Maintenance and Installation Specifications

1. Inspection Services

The Contractor is to attend all systems as per Attachment 1 – Schedule of Rates and as detailed in Attachments 4 & 5 – Bore and Scheme Water Location Maps. All systems are required to be activated and run, and all stations checked for operation, and all emitters checked to ensure they are operating effectively.

Faulty parts are to be recorded at each inspection prior to repairs being completed, and details provided to the Principal together with invoicing at the end of each month.

Minor repair works, such as repairing blocked or ill-functioning sprinklers, are to be carried out immediately following the scheduled inspection service.

Should the likely cost of repairs at a single park or reserve be likely to cost more than $1,000, no works are to proceed without the direction of the Principal.

Note: This is not to impact on inspection times allocated as per the schedule of rates expressed in Attachment 1 (Price Schedule).

Any other problems identified when inspections are occurring that are not irrigation related are still to be reported to the Principal.

2. Irrigation – Scheme

Pipe

Pipe works between the meter and the solenoid is to be PVC pipe. All pipe work after the solenoid is to be 19mm poly pipe pending on location and situation. Were possible poly pipe is to be used for the majority of scheme systems.

Sprinklers

In line drip irrigation (tech-line), drip emitters or micro sprayers (used sparingly due to inefficiencies) are most commonly used in scheme systems.

Controller

Hunter Node battery controller is most commonly used for scheme systems.

3. Irrigation – Bore

Trenching
General

Dial Before You Dig Utility information is to be obtained by the contractor within thirty days prior to any excavation occurring. Prior to commencing any trenching or other excavation, the Contractor shall locate all utility services as identified within the Dial Before You Dig Utility information. Damage to any services, whether shown on the plans or not, shall be repaired at the Contractors' expense.

Contractors should be aware that a site may contain debris and rubbish in the soil profile being trenched. In the event of very large, buried obstacles requiring a specific breaking, and/or removal and disposal operation, the Principal will liaise with the Contactor. However, the likelihood of this occurring is considered minimal as the Town of Claremont is situated within the Perth Coastal Zone with deep sandy soils.

Care shall be taken to ensure that the mainline is well bedded and that there is no possibility of rocks rubble or other debris impacting the pipe if minor settlement or heaving occurs.

To minimise root damage, no trenching within 3m of the trunk of any tree will be permitted.

All trenching shall be in straight lines or smooth curves as indicated on the plans. Where trenching runs parallel to a vehicular traffic bearing road, the trench shall not be dug closer than 600mm from the kerb face or pavement edge, to prevent the collapse of the road sub-base.

Dimensions

The trench shall have as minimum depth to provide cover over the piping of:

Mainlines	450mm
Laterals	300mm
Road Crossings	600mm
Electrical cable conduit	600mm

Unless otherwise directed by the Principal.

Dial Before You Dig Utility information is to be obtained by the Contractor within thirty days prior to any excavation occurring.

Trench width shall be sufficient to enable pipes to be joined in the trench if necessary and to allow clean fill under, on top of and either side of the pipes to the bedding clearances indicated below. Where multiple pipes are installed in a single trench, there shall be a separation of 100mm (minimum) between pipes and the adjacent services, unless a greater separation is required by the service Authority. Separation requirements are to be obtained as per the Dial Before You Dig Utility respective specifications.

Bedding & Trench Bottom

The trench bottom shall be smooth and continuously support the pipe over its entire length.

Bedding material shall be free of clay, roots and other organic matter, or rocks and rubble greater than a nominal 6mm aggregate size.

Bedding material shall have a nominal depth as follows:

Laterals	up to Ø 80mm	25mm
Mainlines	up to Ø 80mm	50mm
Mainlines	>Ø80mm	100mm

Where the in-situ material is of sufficient quality it may be used for bedding.

Cutting Made Surfaces

No made surfaces shall be cut or broken during trenching without the express permission of the Principal. All paths, roads, paving, etc. shall be crossed by means of horizontal or directional boring. Any subsistence or damage caused by such boring shall be reinstated at the Contractors expense.

Note: Clarification shall be sought from the Principal prior to undertaking any boring as trenching may be the preferred option of installation in particular instances.

4. Pipes and Fittings

All materials shall comply with the relevant Australian Standards and be accepted by the Principal prior to installation. Piping shall be uPVC or Polyethylene unless otherwise specified.

