BRISBANE CITY COUNCIL

MASTER IRRIGATION SPECIFICATIONS:

AUTOMATIC IRRIGATION FOR SPORTS FIELDS

Document Change History

Document Control Sheet

Contact for enquiries and proposed changes. If you have any questions regarding this document or if you have a suggestion for improvements, please contact:

Revision History

Revision (Whole number only) (e.g. 1, 2, 3)	Author	Issue Purpose	Date (e.g. 29-JUL-2023)
1	Marke Jennings-Temple	Revision and update of various sections	05-OCT-2018
2	Samantha Parker	Revision	05-DEC-2018
3	Samantha Parker	Revision	18-MAR-2019
4	Bruce Rome (Mottech Parkland) and Matt Roche (Australian Sports Turf Consultants)	Revision	14-APR-2022
5	Matt Roche	Revision	12-MAY-2022
6	Bruce Rome and Matt Roche	Revision	19-JUL-2022
7	Matt Roche and Bruce Rome	Final	23-APR-2023

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1 IINTRODUCTION AND GENERAL DOCUMENT INFORMATION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide the minimum requirements for the supply and/or installation of an automatic, underground irrigation system (the system) to Brisbane City Council (Council / The Principal) owned sports fields.

The objectives of these specifications are to:

- provide information to suppliers to understand Councils' requirements;
- inform irrigation contractors, including subcontractors, and Principal Contractor's of their requirements;
- promote the conservation of resources, including water, where possible;
- ensure a system is designed that is capable and flexible enough to allow for future technology changes and improvements;
- ensure a system is designed that allows control of an irrigation system independently in the field, or, from Council's control water monitoring system;
- set minimum standards for design, implementation and performance of Council's irrigation systems; and
- standardise Council systems (within reason).

Notwithstanding any information contained in this general specification, it will be the responsibility of the Contractor to have fully informed itself as to all existing conditions, and the nature and extent of the works. No claims will be considered for extra costs arising from neglect by the Contractor to undertake this inspection and undertake an accurate assessment of the site prior to undertaking any work or purchasing materials.

The Superintendent, listed herein, will generally refer to the Brisbane City Council Project Manager. However, if irrigation works are being undertaken by a sporting club, the Superintendent will be the Club President. All relevant documentation must also be supplied to Brisbane City Council for file.

1.2 CLUB / LESSEE REQUIREMENTS

If a sporting club (Lessee) of a Council-owned sports field or facility is wanting to undertake irrigation works within their sports field or facility, the sporting club (Lessee) must understand that their irrigation Contractor must adhere to the specifications listed herein.

1.3 CONTRACTOR REQUIREMENTS

Contractors must understand and adhere to the following requirements:

- All irrigation infrastructure is to be installed by an irrigation contractor who holds a current Queensland Building and Construction Commission (QBCC) Contractor Licence.
- All contractors' individuals/employees working on-site must provide preferred manufacturer certification that they have been trained in the installation of irrigation and components. See below for more details.

- All electrical work must comply with relevant regulations and the Superintendent must be provided with certification and qualifications of contractors working on-site.
- No work shall be undertaken without providing certification from the manufacturer that the contractor individuals/employees are qualified to install the required/specified irrigation components.
- The Contractor is to be aware of seasonal climatic conditions, including wet weather, they may encounter within the timeframe of this project. The Contractor must allow for interruptions due to inclement weather, as per the expected standard number of rain days for the time of year as published by the Bureau of Meteorology (BoM). Only weather events in excess of this figure shall be considered by Council for any time extension requests by the Contractor. Please refer to the BoM web site (http://www.bom.gov.au/) to access historic rainfall data provided from the nearest weather station to the work site.
- The Contractor must inform Council of any changes to their project methodology. This must be approved in writing by Council.
- The Contractor is to be aware of any testing requirements specified herein and that sufficient allowance has been made to conduct the necessary testing within their scope of works and agreed pricing. It will be the responsibility of the Contractor to list any unscheduled items within tender documentation BOQ or schedule of rates.
- If an alternative product, presented by the contractor after the original design has been submitted and confirmed, is subsequently approved, the contractor shall be notified in writing. Installing an alternative product without written approval from Council will result in the product being removed from the site at the contractor's expense and the originally approved product installed at the contractor's expense.
- No work shall be undertaken prior to Council approval of the Site-Specific Workplace Health and Safety and Environmental Management Plan (SSWHSEMP), taking into consideration sites on known contaminated land or sites where potentially contaminated or hazardous material may be exposed.
- The Contractor is required in the SSWHSEMP to nominate a suitably experienced staff member or sub-contractor that can identify unsuitable and/or contaminated material should it be exposed during the works. Where potentially contaminated or hazardous material be exposed, works should cease, and the Superintendent should be informed immediately.
- The Contractor is to provide a minimum 48 hours' notice to the Superintendent and/or Council's Representative for Hold and Witness Point inspections.
- Machinery or equipment requiring registration or safety tags shall have a current sticker or inspection tag.
- For installation, the Contractors' Project Manager shall be a Certified Irrigation Contractor (Irrigation Australia Ltd, Certification – Centre of Irrigation Excellence (coie.com.au), or hold an equivalent approved qualification. The Contractors' other staff involved in the installation and maintenance of the irrigation system shall hold Certified Irrigation Installer qualifications, or approved equivalent.

