSTEM	6
2.1	DESIGN OBJECTIVES	6
2.2	DESIGN APPROVAL	6
2.2.1	CID Designer	6
2.2.2	Designs	6
2.2.3	Existing Irrigation	6
2.2.4	Potable Watering Requirement	7
2.2.5	Flow And Pressure Test	7
2.2.6	Effluent Reuse Irrigation Systems	8
2.2.7	Hydrozoning	9
2.2.8	Pressure Loss	9
2.2.9	Operating Pressure	9
2.2.10	Water Velocity	9
2.2.11	Overspray	9
2.2.12	Solenoid Valve Isolation	10
2.2.13	Backflow Protection Devices	10
2.2.14	Cyclone Rating	10
2.2.15	Regulations	10
3	MATERIALS AND INSTALLATION	11
3.1	MATERIALS	11
3.1.1	Underground Pipework	11
3.1.2	Solenoid Control Valves	11
3.1.3	Pressure Control	12
3.1.4	Threaded Fittings	12
3.1.5	Isolation Valves	12
3.1.6	Mainline Isolation Valve	12
3.1.7	Air/Vacuum Release Valve	12
3.1.8	Valve Boxes	13
3.1.9	Sprinklers	14
3.1.10	Dripline	15
3.1.11	Fittings	15
3.1.12	Cobra Clamps	15
3.1.13	Vacuum Breaker	15
3.1.14	Manual Flushing Valves	16
3.1.15	Headers/Collectors	16
3.1.16	Dripline Staking	16
3.1.17	Filters	17
3.1.18	Tanks	17
3.1.19	Pumps	17
3.1.20	Pump Delivery and Discharge Manifolding	17

3.1.21	Siemens Magflow.....	19
3.1.22	Solenoid Control Wires	19
3.1.23	Wire Connectors	19
3.1.24	MD Conduit	19
3.1.25	HD Conduit.....	20
3.1.26	Cable Pits.....	20
3.2	INSTALLATION.....	21
3.2.1	Existing Services.....	21
3.2.2	Road Crossings.....	21
3.2.3	Setout.....	21
3.2.4	Pipework Cover.....	21
3.2.5	Trenching Parallel With Roads	21
3.2.6	Embedment & Backfilling	21
3.2.7	Compaction.....	22
3.2.8	Excess Spoil.....	22
3.2.9	Turfing.....	22
3.2.10	Cross Stacking of Fittings	22
3.2.11	Pipe Between Fittings	22
3.2.12	Bending of Pipe.....	22
3.2.13	Solenoid Control Valves.....	23
3.2.14	Mainline Isolation Valve	24
3.2.15	Air/Vacuum release valve	24
3.2.16	Flushing Valves.....	25
3.2.17	Tank Installation	26
3.2.18	Dripline	27
3.2.19	Solenoid Control Wiring	27
3.2.20	Cable Pits.....	27
3.2.21	Final Inspection And Commissioning.....	27
4	ELECTRICAL.....	29
4.1	REGULATIONS	29
4.2	POWER SUPPLY, LABELLING, EARTHING	29
4.3	IRRIGATION CONTROL CABINET	29
4.3.1	Cabinet CONSTRUCTION HENK to Provide infomation.....	29
4.3.2	Ancillary Equipment	30
4.3.3	Concrete Base	30
5	PARK MANAGEMENT SYSTEM SPECIFICATION	31
5.1	GENERALHENK TO PROVIDE INFOMATION.....	31
5.2	LOCAL CONTROLLERS	33
5.2.1	Hardware.....	31
5.2.2	Firmware and software	31
5.2.3	Handheld control devices.....	33
6	INTERNET ACCESS.....	33
6.1	HARDWARE	33

|

1 INTRODUCTION

This document is designed to ensure that appropriate equipment, material and workmanship are employed when designing, installing and maintaining irrigation systems for the Town of Port Hedland or future Town of Port Hedland systems.

The main objective is to standardise equipment being used in irrigation systems that are to be handed over to the Town of Port Hedland. This allows for ease of maintenance.

2 DESIGN, AND OPERATION OF IRRIGATION SYSTEM

2.1 DESIGN OBJECTIVES

The objectives and requirements outlined below are the minimum expected design outcomes to be achieved by the designer for when the system is operational.

2.2 DESIGN APPROVAL

All designs must be submitted to Town for assessment and approval. Installation **MUST NOT** commence until Council has provided written approval.

2.2.1 CID DESIGNER

All design work undertaken for Town of Port Hedland is to be undertaken or approved by a currently certified irrigation designer.

2.2.2 DESIGNS

All designs shall be presented in AutoCAD 2013 format on a current landscape base. The irrigation designs shall include:

- Water supply source information including Potable water or Reuse water
- Water supply location including size, expected flow rate, backflow prevention requirements and treatment requirements.
- Tank and pump location including details on tank size, pump model and layout of associated equipment.
- Sleeve plan specifying size and location.
- Location of solenoid valves including diameter and flow rate, electrical pits, pipe-work (showing nominal diameter) and all sprinklers.
- Legend of sprinkler valves and associated equipment outlining brands and model names and specifying nozzle sizes, flow rates and operating pressure.
- Proposed station schedule outlining valves to be operated concurrently, including combined flow rate requirement, landscape type and precipitation rate.
- Standard installation detail drawings for solenoid valves, thrust blocks, isolation valves, flushing valves, air release valves, sprinkler installation, and pump and tank details

2.2.3 EXISTING IRRIGATION

Where installed piping is to be connected to any area of existing irrigation, the contractor shall ensure that a flushing point (valve) is provided immediately prior to the point of connection to the existing system, including an additional isolation valve at the point of connection to the existing irrigation system.

The contractor shall utilize the flushing point to thoroughly flush the newly installed piping to ensure that no debris enters the existing irrigation.

The contractor shall remedy any fouling of existing valves/equipment, where the Contractor has failed to adequately flush newly installed piping (as evidenced by fouling of existing valves/sprinklers)

2.2.4 POTABLE WATERING REQUIREMENT

Unless specified otherwise, watering requirements shall be based on a minimum of 100mm per fortnight evenly distributed over all surfaces within 56 hours (7 days per fortnight). If the available water supply does not make this possible, the total weekly watering time shall be the minimum possible with the available supply.

2.2.5 FLOW AND PRESSURE TEST

The Contractor shall carry out a flow and pressure test from the scheme water connection point and use these figures as a basis for design. Sprinkler operating with inadequate flow and pressure shall be rectified by the Contractor at his expense.

2.2.6 EFFLUENT REUSE IRRIGATION SYSTEMS

The Town of Port Hedland (ToPH) recycled water quality management plan (RWQMP) is a stand-alone document to be used by all parties in the day to day operation and management of the ToPH recycled water scheme.

The RWQMP is to read in conjunction/conformed to the current WA Health Department “**Guidelines for the Non-potable Uses of Recycled Water in Western Australia**” 2011.

It also must conform with regard to lilac colour identification. All mainline pipe, sprinkler tops, solenoid isolation valves, solenoid valve flow control handles and valve box lids are to be lilac in colour.

Any omissions will not be considered and on final handover, if any irrigation equipment does not conform to the WA Health Department regulations then those items will be replaced at the contractor’s expense.

WARNING SIGNS

Wherever water is being used for non-potable applications, erect prominent warning signs indicating, in English and any other primary languages predominately spoken in the area: “**Recycled Water – Do Not Drink**”



All recycled water storage areas should also be clearly signposted. The wording of these signs should state: “**WARNING – RECYCLED WATER – DO NOT DRINK OR SWIM**”.