Medium Density Polyethylene Pipe (MDPE)

MDPE pipe shall be manufactured to AS4130, (PE80, Type B) coloured black. Note: Blue striped pipe is not to be used for irrigation purposes.

Tapping Bands

Where tapping bands are used to connect MDPE pipe to smaller diameter pipework or pipe of different material, the straps shall be of the split band type, manufactured from HDPE, or moulded Noryl nylon (Stockbrands) type to AS 1477.

Mainline Fittings

Mainline Fittings are to be compression fittings or fusion weld fittings for the MDPE PN 12 mainline.

Jointing

Mechanical

The jointing system shall be based on plastic mechanical compression fittings with an “O” ring seal. The fitting shall be manufactured from black polypropylene in accordance with AS1460.1.

Electro fusion

Fittings shall be suitable for use with the pressure class of pipe specified. Electro fusion fittings shall conform to AS1460.2.

Butt welding

Joints within sections of pipe required for trenchless installation shall be joined by butt welding in accordance with the pipe manufacturer's requirements.

Reducers for mainlines shall be moulded MDPE butt or fusion welded.

uPVC

uPVC pipe shall be manufactured to AS1477-1996.

Mainline piping exceeding 50mm diameter shall be rubber ring jointed.

Lateral Piping

Lateral piping shall be solvent weld. Pipe class shall be as shown on the drawings.
uPVC fittings shall be fully moulded and to Class 18.

Tees of diameter 80mm or less may be in uPVC class 18 solvent weld tees.

Flanges shall be table E pre-drilled with 3mm thick flat composite full-face rubber gaskets.
All nuts, bolts and washers shall be hot dip galvanised.

Sleeves

All sleeves under roads, paving, retaining walls, etc., shall be PVC Cl 9 water pipe or Vinidex Stormpro storm water pipe of a suitable size to carry all pipes and control cables as necessary.

5. Valves

All valves shall be installed such that they are accessible for adjustment and for repair or servicing.

No valves are to be installed in paved or made surfaces unless approved by the Principal.

Valves shall be offset sufficiently to permit the installation to be in a garden bed or turf area.

Above ground installations (where requested) shall have adjustment handles, hand wheels or levers secured against vandalism or unauthorised adjustments using padlocks and locking plates.

All valve installations shall be drip tight. Sealing tape and compounds shall be used where required to achieve a watertight seal.

Butterfly Valves

Butterfly valves shall be for Table E mounting. Valves shall be:

Body	Cast Iron
Disc	Stainless Steel GR316
Stem & Pins	Stainless Steel GR316
Seats and seals	EPDM or BUNA-N
Pressure Rating	1600kpa

Valves 50-150mm diameter shall be lever operated with a locking tab suitable for setting the valve at any notch position. Lockable gear operators shall be used where specifically required. When installed below ground the valve shall be accessible to open or close fully without difficulty.

Gate Valves

Gate valves shall be bronze and equivalent to Johns 59m constructed to AS1628 with a working pressure of 1600kpa.

Solenoid Valves

Solenoid valves shall be Bermad 200 Series 24V AC normally closed valves with flow control adjustment and manual on/off facility and inbuilt decoder coils (as are present at Lake Claremont, North East Precinct (NEP) and Mrs Herberts Park). Valves shall be installed with their bodies free from sand, and underlain with a 50mm-gravel bed.

Note: The Principal may upgrade further systems to this control system during the course of the tender.

Ball Valves

Ball valves shall be installed between solenoid valves and mainline connections and be Philmac or equivalent, threaded plastic ball valves rated to 1400kpa and UV resistant.

Check Valves

Check valves shall be dual flap or wafer type equivalent to the Johns Fig. 430 or Amiad NR – 020. The valves shall be constructed as follows:

Body	: Cast iron, or glass reinforced nylon
Seal, seat & O-Rings	: Buna-N, EPDM, Rubber EPDM
Shaft	: Stainless Steel 316
Flap	: Nylon, fibreglass reinforced, or Aluminium bronze
Pressure rating	: 1000 kPa (min)

Valves under 50mm may be Philmac spring loaded check valves.

Valve Boxes

Valve boxes shall be Irritrol Systems or equivalent and shall have support ribs to prevent deformation due to soil pressure. Valve boxes shall have a "T"-lip on the lids to prevent dirt ingress into the lid seat. Deformed boxes shall be replaced at the Contractor's expense.