- Irrigation contractors are not to drive a vehicle on the sports field to carry out maintenance or repairs when the topsoil has been placed, following turfing or during the sports turf consolidation (turf establishment) or maintenance period.
- The Contractor shall provide sufficient resources (both plant and labour) to complete the works in a timely manner, as per the following table:

Activity	For a AFL or Cricket Size Field *			For a Rugby or Soccer Size Field *		
-	Min # of staff required until works are complete	Min staffing qualifications	Max # of days to complete	Min # of staff required until works are complete	Min staffing qualifications	Max # of days to complete
Trenching and install new mainline	3	1x CIC 2x CII	2.5	3	1x CIC 2x CII	2
Trenching and install lateral irrigation lines	3	1x CIC 2x CII	2.5	3	1x CIC 2x CII	2
Install new tank compound (options for 1 and 2 tanks)	3	1x CIC 2x CII	4	3	1x CIC 2x CII	4
Complete irrigation install: • Valve Assemblies • Sprinklers & QCVs • Pump Station	4 3 2	1x CIC Others CII	3 3 4	4 3 2	1x CIC Others CII	2 2 4
Sprinkler head replacement/install across an entire field	2	CII	3	2	CII	2
To install new or lift and repair all Valve Boxes within a field (maybe separate into 2 rows)	2	CII	2	2	CII	2
Irrigation System Pressure Testing and Irrigation System Commissioning	1*	1x CIC 1x CR*	1	1*	1x CIC 1x CR*	1

Notes:

CIC = Certified Irrigation Contractor (or approved equivalent)

CII = Certified Irrigation Installer (or approved equivalent)

CR = Council's Representative

*, if irrigation works is to be undertaken across multiple fields or a multi-use facility, the recommended minimum number of staff and maximum number of days to complete a particular task are to be clearly defined by the Irrigation Consultant.

1.4 IRRIGATION DESIGN REQUIREMENTS

The following are the minimum irrigation system design requirements for a sports field. The system should supply adequate water volumes to each zone from an existing water network or reclaimed water source, where permitted. The system shall provide adequate flow rate from the available pressures and distribute water to at least the marked playing area and the full extent of the safety margin/run-off.

In addition, the system design, including documentation and drawings, must include the following:

- Site specific irrigation technical specifications and designs MUST reference the current BCC Master Irrigation Specification.
- The Certified Irrigation Designer/Irrigation Consultant must identify if non-potable irrigation equipment is to be installed e.g. lilac pipe, lilac detectable Tracer Wire Tape, valve boxes, PESB-R solenoid valves, locking lid covers, irrigation sprinkler caps. This must be referenced within their specification, drawings and bill of quantities.
- The Certified Irrigation Designer/Irrigation Consultant must identify which Hold Points, Witness Points and Quality Assurance Documentation (as listed herein within 'Quality Control') is applicable to the project and required as part of the scope of works/quality control process.
- When survey drawings and irrigation drawings are being provided for a redevelopment or construction project, it is recommended that the irrigation plan layout be provided as an overlay within the survey drawings.
- Sports field line markings, and dimensions, must be shown on the irrigation drawings. Distances in metres are also to be provided on the drawings to identify (i) the location of corner sprinklers or at least 4 sprinklers to fixed positions e.g. light towers, field of play corner fencing etc., (ii) distance between sprinkler heads on a lateral line and (iii) distance between sprinkler heads between lateral lines. This information will also be used for site set out.
- The irrigation mainline is to have 600mm of cover over the main pipes after installation. The lateral pipes are to have 400mm cover after installation.
- Lateral irrigation lines are to run in the direction of play e.g. down the length of the field.
- Valve numbering in the field is to be sequential from one end of the field to the other or around the perimeter of the field. This is to assist with testing and manual operation.
- It is desirable for sprinkler heads to be able to irrigate up to 4 metres outside of the line marked field of play boundary. It is desirable for valve assembles and valve boxes to

be installed a minimum 4 metres offset from the line marked field boundary, unless the irrigation is to be installed into an existing field and the area is limited due to field of play fencing or other infrastructure.

- Where possible, perimeter sprinkler heads should be positioned outside of the safety zone, and part circles installed to be able to irrigate the playing surface. The idea is to stop/limit unnecessary watering outside of the playing surface.
- Air valves are to be installed at isolated high points and end-of-line in the mainline.
- Focused and uniform irrigation application to the specified field platform only (note that the platform includes both the actual field of play and any surrounding turf up to the perimeter fence). This shall include part-circle sprinklers around the perimeter of the irrigated area, zoned separately to full-circle heads, to ensure an even application across the platform without overspray to surrounding areas.
- A minimum of two (2) quick-coupling valves (QCVs) to be provided at appropriate locations for each rugby or soccer field, with a minimum of four (4) QCVs per AFL or cricket-sized field.
- The ability to supply information to each field controller and relay flow rates for each valve as it irrigates.
- The ability to detect and respond to any unexpected flow condition (e.g. high flow, low flow, no flow, uncontrolled flow).
- High Density Polyethylene (HDPE) piping divided into zones with electric remote-control valves, sized to achieve the following:
    - pressure losses shall be limited by ensuring that fluid velocities do not exceed 1.5m/s in mainline pipes and 1.8m/s in lateral pipes.
    - sprinkler base operating pressure variations across stations shall be limited to a total of 10% of the design operating pressure of the sprinkler.
- The ability to add moisture sensing devices, if required.
- Lightning and electrical surge protection.
- The ability to link seamlessly with Council's Rain Bird IQ central control water monitoring system.
- Connection to local rain sensor and Brisbane City Council area weather stations.
- Pop-up sprinklers, including swing joint risers, on HDPE pipe for sprinkler irrigation of grass covered areas.
- Electric remote-control valves with valve box protection.
- Sprinklers grouped together within lateral zones to be of matching arc only (i.e. no 180 degree heads with 360 degree).
- An irrigation control system including electric two-wire path valve module wiring (unless a multi-core system is proposed).
- All accessories needed for these systems.
- The ability to meet pressure test standards (Section 9.2).