These signs must incorporate the following requirements:

- A minimum size of 20cm x 30cm on a white background with black lettering of at least 20mm in height.
- Contain the recommended International Public Information – Drinking Water Symbol with the Prohibition Overlay in RED.
- In compliance with AS1319 – 1994 Safety Signs for the Occupational Environment.

- The number of signs and size of wording should be determined on the basis of the visual distance from the observer.

SPRAY IRRIGATION

For spray irrigation in Town of Port Hedland these are the requirements to comply with the Western Australian Department of Health guidelines on the use of recycled water.

Spray Irrigation Start Time	9:00 pm or when public access to lawn areas is restricted
Maximum Run Time for Spray Irrigation	6 hours i.e. (9:00pm to 3:00am)
Retention Time	4 hours
Potable Water Flushing	5 minutes for every spray station

Potable water flushing is required to reduce the risk of biofilms building up in the pipes.

2.2.7 HYDROZONING

The irrigation system shall be designed so there is hydro-zoning between:

- Active turf
- Passive turf
- Planted garden beds
- Trees.

All tree irrigation must be independently hydro-zoned to allow for decommissioning after two (2) or three (3) years without affecting the irrigation of turf and garden bed areas.

2.2.8 PRESSURE LOSS

The pressure loss through any automatic solenoid valve is not to exceed ten (10) percent of the system operating pressure.

2.2.9 OPERATING PRESSURE

The maximum and minimum operating pressure of sprinklers in a system shall not vary by more than 10%.

2.2.10 WATER VELOCITY

The water velocity in a mainline should not exceed 1.52 metres per second.

2.2.11 OVERSPRAY

No overspray will be permitted on adjoining properties, roads or buildings. Desirable to use low trajectory angle, part circle sprinklers in these situations and offset a minimum of 300mm from property lines. When using recycled water no pooling of water is allowed on any surface.

2.2.12 SOLENOID VALVE ISOLATION

The control valves shall be isolated from the mainline by means of a Philmac ball valve or equivalent.

All isolation valve used for reuse water are to have **lilac** coloured handles.

2.2.13 BACKFLOW PROTECTION DEVICES

All potable water systems need to incorporate the necessary backflow protection device as per Water Corporation specifications.

2.2.14 CYCLONE RATING

All equipment and structures installed in the Town of Port Hedland must be designed to withstand adverse wind conditions of **Region D Terrain Category 2**).

All structures are required to be designed and certified by a practicing certified structural engineer in accordance with the Building Code of Australia and Australian Standards

2.2.15 REGULATIONS

The system to be designed to achieve all watering within current rules and regulations for water of public open spaces enforced on Local Governments.

3 MATERIALS AND INSTALLATION

3.1 MATERIALS

3.1.1 UNDERGROUND PIPEWORK

MAINLINE PIPES

All mainline pipework installed on the downstream side of the irrigation water supply point is to be either PN12.5 PE100 Poly pipe or Class 12 PVC pipe as per design.

All poly pipework shall be manufactured in accordance with AS4131-1997 and AS 4130-1997.

All mainline pipe used for reuse water is to be **lilac** in colour. If Lilac pipe is not available then the mainline pipework is to be sleeved in a reclaimed water pipe sleeve.

LATERAL PIPES

All lateral pipework installed on the downstream side of the solenoid control valves is to be a minimum of class 12 PVC pipe, and utilise the Solvent Weld method of joining (SWJ).

All lateral uPVC piping shall be manufactured to Australian Standard AS1477-2006.

All lateral pipe used for reuse water is to be **lilac** in colour. If Lilac pipe is not available then the lateral pipework is to be sleeved in a reclaimed water pipe sleeve.

METRIC POLY PIPE FITTINGS

All poly pipework is to be joined using metric compression fittings. These are to be manufactured to the requirements of Australian Standard AS/NZS 4129.

PVC FITTINGS

All fittings used in the installation must be new, manufactured to AS1477-2006 and shall be compatible with PVC pipe. Changes in direction of pipework shall be with standard fittings. Excessive bending of the pipes will not be permitted.

PRIMERS AND SOLVENTS

Primers and solvents used for the PVC piping connections shall be of approved manufacture and shall be used in accordance with the manufacturer's recommendations. Cleaners must be coloured.

3.1.2 SOLENOID CONTROL VALVES

POTABLE WATER

Electrical control valves shall be 25mm, Irritrol 2400 series jar top valves or equivalent.

40mm or 50mm Rain Bird PEB normally closed 24 volt 50 cycle solenoid valves or equivalent.

REUSE WATER

Electrical control valves shall be 25mm, 40mm or 50mm Rain Bird PRSB-R normally Plastic.

All valve flow control handles are to be **lilac** colour as required for water reuse.

3.1.3 PRESSURE CONTROL

POTABLE WATER

All pressure regulation shall be done with a pressure regulation device shown below;

Valve Size	Pressure Regulator	Spring Colour
25mm Valve	100-PRV	Black
40 & 50mm Valves	Incorporated onto the Rain Bird valve using a PRS-Dial pressure regulating module	

NON POTABLE WATER

All pressure regulation shall be done with a pressure regulation device shown below;

Valve Size	Pressure Regulator
40 & 50mm Valves	Incorporated onto the Rain Bird valve using a PRS-Dial pressure regulating module
80mm	Bermad 700 low-pressure hydraulic valves

REUSE WATER

Where pressure regulation is required on a station of sprinklers this shall be done by means of a Rain Bird PRS-Dial pressure regulating module on the solenoid valve.

3.1.4 THREADED FITTINGS

All plastic threaded (BSP) pipe fittings are to be utilised for connection of the mainline tapping bands to the solenoid valves shall be manufactured from glass fibre reinforced nylon or polypropylene material. They shall be rated at a maximum working pressure of 1600 kPa (PN16) as tested by the manufacturer in accordance with AS1460.

3.1.5 ISOLATION VALVES

Solenoid Valves, Air Release Valves and Flushing Valves shall be isolated from the mainline utilising a **Philmac** Ball Valve or equivalent. All equivalent or replacement parts can only be approved if town of Port Hedland nominated Superintendent or representative provides written approval

All isolation valves used for reuse water are to have **lilac** coloured handles.

3.1.6 MAINLINE ISOLATION VALVE

On 90mm and greater mainline size, isolation valves shall be an AVK ductile iron resilient seated sluice valves with spindle cap. These valves shall be manufactured to Australian Standard 2638. 2-1999, be suitable for Table 'D' flange.

Valves shall be configured for 'clockwise turning' to close and the top of the spindle cap shall have an arrow indicating the direction to turn for closing.

All mainline isolation valves used for reuse water are to have **lilac** coloured spindle caps

3.1.7 AIR/VACUUM RELEASE VALVE

Shall be a 25 or 50mm combination air vacuum release valve that incorporates in one body a kinetic air and vacuum release. The locations of these air valves shall be such that any trapped air in the mainline is able to be readily exhausted whilst minimising the risk of water hammer in the system.

3.1.8 VALVE BOXES

Valve Boxes shall be **Rain Bird** reinforced plastic valve boxes with lockable lids. Valve boxes shall have minimum dimensions in accordance with the following models:-

All valve boxes used for reuse water are to have **lilac** coloured lids.