- Solenoid valves, air valves, butterfly valves, etc shall be installed in nominal 1419-300mm deep valve boxes, or larger as required.
- Isolation valves (spindle cap) shall be in a masonry pit with a galvanized tread plate cover (trafficable grade)
- Gate, check, relief valves etc shall be installed in valve boxes of sufficient size to access, operate and service the valve without removing the valve box.
- The Contractor shall allow to return to site on the establishment of the turf to reset all valve boxes to the required level.

No valve boxes shall be installed in paving or footpath zones unless specifically approved by the Principal. All valve boxes shall be installed on one or more courses of non-mortared bricks, sufficient to allow operation, servicing and the maintenance of the enclosed item and to exclude the ingress of soil. The bodies of the enclosed items shall be clear from the bed, which shall have a bedding layer of 50mm of gravel or granular material to stabilise the soil.

6. Pipe Installation

Laying

Pipes shall be laid in straight lines or smooth curves on continuous grades to prevent accumulation of air pockets.

Bending

Bending of pipes shall be strictly in accordance with manufacturer's recommendations and all joints shall be thoroughly supported to prevent stress-initiated leaks.

i. MDPE jointed pipes shall use fabricated bends for all deflections more than 45º for sizes 90mm and greater.

ii. Solvent weld pipes under 100mm shall use molded bends for deflections 45º and greater.

Jointing of Pipes

Solvent weld joints shall be made in accordance with the pipe manufacturer's recommendations, and coloured primers or cleaners shall be used on all joints.

Solvent cements shall be for the weather conditions that prevail during construction. Excess solvent cement shall be wiped from the joint to prevent pipe deterioration.

Pipe joints shall be allowed to cure for at least one hour before installation where pipes are joined outside of the trench.

Back Filling

On completion of a suitable length of laying the pipe shall be backfilled with clean fill. Backfill material shall be free of clay, roots and other organic matter, or rocks and rubble greater than a nominal 6mm.

- Bedding as to the depth specified in the “Trenching” clause shall be carefully placed around and above the pipe. Care shall be taken to restrain the pipe from "kicking' out of alignment, or of rocks, rubble or foreign matter encountering the pipe.
- Backfilling - In hot weather only partial backfilling shall be allowed to permit pipe temperatures to stabilise before final backfilling. Where depth of bedding is less than 100mm selected material shall be placed over the pipe to this depth. Thereafter the trench shall be filled with the remaining material. No rocks, rubble, or debris greater than the nominal 100mm shall be returned to the trench. The Contractor shall dispose of all surplus material.
- Should the Principal consider the excavated material unsuitable for bedding or backfill, clean sand shall be provided by the Contractor at his own expense to complete the works.

Compaction

All trenches shall be compacted after pipe installation. Where depth of fill exceeds 500mm the compaction shall take place in maximum of 300mm lifts. Compaction shall be equivalent to that of adjacent material.

Any subsidence of trenches shall be rectified at the Contractor’s expense, including costs of reinstating finishes where bitumen, paving etc. is present.

Clean Up

On the completion of backfilling all surplus material and debris shall be removed from site and the trench surface left in a neat and tidy state. All scrap material or construction debris shall be removed from site.

Thrust Blocks

All bends, tees, valves, endcaps or other non-self-straining fittings for rubber ring jointed pipe shall be thrusted with a concrete thrust block of minimum 20 MPa concrete at 28 days.

The thrust block configuration shall be in accordance with the pipe manufacturer’s recommendations.

The thrust block shall have a bearing surface of not less than: -

∅80mm pipe	200mm x 200mm

The bearing surface shall be against undisturbed soil and all sides in contact with disturbed soil shall be formed.

Where poor soil conditions exist, the Contractor shall calculate the increased thrust block size and have his calculations approved by the Principal.

There shall be a bond breaker, such as PVC film, between the concrete and the fitting. Nuts and

bolts shall not be encased in concrete.

Pipe Sleeves

Where piping is installed under roads, paths, paving or other made surfaces it shall be installed in PVC class 9 sleeves of sufficient size to allow the mainline, lateral, conduits and/or other services to be installed without difficulty. Depths shall be as determined by the Principal. Final levels shall be ascertained prior to the installation of sleeves with the maximum allowable depth of sleeves being 1.0 metre below final surface level.

7. Sprinklers and Emitters

All sprinklers shall be installed in the vertical position and neatly aligned to provide a good visual impression when running.