- Confirmation that the correct flow is available with the minimum amount of operational pressure as possible.
- The ability to meet Council requirements regarding spoil and construction material handling practices from the site.
- The entire system (i.e. the pipe network, sprinklers, sprinkler groupings and nozzles) shall be sized to meet application requirements corresponding to an Evapotranspiration Rate (ET) of 6 mm/day within a reasonable time window of six hours given the available flow rate and pressure.
- SPACE (or SPACE pro) analysis that demonstrates the following minimum performance criteria can be met in the field (an independent irrigation performance test will be carried out prior to handover):
  - Distribution Uniformity (Du) ≥ 80%
  - Scheduling Co-efficient (Sc) ≤1.3.
- Valve boxes must be installed a minimum of 3 metres away from the field of play – preference will be for valve boxes to be installed at the perimeter of the field platform (adjacent to perimeter fencing). Confirmation is required if the sports facility will be used for higher grade sports and if a minimum of 5 metres is required.
- Valve boxes are not to be installed near pedestrian and double gate access points to the sports field. When new irrigation systems and sports field perimeter fencing is being installed, the perimeter fencing should be overlaid in a set of For Construction plans.
- Where possible, the positioning of water tanks and the tank compound should be to allow for future tank installations should there be such need.
- To install an independent water flow meter inside a lockable valve box near the irrigation connection point. The meter is to allow the club to monitor irrigation water usage both during project works and provide a sustainable maintenance tool moving forward.
- Where a natural turf cricket wicket is to be installed, an independent potable water source is to be made available to irrigate the wicket. This includes irrigation sprinklers and the installation of a Quick Coupler Valve (QCV). The installation of a QVC is non-negotiable.
- If irrigation works is to be undertaken across multiple fields or a multi-use facility, the recommended minimum number of staff and maximum number of days to complete a particular task are to be clearly defined by the Irrigation Consultant.

2 WORK HEALTH AND SAFETY

All Contractors shall regularly monitor and update their work health and safety policy relative to the work site and activities. The Contractor (all staff on site), Subcontractors and Visitors to the site during works, are to complete a site induction provided by the Principal Contractor. The Principal Contractor must also keep a logbook of all persons entering the site. The preference for the site attendance register is to be electronic to enable a Contractor, Subcontractor and Visitor to sign in after scanning a quick reference (QR) code shown on Site Safety corflute signage attached to temporary fencing at access points to the site.

Please refer to the Safe Work Australia website (https://www.safeworkaustralia.gov.au) for further information and examples.

The Principal Contractor and their Subcontractors shall have current Safe Work Method Statements (SWMS) relevant to the scope of works. This also includes SWMS information provided by the Suitably Qualified Person (SQP) when working on contaminated sites.

2.1 TRAFFIC MANAGEMENT PLAN

Access to driveways, car parking, park facilities etc. must be maintained at all times, unless approval is provided in the site-specific Traffic Management Plan (TMP) to be supplied by the Principal Contractor. Where access may be restricted, the Principal Contractor must notify the Superintendent in writing 14 days in advance of such interference and shall confirm to the Superintendent of alternative arrangements. Approval must be provided by the Superintendent in writing.

The site-specific TMP, which is to be approved in writing by Council prior to commencing works, must also include:

- the access route(s) of machinery and delivery trucks;
- pedestrian management, including the movement of pedestrians through access points or along footpaths; and
- the type and placement of appropriate safety signage.

The Principal Contractor must be familiar with the site access and stockpiling options (for gravel sand topdressing material only). This includes the delivery and access of body trucks, truck and dogs and turf delivery trucks to the site. There will be no variations approved by the Superintendent if the Principal Contractor allows for truck and dog deliveries and they are not able to gain safe site access.

Steel road plates are to be used to cover any stormwater or electrical pits or boxes that may incur damage from truck access onto the sports field. All road plates are to be safely secured into position and must not pose a trip hazard.

Concrete or asphalt carparks, access points and footpaths traversed by the Principal Contractor when moving equipment or machinery and having materials delivered to site, area to be broomed and blown clean at the completion of each workday.

Site/facility access gates from the street are to remain closed at all times, except when deliveries are being made on site.

3 ENVIRONMENTAL

3.1 ENVIRONMENTAL MANAGEMENT PLAN

The Principal Contractor is to have a site-specific Environmental Management Plan (EMP) approved in writing by The Principal prior to commencing works. The EMP describes how an action might impact on the natural environment in which it occurs and sets out clear commitments from the Principal Contractor taking the action on how those impacts will be avoided, minimised and managed so that they are environmentally acceptable.

Brisbane City Council has an Environmental Management Checklist checklist/template that is to be completed and approved by Council prior to commencing works.

Refer to the Department of the Environment Environmental Management Plan Guidelines for supplementary information.