Equipment	Valve Box Size
25mm & 40mm Solenoid Valves	Standard Rectangular Series (VB-STD) (368 mm x 239 mm x 307mm)
50mm Solenoid Valves	Jumbo Rectangular Series (VB-JMB) (430mm x 300mm x 305mm)
Mainline Flush Valves	Standard Rectangular Series (VB-STD) (368 mm x 239 mm x 307mm)
25mm, 40mm and 50mm Filters	Jumbo Rectangular Series (VB-JMB) (430mm x 300mm x 305mm)
Solenoid Isolation Valves	Inside Solenoid Valve Box
Mainline Air Release Valves	10" Round Series (VB-10RND)
ABB Water Meter	Jumbo Rectangular Series (VB-JMB) (430mm x 300mm x 305mm)

3.1.9 SPRINKLERS

PREFERRED SPRINKLER

The Town of Port Hedland typically utilises sprinkler products from Rain Bird, Hunter and Toro as outlined in the table below. Any proposed alternative sprinkler must to the written satisfaction and approval meeting or exceed the specifications of the preferred sprinklers listed.

All sprinklers used for reuse water are to have **lilac** coloured caps.

Preferred Sprinkler			
Brand Name	Type	Series	Nozzles
Rain Bird/Hunter	Pop-up gear drive	8005-SS / I-25	
Rain Bird/Hunter	Pop-up gear drive	5505-SS / I-20	
Rain Bird/Hunter	Pop-up gear drive	5000 / PGP	
Rain Bird/Hunter	Pop-up gear drive	3000 / SRM	
Toro	Pop-up fixed head	570 series	
Toro	Pop-up Tree bubbler	570 PC Flood Bubbler	

SPRINKLER OFFSET

All sprinklers adjacent to any hardscape shall be offset 300mm (Rotors) and 150mm (Pop-up) off the hardscape edge including any kerbing.

SPRINKLER CONNECTION

All sprinklers will be connected to the lateral pipework via a suitable diameter 300mm artic risers articulated riser of quality manufacture. These risers shall be reinforced threaded poly elbows and the nipples shall be at an angle of 45 degrees when correctly installed.

All tree bubblers shall be on Olson Ezel flexible swing pipe (500mm minimum) with E - Z elbows or equivalent.

3.1.10 DRIPLINE

In the Town of Port Hedland all garden bed areas are to be irrigated with dripline.

DRIPLINE – POTABLE WATER

Items	Requirements
Dripline Type	Netafim 13mm, Techline AS 1.6LPH, pressure compensating
Emitter Spacing	400mm
Row Spacing	400mm
Dripline Pressure	200 kPa
Dripline Fittings	13-mm (low density polyethylene pipe) fittings with Cobra Clamps
Installation Depth	75mm Sub Mulch

DRIPLINE – REUSE WATER

Items	Requirements
Dripline Type	Netafim 13mm Techline AS Purple (Bioline AS) 1.6LPH, pressure compensating
Emitter Spacing	400mm
Row Spacing	400mm
Dripline Pressure	200 kPa
Dripline Fittings	13-mm (low density polyethylene pipe) fittings with Cobra Clamps
Installation Depth	100mm Sub Mulch

3.1.11 FITTINGS

All fittings are to be as per manufactures recommendations.

3.1.12 COBRA CLAMPS

All dripline connections are to be secured using stainless steel Cobra Clamps. The cobra clamp sizes used is to be as per manufactures recommendations.

3.1.13 VACUUM BREAKER

These shall be 15mm Bermad vacuum breakers or equivalent and will be housed in a 910 round valve box.

3.1.14 MANUAL FLUSHING VALVES

These shall be a 15, 20 or 25mm Philmac or approved Equitant Ball valve on a suitable diameter articulated riser of quality manufacture all housed in valve boxes.

3.1.15 HEADERS/COLLECTORS

All header and collector pipework installed on the downstream side of the solenoid control valves shall be Low Density Poly Pipe (LDPE) or (SWJ) PVC depending on the flow of the stations.

Header / Collector s Size	Recommended Flow (LPM)
19mm (LDPE)	30
25mm (HDPE)	45
40mm (SWJ)	120
50mm (SWJ)	240
80mm (SWJ)	480

3.1.16 DRIPLINE STAKING

All dripline is to be secured by Antelco asta hold down stakes #43615. These hold down stakes are suitable for securing polyethylene tubing (up to 22 mm OD).

3.1.17 FILTERS

PRIMARY FILTER

All primary filter to be used are Filtaworx. It shall be sized to suit the flow and water quality.

The filter body shall:

- Constructed from 316 grade stainless steel.
- Be fitted with pressure differential (PD) control mechanisms to allow for the automatic activation of the filter flushing cycle.
- Have Table 'E' flanges.

SECONDARY FILTERS

All secondary filters shall be Triangle Plastic Screen Filters with a 120 Mesh. They shall be sized to suit the flow.

3.1.18 TANKS

All tanks are to be a minimum of 50,000lt in capacity & of poly construction. Where there is a requirement for additional water storage steel walled liner tanks are to be installed individual designs will be required and written approval granted by Port Hedland nominated Superintendent or representative.

PENETRATIONS AND FITTINGS

Penetration through the tank walls and the installation of other fittings and accessories shall be carefully programmed during construction so as not to reduce the tank performance in any respect. Modifications or retrofit after construction will not be acceptable.

TANK / PUMP COMPOUND

The tank and pump shall be installed in a 2400mm high garrison fenced compound. It shall be powder coated in a colour nominated by the Town of Port Hedland.

Gates are to be matching and use heavy duty hinges and locks. All locks are to be keyed to Town of Port Hedland requirements.

3.1.19 PUMPS

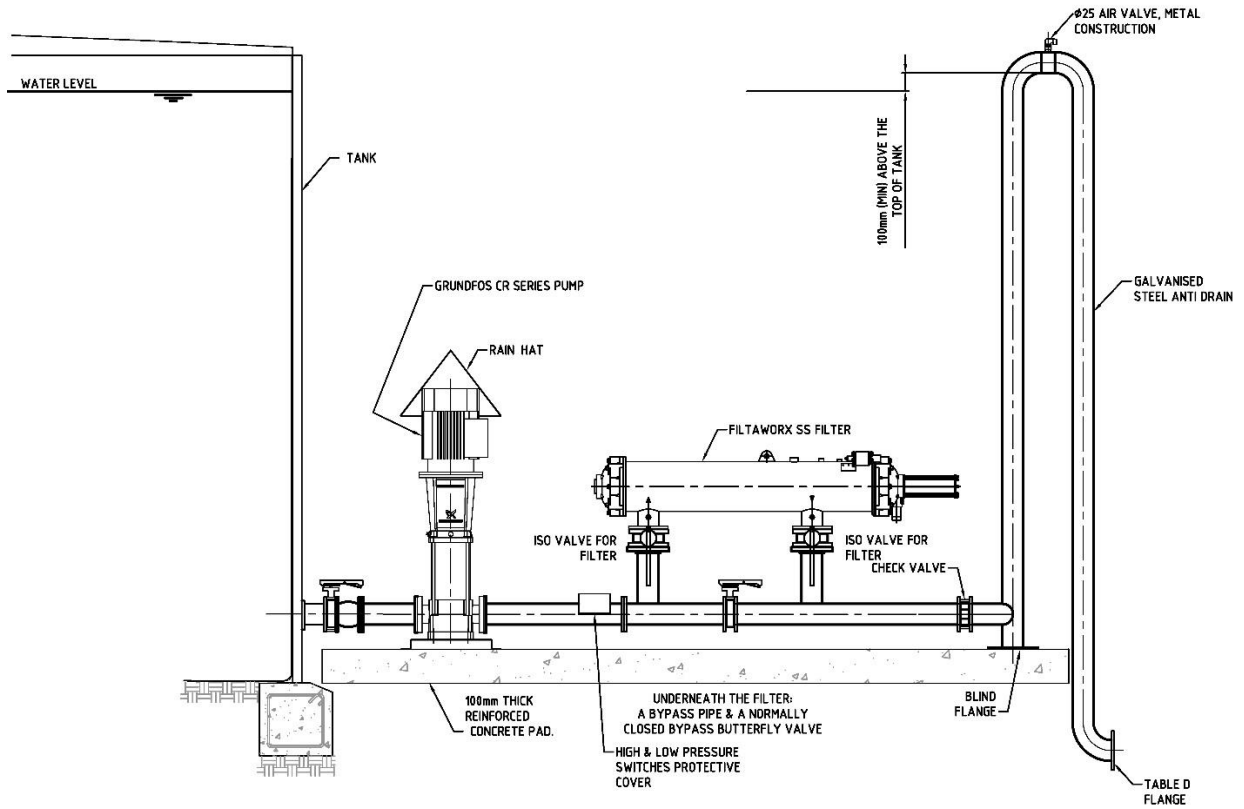
The Town of Port Hedland preferred pump manufacturer is Grundfos. The model to be utilised is CR or CRI series vertical multi-stage.