Sprinklers shall be set back 150 to 200mm from any boundary, fence, kerb, or building. The Contractor shall maintain uniform setbacks, head heights and sprinkler alignments.

All heads shall retract fully when not in operation. The visual impression of the sprinklers and sprays in operation shall be of uniformity and neatness.

The Contractor shall allow for return to site on new installations to reset all sprinkler heads to the required level.

Gear Drive Heads

Gear drive heads shall be appropriate for the arc covered with adjustable arcs from approximately 40° to 330°, or full circle as required.

Rotation shall be at a uniform speed without a quick return cycle. Heads shall be fitted with anti-drain valves to hold back 3m of elevation pressure.

Nozzle arc and range setting shall be adjusted to ensure full coverage under the prevailing site wind conditions. Care shall be taken when adjusting the range setting to ensure the precipitation rate is not unduly disrupted.

Gear drive heads may slightly vary upon location, and include Hunter I31 (No. 5), Hunter PGP, Hunter I25 pop up.

Sprinkler Risers

Sprinklers shall be installed on 25mm poly-articulated risers of 600mm length set at an angle of less than 45° to the vertical with the sprinkler head set at finished or future turf height.

All threaded joints shall be sealed with thread tape for the prevention of leaks.

The risers shall be set to allow for ease of raising the sprinklers should settlement of the fill occur.

Garden Bed Sprinkler Heads

All sprinkler heads for garden beds are to be MPR 570 with the blue nozzle (10”) or side and end strip sprays for narrow bed areas.

Sprinklers shall be installed on 20mm poly-articulated risers of 600mm length set at an angle of less than 45° to the vertical with the sprinkler head set at finished or future garden bed height.

8. Irrigation Electrical

All electrical work on 240/415 V power sources shall be carried out by a licensed electrician and comply with AS 3000 (SAA Wiring Rules). The Contractor shall take power and control from the source provided within the existing electrical cabinet and controller.

Control Cables

All control cables are to be twisted pair cables as specified by the controller manufacturer.

- Minimum cable conductor size is 1.5mm^2.
- A spare cable shall be run to allow connection for future control options.
- All cables are to be megger tested before commissioning to ensure continuity and soundness of joints.
- Cables are to be joined only with approved connectors, namely King One-step, King SA101, King SA102 or Scotch DBY connectors and in accordance with the controller requirements.
- Cable joins are to take place only at solenoid valves. Other cable runs are to be continuous between valve and controller.
- Cables are not to be kinked, skinned, or stretched on installation.
- A surplus 1.0m of cable shall be left at each solenoid valve and cable pit for future servicing.
- Cables are to be run in 25mm LD grey electrical conduits.

9. Bore Construction

Requirements

A licence will be issued by the successful contractor for the construction of the bore and a copy shall be given to the Town prior to the commencement of works.

All materials used by the Contractor in the construction of the bore and retained therein shall be new and comply with the relevant Australian Standards as applicable, unless otherwise specifically excluded. Where there is uncertainty over the applicability of standards, the Principal’s decision shall be governing.

The works shall be required to produce a fully functional and equipped bore in terms of the specification. The materials and activities required are as listed:

- Mobilisation and demobilisation of all plant and equipment necessary for the works.
- Drilling a pilot hole and assessing the bore strata log, water quality and estimated capacity of the bore.
- Reaming hole to size and installation of all equipment.
- Develop the bore and carry out test pumping.
- Documenting the bore geology, bore construction and pumping tests.
- Submitting completed logs to Department of Water and the Town.
- Supply and installation of submersible pump, rising main and discharge headworks as specified.
- Supply and installation of electrical control equipment in a new cubicle.
- Any other works not detailed but required for the proper construction and function of the system.
- Bore location.
- Bore hole.

Alignment and Method

The Contractor shall use either rotary or cable tool method as appropriate. The Contractor shall assess the potential for lost circulation in limestone and take the necessary precautions. No drilling fluids or muds shall be used which will cause permanent sealing of the strata or create other permanent obstruction to the water flow. The bore alignment shall be plumb with a maximum deviation of 1:300 from the vertical. There shall be no kinks or misalignments in the bore.

Pilot Hole

The Contractor shall drill a pilot hole to 30m with the full depth of the superficial aquifer. The Contractor shall log the pilot hole and discuss the production potential of the hole with the Principal before reaming it to full size and depth. Should the Principal decide that the bore would not produce sufficient water at this stage, the option of relocating the drilling rig to a more favourable location may be exercised.