3.2 SUITABLY QUALIFIED PERSON

When disturbing the ground or excavating within a contaminated land site, the Principal Contractor must engage the services of a Suitably Qualified Person (SQP) (as defined by Section 564 & 565, Environmental Protection Act 1994 and Guideline Environmental Protection Act 1994, Assessing a Suitably Qualified Person) to (i) provide a Contaminated Land Management Plan to include an environmental summary report and review of The Principal Contractor's Safe Work Method Statement (SWMS); and (ii) be present during ground disturbance and excavation to oversee works as this site is known to be contaminated and/or listed on the Environmental/Contaminated Land Register. The SQP must be experienced in contaminated land/closed landfill and/or gas assessment and remediation.

3.3 SEDIMENT CONTROL

A site-specific Erosion and Sediment Control Plan (ESCP) is to be prepared by the Principal Contractor. The Plan is to be approved by Council in writing prior to commencing works.

3.4 FIRE ANTS

Refer to Council's Planning and Environmental Due Diligence (PEDD) assessment memorandum for the site to identify if it is located within a declared biosecurity zone.

The Principal Contractor is to have a Red Imported Fire Ant (RIFA) Approved Risk Management Plan (ARMP) prior to commencing work.

All materials delivered to site are to be free from RIFA. All Department of Agriculture and Fisheries (DAF) Biosecurity Queensland requirements for transporting materials to and from the site must be adhered to.

The Principal Contractor, or its subcontractors, have a legal obligation to report the presence or suspicion of RIFA to Biosecurity Queensland within 24 hours of becoming aware of their (suspected) presence within the sports field or within imported materials. Reporting can be made via:

- Phone: 13 25 23; or
- Online (preferred): https://ants.daf.qld.gov.au/table-of-contents/report-fire-ants/.

Upon reporting the sighting to Biosecurity Queensland, the Superintendent must also be notified via email. The following is to be provided:

- A reference number provided by Biosecurity Queensland;
- Email confirmation from Biosecurity Queensland (if the report has been made online);
- Date and time when found; and
- The approximate location of the sighting.

For further information call the Biosecurity Queensland helpline on 13 25 23 or visit the National Fire Ant Eradication Program online https://www.fireants.org.au/.

4 PROJECT INFORMATION

4.1 GENERAL

- Irrigation technical specifications and drawings for projects, once approved by Council, have precedence over the specifications listed herein.
- Faults or repairs are to be actioned within 48 hours of being notified by the Superintendent or Council's Representative.

4.2 SITE MEETINGS

The Contractor is to allow for a pre-start meeting with the Superintendent and The Principal's Representatives prior to site mobilisation. This should be undertaken at least one week prior to commencing any site works. The Principal Contractor's Project Manager must attend this site meeting.

The Contractor shall allow for regular site meetings (weekly, or more often if required) with Council and the Council's Representative to check on progress and/or discuss complications and resolutions.

4.3 DILAPIDATION REPORT

The Contractor is to visit the work site and is to prepare and submit a dilapidation report to the Superintendent prior to site mobilisation. This is to identify and report any damage to buildings, fences, structures, footpaths, irrigation infrastructure, goal posts, player boxes, cricket wicket, fixtures etc. within the work area prior to the Contractor undertaking site setup. High quality photos are also to be taken of stockpiling or storage locations and where rumble grid(s) or stabilized rock pad(s) are to be installed (if applicable). This is to determine the existing site conditions and to assist with reinstatement.

Multiple high quality photos are required of any existing damage to access gates, footpaths, carparks, access points and kerbing near, within or immediately surrounding the work site. If damage is noted during or at the end of the project by the Superintendent, the Contractor may be liable to remediate or replace damaged areas at their own cost.

4.4 SIGNAGE

4.4.1 Project Notice Signage

Appropriate danger, warning and PPE safety signage and a phone number for the Principal Contractor are to be prominently displayed on areas of temporary fencing and at all access points to the work area.

4.4.2 Site Safety Signage

Project notice corflute signs will be supplied by the Superintendent for installation by the Principal Contractor.

4.5 SERVICE DETECTION

The Principal Contractor is to undertake service detection before commencing ground preparation works, excavation, trenching or digging within the work site. This includes conducting a Dial Before You Dig (DBYD) search online (https://www.byda.com.au/) to identify

known services are within the work site; **and an accredited service locator is to be used** to identify services within the work site which may not be shown within the DBYD documentation.

The Principal Contractor is to provide all staff and subcontractors with the necessary details, including service locator report, safety information and to undergo a Toolbox Talk prior to commencing ground preparation works, excavation, trenching or digging within the work site.

Potholing for verification of services may be required to be undertaken or organised by the Principal Contractor.

4.6 PROJECT REPORTING

4.6.1 Gantt Chart

A Gantt chart is to be provided by the Irrigation Contractor prior to the commencement of works. The Gantt chart is to contain:

- all work dates e.g. Mon to Fri or Sat if written approval is provided by The Principal to work on Saturdays;
- start dates and estimated timeframes of all major works, including all Hold Points, Witness Points and Documents Required (to be provided);
- labelling or colouring is to clearly denote completed activities; and
- the anticipated project completion and/or handover date.

The Gantt chart is to be updated by the Irrigation Contractor weekly during the project and emailed to the Superintendent and Council's representative in PDF format, along with each Weekly Project Report, by 12:00 PM each Friday.