3.1.20 PUMP DELIVERY AND DISCHARGE MANIFOLDING

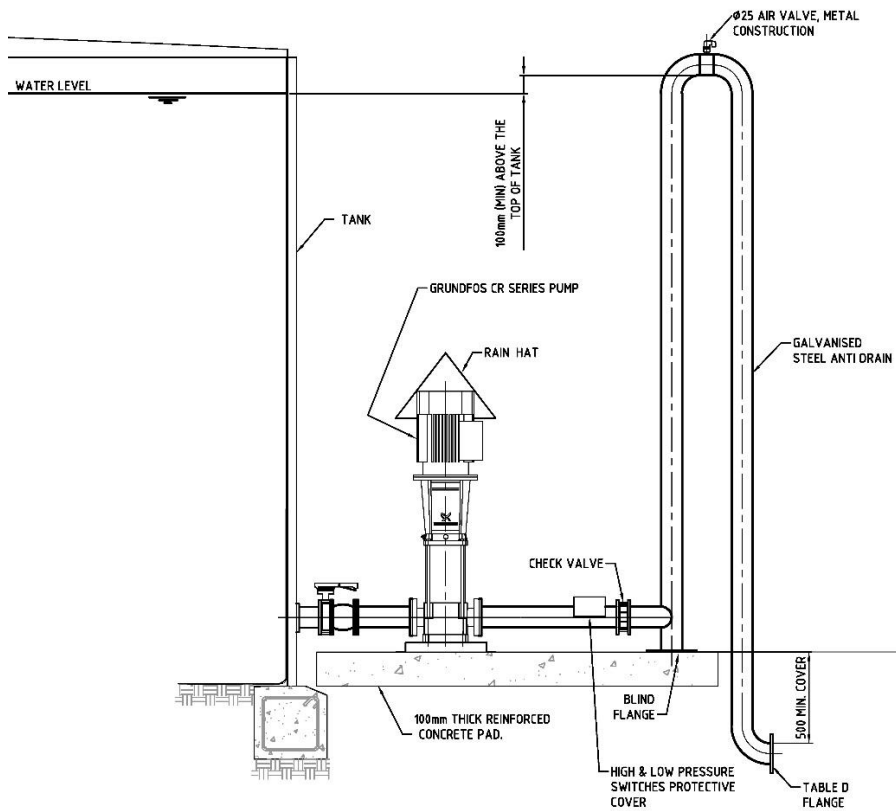
All pipework and fittings within the discharge manifold shall be manufactured from fusion welded PE100 poly onsite to suite nominated size & specification

Essential components of the discharge manifolds are:

- Epoxy coated cast iron butterfly valve with a stainless steel spindle installed on the discharge manifold - sized as shown.
- Epoxy coated cast iron wafer check valve with a stainless steel spindle installed on the discharge manifold - sized as shown.
- Flow switch for an irrigation pump.
- An anti-drain manifold which is 100mm higher than the tank.
- All flanges shall be joined with galvanised bolts, nuts and washers.



TYPICAL PUMPING STATION & FILTER



TYPICAL PUMPING STATION

3.1.21 SIEMENS MAGFLOW

A Siemens Magflow type meter with a remote readout attachment. The meter is to be installed downstream of the water source as per manufacturers specifications. The contractor shall allow connecting the signal output from the meter to the satellite controller sensor input at each site.

Each magnetic flow meter element shall be installed in such a way that a straight length of pipe is provided 6 diameters before and 3 diameters after the sensing element. When installing in non-metallic pipes, earth rings shall be installed at each side of the sensor

Special cabling from Siemens links the sensor element to the remote readout. which is normally housed within the irrigation control cabinet. In turn the readout is linked to the controller via a Modbus RS485 connection.

The contractor shall carry out whatever calibration/configuration is required to ensure that the flow rate is accurately recorded. A flow verification certificate from the manufacturer, shall be provided by the contractor with each new flow meter supplied.

The Siemens Magflow sensing element is to be housed in one (1) Rain Bird Jumbo Rectangular Series (VB-JMB) valve box.

3.1.22 SOLENOID CONTROL WIRES

All low voltage (24 Volt) solenoid control valves shall be TYFLO multi-core cable multi-strand copper conductors sheathed in polyethylene.

A separate 2.5mm² multi-strand black common cable shall be installed with the multi-core.

Minimum cable sizes shall be:

Common Wires -	2.5mm ² conductor
Active Wires < 400m -	1.5mm ² conductor when cable run is under 400m.
Active Wires 400m-800m	2.5mm ² conductor when cable runs are between 400m.
800m – above	2 wire installations. The two-wire path shall be 4mm decoder wiring. The wiring must be as specified and recommended by the manufacturers of the controller and decoders.

3.1.23 WIRE CONNECTORS

All solenoid cable joints shall be fitted with a crimp and sealed with DBY or DBR connectors or to manufactures specifications.

Product	Wire Range mm ²
DBY or One King connectors	0.823 - 3.31 mm ²
DBY or One King connectors	1.31 - 5.26 mm ²

3.1.24 MD CONDUIT

All low voltage solenoid wires and 2 wire paths and wires shall be installed in an appropriate sized MD electrical conduits.

3.1.25 HD CONDUIT

All high voltage power is to be installed in an appropriate sized HD electrical conduit.

3.1.26 CABLE PITS

P2 cable pits are to be used for all irrigation cabling.

3.2 INSTALLATION

3.2.1 EXISTING SERVICES

The Contractor shall determine the exact location of all existing site services and shall conduct his work so as to prevent disturbance or damage to them. Any damages to existing services shall be repaired at the Contractor's own expense.

3.2.2 ROAD CROSSINGS

Where irrigation sleeves do not exist all road crossings must be done by means of horizontal under-road boring. Sleeves must be two sizes larger than the irrigation pipe nominated to be installed. Ducts shall be constructed as nominated below:

- All sleeves are to be class 9 PVC pipe.
- All sleeves are to extend to start and finish under non hard surfaces by minimum of 400mm (paths etc.).
- All sleeves are to be capped to stop ingress of soil.
- All sleeves are to be installed 750mm under the finished road surface.

3.2.3 SETOUT

The contractor shall do all setting out in accordance with the approved CAD irrigation drawings.

3.2.4 PIPEWORK COVER

Minimum Cover of Pipe		
Pipe Type	Landscape	Roads
Mainline	450mm	750mm
Laterals	350mm	750mm

3.2.5 TRENCHING PARALLEL WITH ROADS

Trenching which runs parallel with the road shall be no closer than 600mm from the kerb.