Reaming

Once the Principal has given approval to proceed with reaming, the Contractor shall ream the hole to a nominal 300mm which is to allow the installation of the bore casing (currently between 155mm and 200mm), centralisers and gravel pack.

Sampling

Samples shall be taken at metre intervals throughout the drilling procedure and the Contractor shall maintain a log describing the geology and keep the material samples bagged and tagged for

the Principal to inspect. The bore log shall be included in the bore report submitted to the Department of Water and Environmental Regulation.

Bore Casing, Screen and Gravel Pack

The Contractor shall install a 150mm diameter class 12 uPVC bore casing with a 150mm NB inline stainless-steel screen 6 metres in length. The screen shall have 0.5mm apertures.

The bore casing shall be surrounded by an appropriately sized gravel pack designed to prevent migration of fines and penetration or blockage of the screen.

The Contractor may make changes to the headworks providing the performance and general arrangement and concept is retained.

Lost Bore

Should the Contractor fail to construct the bore to the required specification through equipment malfunction, action of the ground or reasons other than instruction by the Principal, this shall be deemed a "lost bore" and no payments will be made for labour, equipment costs or materials expended.

Development

On completion of the bore construction the Contractor shall develop the bore using standard best practice drilling industry methods to achieve the production of clean sediment free water. During development the Contractor shall use appropriate equipment to prevent danger and nuisance to the bore site and personnel attending.

Test Pumping

The Contractor shall undertake test pumping of the bore once it is producing water of requisite quality. The test shall consist of a stepped test in 4 x 30-minute segments, and a constant rate test of 8 hours duration, and a recovery test. The discharge and water level shall be accurately measured to the satisfaction of the Principal.

The test pump shall be capable of pumping up to 4 to 5m³ per hour through a static lift of 25 metres and having sufficient pressure to allow flow control.

Should the test be interrupted during its execution, the Contractor shall recommence the test at his cost and complete it in a continuous cycle. The constant rate test duration is to be nominally 8 hours.

Water level measurements should be made immediately prior to the start of each test, then during the test at the following times in the pumping bore:

- 0-10 minutes - every minute
- 10-50 minutes - every 5 minutes
- 50-100 minutes - every 10 minutes
- 100-180 minutes - every 20 minutes

- 180-300 minutes - every 30 minutes
- 300-600 minutes - every 60 minutes
- > 900 minutes - every 100 minutes

Where measurements cannot be taken at these times precisely, the exact time of obtaining each measurement shall be recorded. This is to permit accurate production analysis.

The Contractor shall maintain continuous pumping yields as directed by the Principal and they will provide labour to maintain the yield constant and uninterrupted and to record drawdown levels in the bore in accordance with the Principal's directions. Should a pumping test be interrupted for any reason, or should the Contractor fail to maintain the yield constant, a new test will begin after an appropriate recovery period specified by the Principal. Payment for the new test shall be at the appropriate rates with the interrupted test being at the Contractor's expense.

The Contractor shall provide the Principal with the test log recorded showing drawdown, flow rate and recovery data for analysis.

Disinfecting

On completion of all construction and testing operations the Contractor shall ensure that the bore is suitably disinfected with Sodium Hypochlorite to prevent the infection of the bore with "iron bacteria" by the equipment used, with the retention in the bore for 24 hours minimum.

Water Samples

The Contractor shall take clean water samples on completion of the pump test and prior to chlorination and have them analysed by a suitably certified testing laboratory within 24 hours. The samples shall be taken in clean uncontaminated sample bottles per the laboratory's requirements.

The analysis shall include testing for:

- Odour
- Colour
- pH
- Electrical Conductivity
- Total dissolved solids
- Bicarbonate
- Total Iron
- Hardness
- (CaCO3)
- Alkalinity (CaCO3).

These quantitative analyses are to be reported as mg/l.

Site clean up

The Contractor shall maintain the site clear from obstruction, rubbish and waste drilling fluid and water as far as possible. Upon completion, the site shall be cleaned up and restored, as nearly as possible, to a condition that is unlikely to endanger animals or persons and will not represent a nuisance, to the satisfaction of the Principal. Mud pits shall not be excavated, and the Contractor shall use mud tanks.

10. Pump

Subcontractors

The Contractor shall nominate its pumping subcontractor for the headworks fabrication and pump installation. The subcontractor's details and capabilities must be provided to the Principal. The subcontractor shall be approved by the Principal who shall have the right to veto the use of subcontractors it considers not suited to the project.