4.6.2 Weekly Project Reports

Weekly Project Reports are not required if irrigation works are being undertaken as part of a sports field redevelopment or construction project and the Irrigation Contractor is performing works as a subcontractor. Reporting will be undertaken by the Principal Contractor.

Weekly Project Reports, which are to be numbered in sequential order, are to be provided by the Irrigation Contractor once the project commences until the completion of works. Each Weekly Project Report, which is to be provided in a single PDF document, accompanying the Project Gantt Chart, is to be emailed to the Superintendent and Council's representative by 12:00 PM each Friday during works. Each Weekly Project Report is to communicate:

- the proposed completion and/or handover date;
- what work has been undertaken during the week;
- the planned activities for the following week;
- any obstacles, issues or delays;
- any pending or approved variations; and
- high quality digital photographs, which are date time stamped, are to be provided of all Hold Points, Witness Points and important activities.

4.7 QUALITY CONTROL

4.7.1 Hold Points

In project specific design documentation, the Consultant or Council is to identify which Hold Point numbers are included in the project. The following table shall be copied into project specific design documentation.

The Principal Contractor shall include the below Hold Points as milestones in the overall project Gantt chart.

The Contractor shall liaise with the Superintendent and/or Council's Representative to obtain sign-off at the following Hold Points, prior to proceeding with the next stage of the works.

Task	Hold Point #	Included in Project	Description
Pre-start meeting	1	Yes / No	A pre-start meeting is to be scheduled before any works commence on site. If works are being organised by the sporting club, a Council Project Manager is to be asked to attend.
Temporary fencing	2	Yes / No	When irrigation trenching is being undertaken, temporary fencing must be installed to secure the site/area.
Service Location	3	Yes / No	Dial before you dig (DBYD) is to be undertaken and an accredited service locator used to identify services within the work area prior to disturbing any soil. Information to be shared with Superintendent and all sub-contractors, highlighting any potential hazards.
Mark-out	4	Yes / No	Irrigation mark-out, including service location and management plan. This shall include a total marking of the site (spray paint marking of mainline and lateral pipes, valve boxes, blue irrigation flags for sprinkler head locations), along with location of existing services by an accredited service provider. Any design layout changes are to be approved in

			writing by the Superintendent or the Council's Representative.
Accredited service locator	5	Yes / No	Before trenching, and in addition to Dial Before You Dig (DBYD), an accredited service locator is to be used to identify services within the work site which may not be shown on the DBYD. Services are to be clearly marked out before excavation commences.
Irrigation compound subsoil base	6	Yes / No	The subsoil base under the irrigation compound pad must be compacted to a minimum of 50kPa before the sand base is installed.
Survey	7	Yes / No	A survey of the installed irrigation system is to be undertaken before backfilling commences. Survey plans and data are to be provided to the Superintendent within 7 days following surveying.
Trench compaction	8	Yes / No	• Trenches are to be recompacted in 150 mm increments/layers using a vibratory hydraulic compaction wheel attachment. 95% SMDD (Modified Maximum Dry Density) is to be achieved. • All traffic and surface damage has been repaired to Council's satisfaction.
Pressure testing	9	Yes / No	Irrigation system pressure testing.
Functioning irrigation and independent irrigation audit	10	Yes / No	The irrigation system must be fully functional at least 72 hours prior to turfing. Turfing can commence after the system has been inspected by an independent irrigation consultant or independent Certified Irrigation Systems Auditor. Includes operation tests, inspections and uniformity testing.
As-Constructed	11	Yes / No	As-Constructed documentation is to be provided to the

			Superintendent 7 days following installation.

4.7.2 Witness Points

In project specific design documentation, the Consultant or Council is to identify which Witness Point numbers are included in the project. The following table shall be copied into project specific design documentation.

The Principal Contractor shall include the below Witness Points as milestones in the overall project Gantt chart.

The Contractor shall liaise with the Superintendent and/or Council's Representative to obtain sign-off at the following Witness Points, prior to proceeding with the next stage of the works.

Task	Witness Point #	Included in Project	Description
Mark-out	1	Yes / No	An inspection is to be undertaken to assess and confirm site mark-out is correct.
Irrigation trench excavation	2	Yes / No	Irrigation trench excavation. Trenches should be of appropriate width and depth as per the specification and detail drawings, in straight lines (where practical) and with smooth level bases free of stones or contaminated material. Note: For full field irrigation installations, including the installation of irrigation mainline and lateral irrigation lines, trenching shall be undertaken by GPS-guided machinery.
Pipe laying	3	Yes / No	An inspection after pipe is laid but before backfilling commences. Includes thrust block installation.
Installation	4	Yes / No	Valve and sprinkler installation, including valve boxes and miscellaneous hydraulic items (e.g. QCVs and air valves).
Trench compaction	5	Yes / No	Trench compaction shall be achieved via the use of a vibratory hydraulic compaction wheel attachment

4.7.3 Quality Assurance Documentation

The Contractor shall include the below Quality Assurance Documentation as milestones in the overall project Gantt chart. The documents are required for Quality Assurance purposes. All applicable QA documentation must also be provided to the Superintendent along with the Weekly Project Reports.