Lateral lines need to be offset even though this may not be indicated on the irrigation drawing.

3.2.6 EMBEDMENT & BACKFILLING

The bedding, overlay and backfilling of all pipework trenches shall be accomplished with material previously excavated from the site trenches providing it is in accordance with AS-2032 and should be of the following:

1. Sand or soil, free from rocks greater than 10mm, and any hard clay lumps greater than 75mm in size.
2. Crushed rock, gravel, or graded materials of even grading with a maximum size of 15mm.
3. Excavated material free from rocks or vegetable matter.
4. Clay lumps which can be reduced to less than 75mm in size.

Where trench work encounters unsuitable bedding material a 100mm bed of sand will be provided at the contractor's cost. This will be placed below pipe in the trench prior to pipe lying. This will apply to overlaying and backfilling of all trenches, where the pipe will be covered with a minimum of 100mm of sand to prevent similar debris from coming in contact with the pipe or control cables. Under no circumstances will construction debris of any kind be included in any

backfill material. Allowances should be made for not backfilling during the heat of the day to minimise the effects of thermal expansion and contraction on pipe already laid.

3.2.7 COMPACTION

Compaction should take place only after suitable bedding and backfilling has been completed to the satisfaction of the principal. Compaction can be achieved by plate compaction or by flooding, depending on the application. However, irrespective of which method is used, it will remain the contractor's responsibility to ensure that reinstatement of trenches, due to subsidence, is not required throughout the defects liability period. Repair of any subsidence during this time shall be the contractors' responsibility.

3.2.8 EXCESS SPOIL

Excess trenching spoil will be removed and disposed to a location of the site of as directed by the Town of Port Hedland.

3.2.9 TURFING

Where trenching is required through existing turf, the turf must be removed via a turf cutter by the Contractor and then replaced after the trench has been backfilled and compacted. The Contractor is responsible for keeping the turf in good condition until it is replaced.

The Contractor shall re-turf all trenches and excavations nominated by the Town of Port Hedland under the contract.

All turf shall be kept in a healthy condition until re-laid and shall be re-laid within a six (6) hour period. The Contractor shall allow for the cost of a water truck to hand water newly laid turf at the end of each day.

3.2.10 CROSS STACKING OF FITTINGS

Cross-stacking of fittings will not be accepted

3.2.11 PIPE BETWEEN FITTINGS

A minimum length of 300mm of pipe shall be installed between fittings.

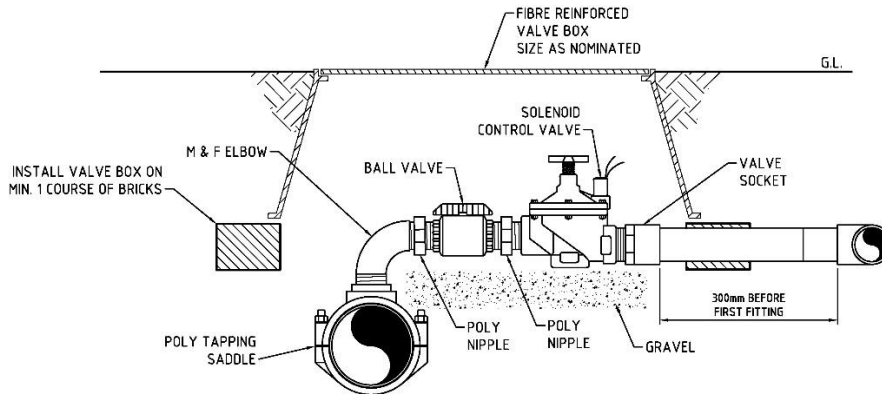
3.2.12 BENDING OF PIPE

Bending of pipes will not be accepted.

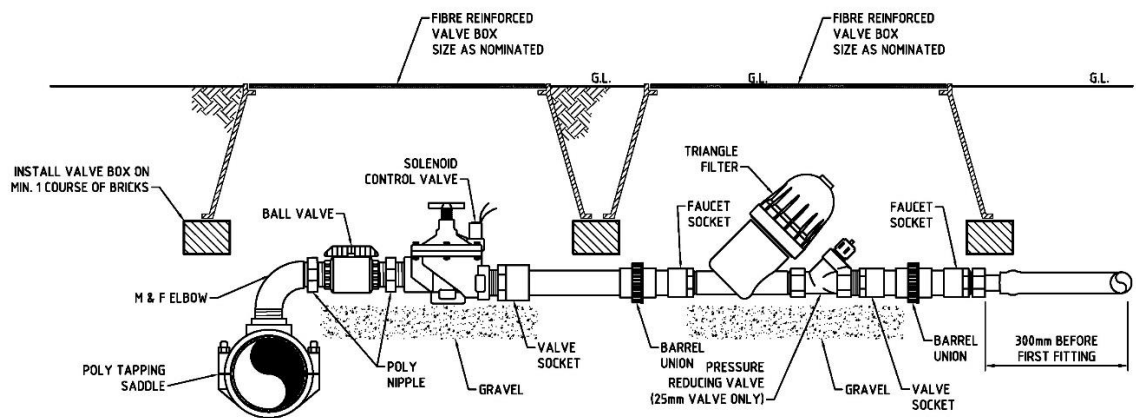
3.2.13 SOLENOID CONTROL VALVES

- Solenoid valves shall be installed as nominated below:
- Joints on the upstream side of the valve can use SWJ PVC.
- Top of the valve is to be located a maximum of 350mm below finished ground level.
- To be housed in the nominated valve box.
- Valve boxes are to be centrally located over the solenoid valve and isolation ball valve to allow for easy operation and servicing.
- All valve boxes are to have 50mm of gravel to cover the base.
- Upstream/downstream pipework mustn't come into contact with the valve box

SPRINKLER VALVE



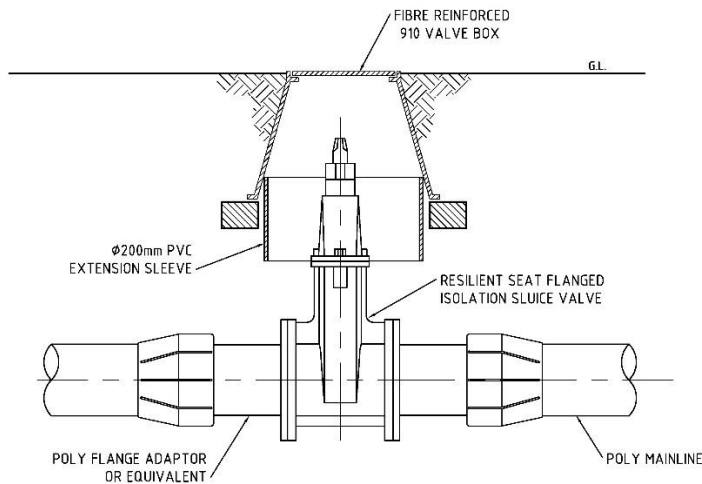
DRIP VALVE



3.2.14 MAINLINE ISOLATION VALVE

Mainline isolation valves shall be installed as nominated below:

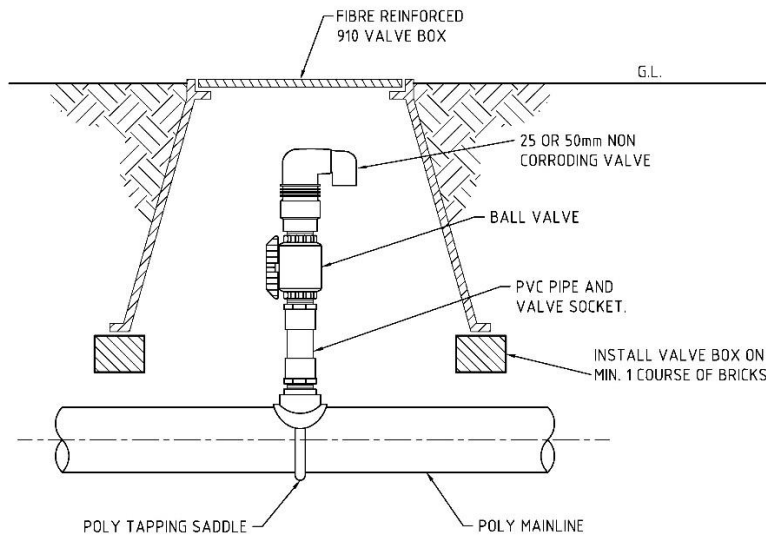
- To be housed in the nominated valve box.
- Valve boxes are to be centrally located over the mainline isolation to allow for easy operation.