Bore pump

The Contractor shall confirm the pump selection and duty point with the Principal on completion of the bore-pumping test and prior to ordering the pump. Failure to do so shall render the Contractor liable for any charges incurred in obtaining the correct pump unit.

Bore rising main

The Contractor shall install the pump on 40mm class 18 pipe column with threaded stainless-steel couplings. All joints shall be watertight and sealed with an appropriate sealing compound.

The bottom of the pump shall be positioned one metre above the top of the screen, providing the drawdown permits. A 20-mm uPVC probe conduit and nylon drawdown tube shall be installed alongside the column to terminate in the bore headworks junction box.

The pump shall be secured to the headworks with a 4mm stainless steel safety cable.

Bore Headworks

The headworks shall be 50mm schedule 40 steel tube and flanges hot dip galvanised after fabrication. The headworks shall include as a minimum 25mm air release valve / vacuum breaker, flow switch, pressure tapping point under vandal resistant galvanised cover, 50 mm Ari check valve (or equivalent), test tee with blank flange, and electrical and control wire and tube conduits. The bore head block shall be 600 square and a minimum 450 mm thick.

The discharge pipe flange shall be 450 mm below ground level and connected into the irrigation mainline.

11. Electrical

Regulations

All electrical work on 240/415 V power sources shall be carried out by a licensed electrician and comply with AS 3000 (SAA Wiring Rules) and the relevant Australian Standards, Western Power requirements and any other Authority having jurisdiction over the works.

The contractor shall take power from the source provided by the Principal.

Power supply

The Contractor shall liaise with the Principal for the power supply point for the site. The Contractor shall connect to the point (pillar) and run supply cable to the bore.

Electrical Cabinet

The Contractor shall fabricate and install a free-standing aluminium cubicle of sufficient size to house all the required equipment.

The cubicle shall be constructed of quality aluminium alloy, grade 5005/H34 material. All seams shall be welded and ground smooth.

The cabinet shall be fitted with engraved labels on the front doors or panels indicating switchboard designation.

Labelling shall be engraved on “gravoply” material or similar, and shall use black lettering on white background, except for warning labels which shall display white letters on a red background.

The control cubicle shall house the electrical controls for the bore pump and ancillary equipment such as the irrigation controller.

The pump control panel shall be neatly arranged allowing for the following:

- Motor starter and control equipment to suit pump.
- Motor/starter instrumentation as specified.
- All fault and warning lamps.
- All reset buttons.

Pump Motor Starter

The Contractor shall allow for all necessary motor protection equipment and switchgear as specified by the motor manufacturer, although it may not be stated in this specification.

The starter shall be fitted with a thermal overload protection device with a manually reset lockout.

The Electrical Sub-contractor shall adjust the starting parameters of the unit to suit the operating conditions of the motor.

Full details of the equipment offered are to be submitted to the Principal prior to the commencement of

work. The pump shall be arranged to start and stop from signals from the irrigation controller.

Motor Cables

The Electrical Sub-contractor shall size, supply, and install all necessary cables between the pump control cubicle and the motor terminal blocks, junction boxes or outlets.

All cabling shall be installed in adequately sized conduits and trays in accordance with electrical regulations. Cables and or cable trays shall be secured to the floor or walls and shall keep free access to the pumps.

Circuit Breaker

Lockable circuit breakers or overload devices as specified by the motor manufacturer shall be supplied and installed by the Contractor. The circuit breaker or overload device shall be compatible with the motor starter being installed. Nuisance tripping of the circuit breaker will not be acceptable, and it shall be the Contractor's responsibility to ensure this does not occur.

Pump Protection

The bore pump shall be fitted with high and low-pressure fault protection devices and no flow protection devices to prevent dry running. Protection sensors may be located on the headworks either above or below ground to offer greatest anti-vandal protection.

Low Level Protection

The bore shall be equipped with a low-level probe within the 20 mm conduit. The probe shall operate through a lockout relay with a fault lamp. The probe shall be set 1 metre above the pump inlet for dry running protection.

Faults shall indicate with a fault lamp, i.e., when the system is calling for a pump, but no flow occurs. A suitable timer shall be incorporated for system start-up, and with a suitable operating delay.