Task	QA Document #	Included in Project	Description
Pre-Establishment (general)	1	Yes / No	• Confirmation of Regulatory Approvals and their conditions. • Confirmation of sub-contractors to be used. • Confirmation of all contact points and lines of communication. • Confirmation of all materials to be used and their testing status. • Confirmation of access/traffic routes. • Confirmation of stockpile locations, areas for storage sheds, plant and equipment etc. • Confirmation that all site-specific WHS items are in place. • Confirmation of current Safe Work Method Statements (SWMS).
Gantt Chart	2	Yes / No	An updated project Gantt chart, in PDF format, is to be emailed to the Superintendent and the Council's Representative by 12:00 PM each Friday during works.
Quality Control Inspection Reports	3	Yes / No	Quality Control Inspection Reports prepared by the Council's Representative are to be retained by the Principal Contractor.
Project Reporting	4	Yes / No	Weekly Project Reports, in PDF format, are to be emailed to the Superintendent and the Council's Representative by 12:00 PM each Friday during works.
Induction Checklist and Site Register	5	Yes / No	An induction and site attendance register are to be maintained and retained by the Principal Contractor during works.

Traffic Management Plan (TMP)	6	Yes / No	• A site-specific Traffic Management Plan (TMP) is to be provided to Council for review and approval before commencing works. • Confirmation that all site-specific TMP items are in place.
Environmental Management Plan (EMP)	7	Yes / No	• A site-specific Environmental Management Plan (EMP) is to be provided to Council for review and approval before commencing works. • Confirmation that all site-specific EMP items are in place.
Erosion and Sediment Control Plan (ESCP)	8	Yes / No	• A site-specific Erosion and Sediment Control Plan (ESCP) is to be provided to Council for review and approval before commencing works. • Confirmation that all site-specific ESCP items are in installed and functioning.
Dilapidation Report	9	Yes / No	A detailed dilapidation report is to be provided to Council prior to commencing works.
Service Locator Report	10	Yes / No	A copy of the service locator report is to be emailed to the Superintendent.
Gravel, Sand, Soil Material Delivery	11	Yes / No	The weighbridge or delivery docket(s) are to be retained by the Principal Contractor. Each certificate is to clearly state the date, supplier, product name and quantity (tonne) delivered to site. All documentation is to be collated in a single PDF document and emailed to the Superintendent within 7 days after completion of material being delivered to site.
Sprinkler Heads and Valve Boxes	12	Yes / No	The Principal Contractor is to check the installation height and levels of all sprinkler heads and valve boxes 4 weeks after installation.

4.7.4 Performance Review

Council will conduct a Community Facilities Planning and Design review following the completion of the project with the Principal Contractor. The purpose of the review is to identify and capture lessons learned from the works undertaken. It also allows the perspective of various project team members and stakeholders to be realised about the implementation and delivery of the project.

4.8 SITE CAMERA

When Council has requested for the Principal Contractor to install a site camera, following installation of the camera or cameras on site, the following details are to be emailed to the Superintendent and Council's Representatives:

- Portal login (access) website link;
- Username; and
- Password.

Should password changes be made, the new password is to be emailed to be Superintendent and Council's Representatives immediately following the change.

Pricing within the BOQ is to include the installation and onsite commissioning, 1 x high-definition live view lapse camera, project management, a fully managed camera system, portal access and offsite maintenance, data costs and post-production and video editing. The edited video is to be provided by the Principal Contractor to The Principal within 3 months after Practical Completion. The pricing must also include for the camera to be on site, fully functional, for up to 6 months.

A high-definition time lapse camera is to be setup, no less than 5.5 m above ground level, on a sports field light pole that overlooks the work area/sports field. Alternatively, a buried pole (installed as the supplier's recommendation) may be installed following approval by the Superintendent. The camera is to be used for remote site monitoring and at the completion of the project, a professional timelapse edited video is to be provided by the Principal Contractor to the Superintendent for promotional internal and external use. The time lapse camera and services are to be provided by either:

- Time Lapse Pty Ltd (http://www.livetimelapse.com.au/);
- Blackbox (https://black-box.com.au/), or
- A similar Australian service provider, which must be approved in writing by the Superintendent.

4.9 MAINTENANCE OF SURROUNDS

Routine mowing of the sports field is separate to that listed below and must be pre-arranged between the Contractor and Superintendent prior to commencing works e.g. who will be undertaking the mowing, when etc.

Mowing and Brush Cutting

Weekly mowing and brush cutting of the grass within the fenced work site, outside the field of play, is required. This includes under temporary fencing and around all temporary fencing, Erosion Sediment Control measures and other infrastructure during works.

A ride on mower is not to be used on the inside of the perimeter fencing where the work area being cultivated, topsoiled and turfed/planted is located less than 2.5 m away from silt fencing or temporary fencing blocks or bracing. Only a rear discharge rotary mower is to be used.

Encroachment

To supply and apply of Numchuck Quad (Active Constituent: Terbuthylazine (350 g/L), Glyphosate (100 g/L) present as the Isopropylamine Salt, Amitrole (60 g/L) and Oxyfluorfen (15 g/L) at 180 ml in 10 L of water (low pressure spraying) is to be applied to provide a 200 mm swath on the outside of the sports field perimeter fencing once (1) during the turf consolidation period when the entire sports field is being returfed by solid turf or line planting. This is to stop or reduce encroachment prior to handover. Further applications of non-selective herbicide control may be required to ensure grass contamination does not go under the perimeter fencing onto the sports field.

Non-Selective Herbicide

Excluding the above, non-selective herbicide is not to be used to kill grass located adjacent to temporary site fencing, or environmental control measures e.g. silt fencing.