3.2.15 AIR/VACUUM RELEASE VALVE

Air / Vacuum release valves shall be installed as nominated below:

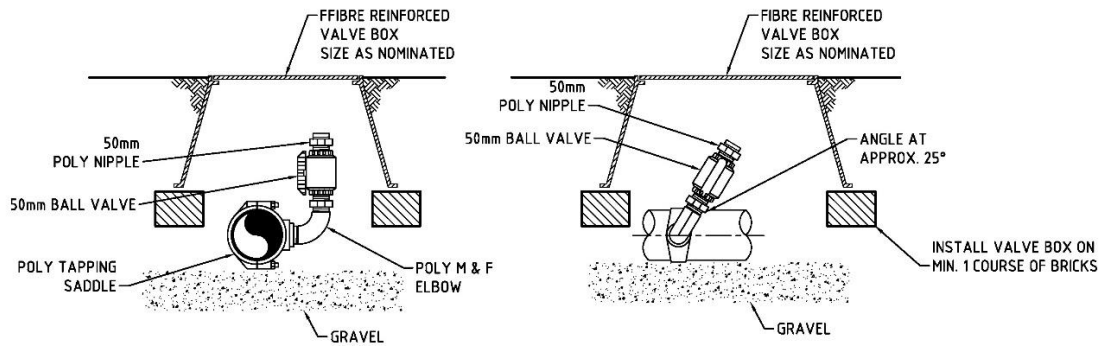
- To be housed in the nominated valve box.
- Valve boxes are to be centrally located over the air/vacuum release valve to allow for easy operation.



3.2.16 FLUSHING VALVES

All mainline shall have a 50mm flushing valves at each capped ends.

- To be housed in the nominated valve box.
- Valve boxes are to be centrally located over the flushing valve to allow for easy operation.



SPRINKLER INSTALLATION

All sprinklers shall be installed as per the manufacturer's instructions. The Contractor shall be responsible for:

- Ensuring all sprinkler heads fully retract when not in operation.
- Each sprinkler is set to the correct height.
- Each sprinkler is set straight.

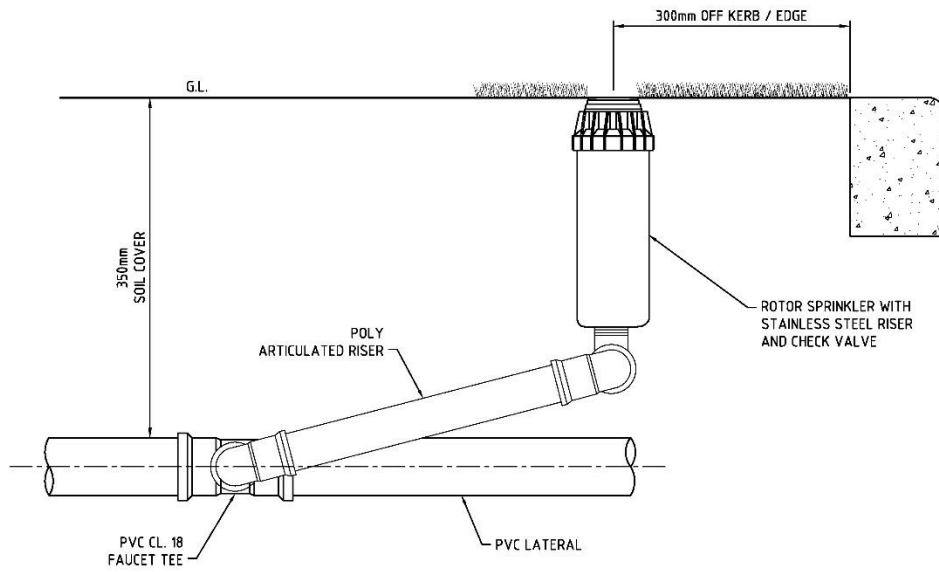
SPRINKLER SET HEIGHT

Area Type	Planting	Sprinkler Height relative to GL
Turf Area	Seeded	Flush
Turf Area	Roll On	Flush
Garden Areas	Plantings with Mulch	75mm under mulch