High and Low-Pressure Protection

High and low-pressure switches shall be installed with the requisite time delay switches, relays and fault lamps. Each pressure switch is to be set on site to conform to site conditions and the Principal's instructions. The high-pressure timer shall have a programmable range of 1 – 10 seconds, and the low-pressure timer 1 – 10 minutes.

Suitable glycerine filled pressure gauges shall be installed with pressure range of 1000kPa full-scale deflection.

No- Flow Protection

Flow switches shall be installed with the requisite time delay switches, relays and fault lamps to enable protection for no flow. The Contractor shall arrange the installation to allow the systems to start and stop without faulting.

Manual On / Off / Auto Switch

A manual on/off/auto switch shall be installed to enable each pump to be run manually. In the AUTO position it shall operate automatically as specified.

In the MANUAL position it shall run manually utilising on/off push buttons and bypassing the pressure switches.

In the OFF position it shall isolate the pump motor with a key lockable switch. It shall be labelled "WARNING, LOCK SWITCH IN OFF POSITION AND REMOVE KEY WHEN WORKING ON MOTOR".

Ancillary Equipment

The pump control panel shall be neatly arranged to include the following equipment supplied and installed by the Contractor:

- Pump operating lamps.
- Hour run meter for the pump motor.
- Fault defect lamp and lock out relay for the pump motor, for each fault, such as: high pressure, low pressure, no flow, and motor overload.
- Motor ammeter.
- Selection switches for manual - off - automatic operation for each pump.
- Manual push button start/stop switch.
- Fault reset button for the pump.
- Isolator for the filter power supply.
- General Power Outlet –240V AC 15A mounted on the panel.

Where any of the above functions are provided by items such as starters or other modular electronic equipment in the panel, they may be omitted as individual items.

Labelling

All equipment shall be clearly; neatly and concisely labelled using engraved labels.

Controller

2 spare wires from the controller shall be used as pump start wires for the bore pump. Should they need to be extended to the pump they shall be run in 25mm LD electrical conduit to the electrical cabinet.

Where replacement of/or new installation of the controller is required an SDS-50 controller is to be used (except on system with more than 40 stations; SDS-100 is to be used). Retrofitting of these controllers will require a relay cube with power supply to integrate into existing systems. When installing SDS controllers a pressure transducer, a pump starts SD relay and a suitable flow meter with connection (such as Flowmag or Turbobar). NSD 3G modem and suitable antenna (generally small flat disc antenna will suit most locations, in areas of poor reception a 1 metre pole antenna may be used).

Testing

On completion of the installation the Contractor shall test the bore and pump system. All necessary pipework and fittings shall be provided by the Contractor to enable the tests to be successfully undertaken. All settings shall be tested to function under operational conditions, and minor adjustments will be made as necessary.

The tests shall be made in the presence of the Principal, who must approve the results before practical completion is given.

12. System Commissioning

On completion of new installations, the system shall be commissioned for use by the Principal.

Flushing and Testing

Once the piping and sprinklers are installed, they shall be flushed with clean water to remove all sand, grit and other dirt that may be within the system. All erosion occurring during flushing shall be reinstated by the Contractor.

On completion of flushing the system shall be thoroughly tested to ensure it is functioning correctly. The system shall be checked to ensure:

- Sprinkler arcs are correctly set
- Coverage is complete and over-spray is minimised, especially onto roads
- Sprinkler heads and valve boxes are set at the correct height
- Valve boxes are neatly aligned with adjacent kerbs, walls, or other permanent fixtures
- System pressures are correctly set, and valves adjusted accordingly

Commissioning

Once testing is complete the system shall be set in automatic mode and shall function correctly for 7 days before being accepted.

During the period of the contract up to and including the commissioning test to the point of practical completion the Contractor shall at his maintain the system and effect all repairs and adjustments required to render the system functional.

Documentation

Part of the contract is the supply of documentation on the materials and equipment used in the system to permit the Principal, or his agent, to successfully operate the system for the purpose for which it was intended.

As-Constructed Drawings

At practical completion, or within 14 days thereof, the Contractor shall supply a set of as-constructed drawings of the installation. The drawings shall be provided to the Principal in the following format:

- Digital format suitable for a seamless reproduction in AutoCAD 2004 (minimum) supplied on USB.
- 2 paper prints at A2 size.

Drawing Detail

The as-constructed drawings shall be accurately measured from fixed locatable site features excluding sprinklers.

The plan shall show identification pegs or marks with offsets and distances shown to enable the irrigation operator to readily identify in ground components with the aid of only a tape measure.