4.10 TEMPORARY FENCING

The Principal Contractor is responsible for the hire, installation and maintenance of adequate temporary fencing, including bracing and shade cloth around the work site/area when trenching is required. The temporary fencing must be in situ prior to trenching and until the turfgrass and surface has established. This includes providing 100% turf cover and a safe playable surface.

Temporary fencing must also be installed around the perimeter where any new irrigation compound or new irrigation tank is being installed, or major irrigation repairs/upgrades are being undertaken.

A minimum of two (2) access gates are required be installed to gain access to the sports field. Access panels are to have gate wheels fitted.

All temporary fencing panels are to be kept secure and access to the site is to be from the designated entry points only. All access gates to the field are to be locked with (i) a extra heavy duty ABUS GateSec lock, and (ii) an all-weather heavy duty combination padlock which is to be fitted to the GateSec lock. The single lock code is to be provided to the Superintendent at the pre-start site meeting.

Temporary fencing blocks are to be either (i) Eco Blocks (recycled material) or (ii) concrete blowmoulded fully encased moulds. This is to ensure no concrete debris is left on the playing surface and surrounds during install and following the removal of the temporary fence.

The Superintendent may also supply the Principal Contractor with a 50 m roll of BCC printed mesh banner to be cable tied to the temporary fencing and maintained by the Principal Contractor for the duration of the works.

5 IRRIGATION DRAWINGS

5.1 DESIGN DRAWINGS

Design drawings are to be submitted and approved by Council.

Designs should be overlain on a site survey for accuracy. The contractor is to organise and supply the site survey if an existing, up-to-date survey is not available.

All design drawings submitted to Council should be full size and reduced size (A3), as well as in PDF format and DWG format (use of AutoCAD 2017 or later or a specialist irrigation design package is expected).

The drawings at a minimum shall include the following:

a) sprinkler locations
b) valve locations, valve sizes and valve box sizes
c) mainline locations including the cover depth and Z coordinate
d) lateral line locations including the cover depth and Z coordinate
e) mainline and lateral line pipe size
f) controller and moisture sensor locations
g) points of connection and associated items
h) wiring and wire joints
i) lightning surge protection
j) air valves
k) station and sprinkler numbering. Station numbering on the plan shall be used to configure station numbering on the controller – so should follow a logical progression across the irrigated platform.
l) all automatic valves shall be tagged and correspond with the stations setup in the controller and be identified on the As-Constructed irrigation plans by their station name and number e.g. ‘SV1’
m) locations of quick coupling valves (QCV)
n) pump and/or tank locations
o) location to and confirmation of the type of water supply and water supply pipe diameter (as appropriate)
p) CAD reference points for project mark-out.

5.2 AS-CONSTRUCTED DRAWINGS

As-Constructed irrigation drawings are to be provided seven (7) days after irrigation installation has been completed. The As-Constructed irrigation plans shall be based on the survey conducted as per Section 8.1.6.1 and include the same details as listed above within the 'Design Drawings'. Additionally, the following details are also to be provided on the As-Constructed irrigation drawings:

- the location of the Queensland Urban Utilities potable water meter on site. Note the serial number;
- (if installed) the location of Council's SUMS water meter. Note the serial number;
- confirmation that "Danger Buried Irrigation Main Below" or (if non-potable water is being used) "Danger – Non-Potable Line Buried Below" (or similar) has been installed over irrigation mainline pipe;
- to note the inlet pipe size (diameter) connecting to the RPZ, irrigation tank and irrigation pump; and
- water harvesting details if they have been installed e.g. from the clubhouse roof to the irrigation tank.

For an existing sports field, the As-Constructed drawing data and information must be overlaid over an aerial image of the sports field and facility.

The full set of drawings in PDF, XML and DWG format shall be provided to Council in electronic format, along with warranty documentation, project certification and product manuals. A hard copy handover manual of the same shall also be provided and include a separate A3 laminated As-Constructed plan which can be installed within the holder inside the pump shed.

6 IRRIGATION SYSTEM INPUTS

6.1 MATERIALS

All materials supplied for the works shall be new and shall conform to the relevant Australian Standards. Installation of irrigation systems shall conform to AS 3500.1 “National Plumbing and Drainage Code”. Installation of HDPE pipes shall conform to AS2033 “Installation of Polyethylene Pipe Systems”. Installation of valve wiring shall conform to AS 3000 2018 “SAA Wiring Rules.

6.2 AUSTRALIAN STANDARDS

The following Australian standards will apply to the irrigation system (as required):

a) AS 1432 Copper tubes for water, gas and sanitation

b) AS 3500 National plumbing and drainage – Water Supply

c) AS 4130 Methods for testing Polythene (PE) pipes for pressure applications

d) AS 4129 Fittings for Polythene pipes (PE) RDs for pressure applications

e) AS 1628 Water supply – metallic gate, globe and non-return valves

f) AS 2033 Installation of polyethylene pipe systems

g) AS 3000 SAA wiring rules and amendments

h) AS 2053 uPVC wire conduits

i) AS 2658 Resilient seated gate valves.

If there is a conflict between this Specification, the Drawings and the Australian Standards, the Australian Standards shall be adopted.

7 REMOVAL

Where a new irrigation system is being installed, the Contractor is to remove and dispose of the existing in ground irrigation features within the field of play e.g. valve boxes and sprinkler heads (see supplementary note below). The Contractor is to leave the non-accessible irrigation features in the ground e.g. cable, lateral irrigation lines and main lines.