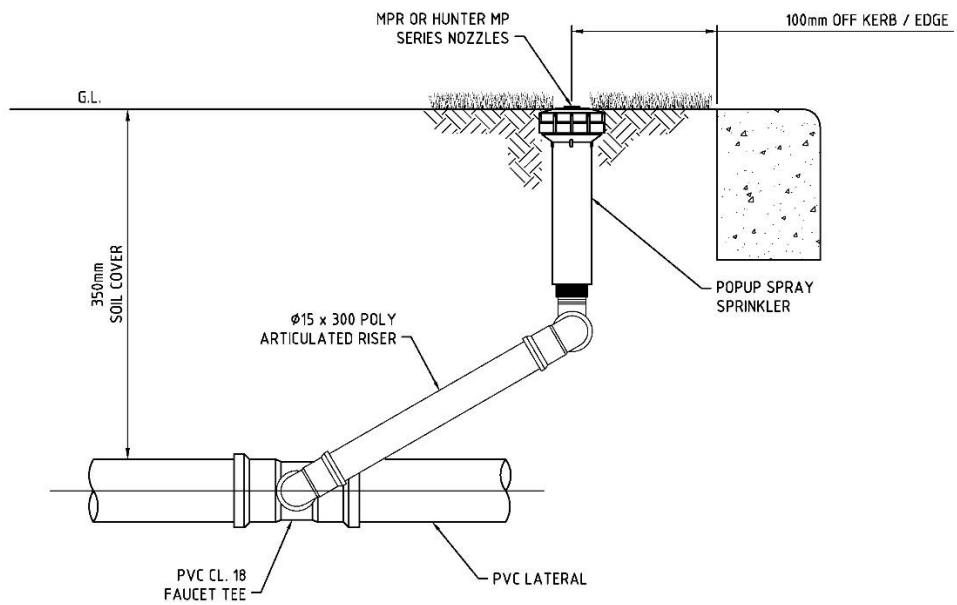
ROAD VERGE SPRINKLERS

Sprinkler Type	Offset from the back of kerb
Gear Drive	300mm
Popup Spray	100mm

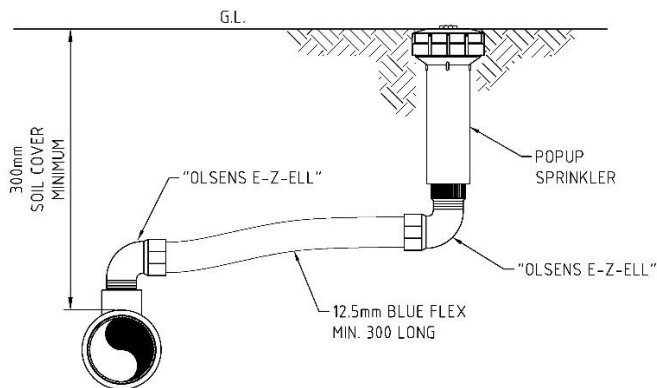
ROTOR SPRINKLER



POPUP SPRAY SPRINKLER



TREE BUBBLER

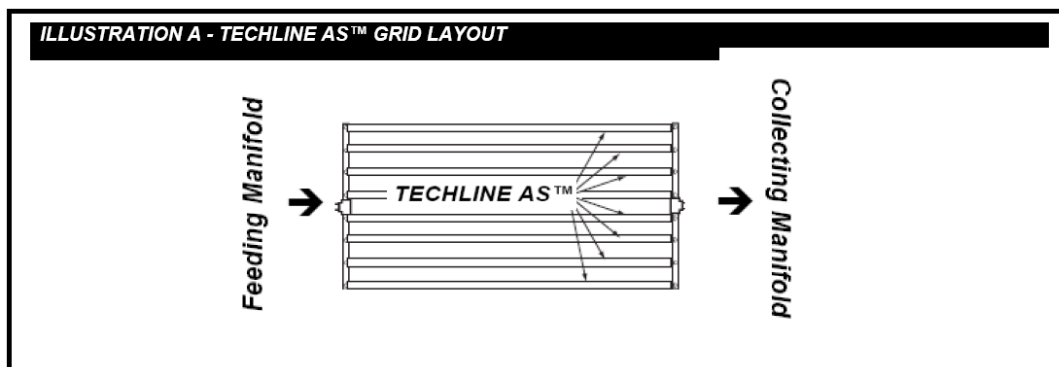


3.2.17 TANK INSTALLATION

The tank must be installed on a concrete slab must be at least 25mpa and 100mm thick with F62 mesh halfway through the mix. It should be screeded flat and level with no high or low spots. The finished surface should have a trowelled finish.

All tanks when installed must be secured for when they are exposed to adverse wind conditions applicable to the Town of Port Hedland.

3.2.18 DRIPLINE



The Grid Layout is the preferred method for installing Techline AS sub-surface under 75mm of mulch.

This method uses required a supply and collecting manifolds with rows of Techline AS connected at each end.

The supply manifold delivers water to each row of Techline AS. The collection manifold forms a continuous loop in the system. A manual flushing point is to be installed on the collecting manifold.

This interconnection of the piping network forms “GRID layout”. This evens out the flow, helps ensure water is being delivered downstream of any breaks in the laterals and allows for much easier repairs of any line breaks.

All fittings are to be secured with Cobra Clamps and dripline is to be secured with Antelco asta hold down stake every five (5) metres.

3.2.19 SOLENOID CONTROL WIRING

The control wires shall be:

- Laid in a conduit alongside, but no closer than 100mm too, the mainline.
- A minimum of 2 spare wires or 10% (whichever is greater) should be left at the end of all mainlines. If the mainline is a ring main the spare wires shall be run bidirectional.
- Wire connectors shall only be carried out by experienced tradesmen to manufactures specifications.

Note: Solenoid valves shall not be paired in the field. Any pairing of solenoids shall be done back at the control cabinet.

3.2.20 CABLE PITS

P2 cable pits are required every 100 meters or change of direction. All cable pits will have a hole in the base of 50mm minimum size.

3.2.21 FINAL INSPECTION AND COMMISSIONING

On completion of all works the Town of Port Hedland must be contacted to arrange a date for final inspection and commissioning. This process must not proceed without Council, or their appointed representative, being present.

4 ELECTRICAL

The Contractor shall ensure that all materials and workmanship shall be accomplished in accordance With the regulations and requirements of Horizon, industry Codes of Practice and with current S.A.A. Wiring rules, standard specification for cabinet size and layout is to be used.

4.1 REGULATIONS

The contractor shall ensure that all materials and workmanship shall be accomplished in accordance with the regulations and requirements of Horizon, industry Codes of Practice and with current S.A.A. wiring rules (AS-3000).

4.2 POWER SUPPLY, LABELLING, EARTHING

The power supply to this installation will be 415/240 volt, plus or minus 6%, 3 phase, 4 wire, 50 hertz, which is to be sourced from the power pole installed as part of these contract works.

The contractor shall make all the necessary applications to the Horizon Corporation, to obtain a suitable 'off-peak tariff' power supply for the project works, with all materials and equipment supplied under this contract being designated for this supply, unless otherwise specified.

The contractor shall supply and install a 100mm galvanised power pole, connections and underground power supply cables/conduits to the proposed location of the new bore & cabinet, in accordance with the rules and regulations of Horizon Corporation.

The Contractor shall:

- Install the earthing system in accordance with the multiple earthed neutral (MEN) system requirements, if applicable.
- Use earthing conductors of high conductivity copper unless otherwise specified.
-

The Earth shall be:

- Installed from the pit electrode via a conduit to the cabinet.
- Connect an earth electrode with approved copper or brass band type clamps, or proprietary made clamp assemblies.
- Ensure that steel clamping bolts are galvanised or stainless steel and paint exposed parts of the connection with an approved metallic paint.
- Earth electrode shall be 3000mm long copper clad steel cored type, of 16mm diameter and driven to a depth of 2900mm into the ground.
- Provide additional earth electrodes as necessary to achieve S.A.A. wiring rules earthing resistance requirement.

4.3 IRRIGATION CONTROL CABINET

4.3.1 CABINET CONSTRUCTION

- Free-standing cabinets shall comply with Category D Cyclone rating
- The irrigation control cabinet shall be a fully weatherproof, free-standing, cabinet type enclosure of 2.5mm (minimum) marine grade aluminium construction. It shall be IP56 rated.
- External finish of the irrigation control cabinet shall be powder coated white
- Cabinet doors shall be constructed from 2.5mm (minimum) marine grade aluminium adequately constructed to protect against unauthorized entry.
- The front irrigation cabinet door (for non-qualified personnel) shall be complete with one-off half Euro swing handle with 3 point linkage locking mechanism (keyed to the Town of Port Hedland standard irrigation key). The hinges shall be chrome plated.

- The rear irrigation cabinet door (for qualified electrical personnel) shall be complete with one-off half Euro swing handle with 3 point linkage locking mechanism (keyed to the Town of Port Hedland standard irrigation key). The hinges shall be chrome plated.
- The irrigation control cabinet shall include a 75mm x 40mm PFC hot dipped galvanised or aluminium base fixed to the irrigation cabinet with galvanised bolts with spring washers and NYLOC nuts. The base shall be fixed to the concrete foundation with six off 100mm x 10mm galvanised bolts.
- The cabinet shall incorporate a separate section within the cabinet for the installation of the Horizon Corporation meter and equipment, and shall conform to the requirements of the Corporation.
- The cabinet shall be ventilated in accordance with the recommendations of the manufacturer of the equipment which is to be installed within the cabinet, and in accordance with sample drawings included with this specification (if any).
- Provide and install labels within the pump cabinet for all the power and control equipment.
- All meters, indicator lamps, key-operated switches, pressure gauges etc. being panel mounted.
- Provide and install a laminated copy of the control schematic in A4 format within the pump cabinet inside a document holder.

4.3.2 ANCILLARY EQUIPMENT

Below is the Ancillary equipment that is required for a potable system and a tank/pump system.