The plans shall show the following information: -

- Mainline alignment shown to include deviations from the design alignment.
- Position of all cardinal points such as valves, tees, bends, controller, and cable pits etc, shall be located with 2 measurements accurate to 0.1m from fixed objects (not sprinklers).
- Schedule of valve numbers and station numbers. The schedule shall list the controller station corresponding to the valve number/s. Where installation varies substantially from the plan, show new positions of sprinklers, and otherwise the design locations will be used.
- Plan shall have all physical reference features, such as buildings, roads, light posts, etc. shown as per the original plan.

13. Capital Works Program

Irrigation works to facilitate the Town's roadworks, footpaths, and other approved Civil and Parks projects.

The Contractor may be required to work consecutively with other Contractors during the delivery of the Town's Capital Works program, specifically personnel will be onsite to cut, cap and mark out existing reticulation lines for the purposes of later reinstatement.

For road projects, the Contractor shall assist the Town's Earthworks Contractors to enable kerb removal and then attend site following these works to reinstate reticulation lines.

For footpath projects, the Contractor shall assist the Town's Footpath contractors to enable path removal and widening, and then attend site following these works to reinstate reticulation lines.

Typically, the Contractor shall reinstate reticulation back to original working condition. Any parts inclusive of pipes, sprinkler surrounds, sprinklers, elbows, tees, valves, and boxes will need to be replaced as necessary.

Upon reinstatement, the Contractor is to undertake an inspection of the system together with the asset owner, to ensure it is fully operational and have this confirmed by the owner in writing which is to be

provided to the Town – typically a signed declaration of completion.

Any additional or special requests outside the general scope of works will need to be approved by the Principal.

The Contractor shall nominate a cost per item for these works in line with the price schedule supplied in Attachment 1 by the to the Principal.

14. Personnel

The Contractor must ensure that all personnel have relevant valid licences and training to operate any machinery, vehicles, or related equipment.

If any personnel are found to not hold a valid licence to operate any plant, the Principal may in its sole discretion remove that person from performing any duties under this Contract. The Contractor shall be responsible for replacing any personnel in this regard.

Personnel performing the services under this Contract shall always wear suitable clothing and personal protective equipment to the satisfaction of the Principal.

All necessary protective clothing/equipment shall be provided by the Contractor at no cost to the Principal unless agreed upon by both the Contractor and the to the Principal prior to the commencement of works.

15. Working Conditions

The Contractor is expected to be readily available and have dedicated crew(s) which give preference to the required works.

Whilst engaged on the to the Principal's works, the Contractor shall always have available a means of communication with the Principal.

The Contract rates shall apply for all work including weekends.

16. Emergency Call Outs

Emergency call outs may need to be attended to on short notice, which will be advised by the Principal's Representative. These call outs determined by the Principal's Representative, will be of the utmost priority and may need to be attended to within a maximum period of one (1) to four (4) hours to be advised of at the time of incidence.

Rates are to be as per the schedule of rates supplied within this RFT.

17. Call Out Timing

Classifications of necessity of the works will be undertaken by the relevant Representative of the Principal as per the list below:

a) Emergency works being works that need to be attended to within a maximum period of one (1) to four (4) hours at a nominated site within the Town's boundaries.

b) Urgent – Non- emergency works being works that need to be attended to within a period of two (2) days at a nominated site within the Town's boundaries.

c) Standard works being works that cause no immediate impact to the community without being undertaken. The standard allowable timeframe given for these works shall be five (5) working days.

18. Dial Before You Dig

The Contractor will be responsible to obtain relevant dial before you dig information for each individual site on which their own staff operate and having this information on site.

In locations that Dial Before You Dig information is not available (including parks and reserves), the Contractor must first check with the Principal for all known services in the area.

19. Site Clean Up

The site shall be left safe and clean at the end of each working day, with each site to have no loose material or debris upon completion of each individual site. No equipment shall be left on site overnight unless agreed upon prior by the Principal.

20. Disposal of Material

Disposal of material shall be incorporated into the relevant item number in the schedule of rates.

21. Traffic Control

Unless otherwise directed, traffic control is to be provided by the Principal.

22. Quality of Finish

All works undertaken by the Contractor are to be of a finish and quality deemed acceptable by the Principal.

23. Principal's Workforce

The Principal at any time at its discretion can undertake the services within this tender by its own internal workforce.