POTABLE MAINS SYSTEM

- Horizon Corporation meter
- General Power Outlet – 240VAC panel mounted within the cabinet
- An automatic irrigation controller

TANK / PUMP SYSTEM

The contractor shall incorporate into the electrical switchboard, but not limited to, the following equipment:

- Horizon Corporation meter.
- An electrical circuit for connection to the pressure transmitter and configured to provide the system with protection from high and low-pressure fault, together with 1-10 minute programmable timing delay, electrical 'lock-out' of the irrigation pump, a visual indication of the low-pressure fault and a reset button via the touchscreen.
- An approved pressure gauge, connected to the high/low-pressure hydraulic pipe, with a scale to 1000 kPa.
- One level transmitter to be configured to provide the system with protection from a low water level in the tank, electrical 'lock-out' of the pump, a visual indication of the low-level fault and a reset button.
- An automatic irrigation controller providing complete pump operating functions.

4.3.3 CONCRETE BASE

The concrete base shall be sized to suit the requirements of the irrigation control cabinet. The exact location is to be verified with the Town of Port Hedland prior to installation.

The finished level of the concrete base shall be a minimum of 150mm above finished ground level and 400mm minimum below finished ground level.

The concrete base shall be constructed from a minimum of 40 MPa concrete and shall conform to all relevant standards.

All electrical conduits shall be complete with sweep bends installed below the concrete base.

5 PARK MANAGEMENT SYSTEM SPECIFICATION

5.1 GENERAL

A Park Management System will be required to provide both local and remote control/monitoring of each of the parks as indicated in the scope of work. Each local control system shall be able to communicate periodically (and upon request) to the Central System via a 3G/4G wireless router.

Each controller shall be able to communicate to a Central Server to provide instantaneous internet access of the park controller

Full details on each of the components of the proposed Park Management System have been included in the following sections.

Controllers shall be Waterman Irrigation Smart Park controllers or equivalent.

5.1.1 HARDWARE

The local park management controller shall utilize standard industrial hardware for the control of solenoids, pumps and sensors. This will have the following specification:

1. The controller shall be programmable using standard internationally accepted programming languages in accordance with IEC specifications
2. The controller shall communicate between the processor and input/output modules using open standard protocols. Manufacturer specific protocols will not be acceptable.
3. The controller shall be identical for all sizes with only the quantity of input/output modules varying per location.
4. The controller shall be made of industrial standard hardware with the main processor capable of operating in temperatures of up to 70°C
5. Replacement parts are to be off the shelf components and capable of being fitted on-site.
6. All outputs shall be fully isolated volt free contacts
7. The controller shall be able to control solenoids via an encoder/decoder system.
8. All sensor inputs shall accept industry standard 4-20 mA input signals
9. The controller shall provide remote I/O capability providing cable, wireless routers and radio-based extension of the control system.
10. Local operation of the controller shall be via a programmable touch screen operator interface.
11. Local operation shall also be possible via the use of a laptop computer or via a 3G based mobile phone/ PDA.
12. The controller shall be able to accept multiple sensor inputs via an RS485 data link
13. Each controller shall have soft start and soft stop facilities for pump outputs as well as VSD control functions.
14. With each pump control function the controller shall be able to accept all the following signal inputs
 - Flow meter (pulse or 4-20 mA)
 - Pressure transmitter (4-20 mA)
 - Level transmitter for bore depth or tank level (4-20 mA)
 - Pump current (4-20 mA)
 - Salinity (4-20 mA)
 - pH level (4-20 mA)
 - Temperature (4-20 mA)

5.1.2 FIRMWARE AND SOFTWARE

1. Each controller shall be capable of controlling as a minimum
 - 100 stations in 100 groups
 - 4 pumps
 - 8 light circuits

- 8 electric BBQ circuits
2. All controllers shall be pre-programmed to accept all the above functions with features being able to be switched on or off
 3. Every controller shall have an integral alarm reporting system with time and date stamping
 4. Changes made to the local controller program shall be able to be viewed and modified from the central control system.
 5. Each controller shall display soft start and soft stop settings for each pump
 6. With each pump control function the controller shall be able to display all the following signal inputs.
 - a. Flow meter (pulse or 4-20 mA)
 - b. Pressure transmitter (4-20 mA)
 - c. Level transmitter for bore depth or tank level (4-20 mA)
 - d. Pump current (4-20 mA)
 - e. Salinity (4-20 mA)
 - f. pH level (4-20 mA)
 - g. Temperature (4-20 mA)
 7. The controller shall be able to display weather station data and retransmit this to the central control system from where the info can be retransmitted to other sites
 8. Individual controllers shall be able to calculate evapotranspiration figures.
 9. Separate control features shall be able to be selected to separate standard pumps from jockey pumps or tank fill pumps.
 10. Faults in the transmitters are to be recorded in the local alarm list
 11. Each pump control shall have alarm functions for:
 - a. No flow
 - b. High flow
 - c. Low flow
 - d. Low current
 - e. High current
 - f. Low level
 - g. High pressure
 - h. Low pressure
 12. Each controller shall be able to skip or stop the irrigation program based on flow (high or low) or pressure (high or low). The setting shall be able to be adjusted from the local touchscreen as well as from the central control system
 13. Each station shall be able to be grouped together in freely assignable groups. A total of 100 groups shall be able to be programmed using stations more than once and not necessarily in numeric order.
 14. Pump or main valve outputs shall be able to be selected per program. E.g.: program 1 can use pump 1 while program 2 uses plain scheme water.
 15. Each controller shall have as a minimum of 6 programs and 3 starting times each.
 16. Manual control of valves or groups of valves shall be selectable from the controller. This shall be independent from the programmed settings.
 17. Semi-automatic control of valves and groups of valves shall be selectable from the controller. This shall be independent from the programmed settings and shall use 1 sec interval settings to a maximum of 9999 seconds.
 18. Access to the controller shall be secure via the use of multiple passwords
 19. A single programmable value (duration factor) shall be able to vary the irrigation times between 0-999% of settings
 20. Irrigation times shall be selectable between 0-9999 minutes in intervals of 1 minute.
 21. Full status information shall be available for all functions via the touchscreen. Values shall be displayed in an easy to follow format allowing all relevant info regarding a single operation to be displayed within one screen.
 22. The controller shall be able to log operational alarms and events in its own memory. A minimum of 5 MB of data log space shall be available in each controller.

5.1.3 HANDHELD CONTROL DEVICES

A single handheld controller shall be able to provide bi-directional control of all the controllers in the system

The device shall be connected to the 3G network and be able to provide instantaneous feedback of the following values:

- a. Line pressure
- b. Flowrate
- c. Time remaining

All functions that are available on the local touchscreen should be available on the mobile devices.

Communications

Each controller shall be equipped with multiple communication ports for the provision of communication between the following:

1. Between the central control system and each controller using a 3G wireless router
2. Between the controller and remote I/O devices using radio
3. Between the controller and remote I/O devices using RS485
4. Between the controller and a laptop computer using Ethernet

5.2 LOCAL CONTROLLERS

Domestic housing controllers are to be Hunter Pro - C controllers either four (4), six (6) or eight (8) stations depending on what is required.

6 INTERNET ACCESS

6.1 HARDWARE

Each controller shall be capable of connecting directly to the Central Control system for the immediate access to the controller functions using the internet and a standard browser. As such a wireless router with programmable VPN functions shall be included with each controller. Antennae selected for the router shall be non-obtrusive vandal resistant.

SOFTWARE

The Central Software shall provide instantaneous access to all controllers. All information stored in the local controllers shall be able to be viewed as well as modified from the central control system.

In addition to the viewing and modifying of data, the central control system shall also provide extensive reporting facilities to provide graphical as well numerical data reports.