The Superintendent is to confirm if the sprinkler heads are to disposed of or refurbished and returned or reused. If the sprinkler heads are to be refurbished and returned or reused and sprinkler heads are found to be damaged and are non-repairable, the Superintendent is to be notified and approval sought in writing before new sprinkler heads are purchased.

For a sports field redevelopment, where a total kill of the existing grass surface is required, the sprinkler heads are not to be removed until total kill has been achieved and if applicable, signed off.

If the irrigation system is being retained and only the irrigation heads are being temporarily removed, the location of the sprinkler heads are to be surveyed for reinstatement.

Before sprinkler heads are removed, ensure the irrigation Master Valve is turned off.

Sprinkler heads are to be removed manually with a shovel e.g. no excavator.

Where voids have been left, including from the removal of valve boxes and sprinkler heads, the holes are to be filled with USGA sand or imported topsoil.

8 INSTALLATION

8.1 EXCAVATION AND OPENING OF TRENCHES

8.1.1 General

If asbestos is discovered on-site, its discovery is to be reported immediately to the Superintendent. Instruction will then be given to the Contractor from the Superintendent in regard to procedures for control measures. Handling and disposal shall be in accordance with the Safework Australia Guidelines.

https://www.safeworkaustralia.gov.au/asbestos

All works shall be undertaken under the best possible conditions to avoid damage to the facility.

The tools and machines used shall be perfectly suited to their function and shall not damage any previously constructed works.

Prior to the commencement of excavation works and during the execution of the work, the contractor shall, at its own expense, take all necessary measures to ensure the safety of traffic, personnel and public within and around the work site. Site signage shall be installed prior to works commencing and all materials should be stored in accordance with the applicable regulations and/or manufacturers recommendations.

8.1.2 Stockpiling

Stockpiling of non-contaminated spoil and imported materials on site is to be pre-approved by the Superintendent in writing. This includes the location on site of where the stockpiling can occur.

Different materials shall be stockpiled separately. Suitable sediment control measures are to be installed by the Principal Contractor around all stockpiles and must adhere to Council requirements, environmental guidelines and best practice.

Routine monitoring is to be undertaken by the Principal Contractor to ensure sediment control measures are performing as required.

For further information on erosion and sediment control visit:

https://environment.des.qld.gov.au/water/policy/erosion-sediment-control-construction-sites.html#new_erosion_and_sediment_control

8.1.3 Typical excavation details

8.1.3.1 Trenching

All mainline and sub main trenches shall be excavated to a depth that provides 400mm cover over lateral pipes and 600mm cover over main pipes after installation. Trench bases shall be free of hard-edged objects, rocks, stones or similar material which would be retained in a 10mm sieve.

For full field irrigation installations, including the installation of irrigation mainline and lateral irrigation lines, trenching shall be undertaken by GPS-guided machinery, fitted with turf tyres/tracks, such as a tractor with elevated chain trencher or "whizz-wheel" attachment (walk-behind trenching machines are not acceptable). The trenching machine must also have the capability of fitting a conveyor to transfer spoil immediately to a companion vehicle for transfer off-field (without being dropped on the field surface) to the site approved materials storage area when called for in the specific project specifications.

Where specific spoil contamination controls are not called for in the project specification, the excavated material, if reusable as backfill, shall be stored on the side of the excavation/trench.

The bottom of the excavated trench shall be properly levelled and clean of spoil.

Trench width shall be at least 100mm wider than the outside diameter of the pipe that is to be installed in it (see trench details). If mainline and lateral line is to be installed in a common trench there shall be a minimum of 100mm between the lines. This area shall be compacted with washed free flowing sand.

Where significant instances of hard rock is encountered during trenching, field activities shall stop and the Superintendent shall be informed to make a decision about how to proceed.

8.1.3.2 Spoil

Should excavated spoil from the trench lines be deemed suitable by the Superintendent (no hard-edged objects, rocks, stones or similar material which would be retained in a 10mm sieve), then it may be used as primary backfill for the trench lines. The primary backfill shall be used from the base of the trench up to 200mm below the finished field surface level, with the final 200mm of backfill being approved imported topsoil consistent with the field surface.

If the excavated spoil is deemed unsuitable for backfill, then imported washed sand shall be used for primary backfill material from the base of the trench, finished with a 200mm final topsoil layer to final surface level.

Excess, non-contaminated, trench spoil shall be removed from site at the contractor's expense and disposed of at a legal dumping facility.

Spoil from contaminated/landfill sites must be disposed of as directed in the approved site-specific Environmental Management Plan.

8.1.3.3 Mole-Ploughing

Where expressly permitted in the project specification, lateral lines up to 75mm and/or cables may be installed via the mole-ploughing method, rather than trenching. This involves the use of a suitable all-terrain traction unit, fitted with turf tyres and a specialised vibrating mole-plough attachment with integrated laying chute and pipe/cable spool.

When installing pipes or cables via the mole-plough method, care must be taken to ensure that no mechanical, tensile stress is placed upon the pipe or cable. Vigilance on maintaining trench depth to specification (equivalent to trench specifications) is critical throughout the process.

8.1.4 Conduits

Conduits and cables shall be laid in the bottom of the excavated trench on a 50 mm bed of sand.

The conduits shall be adequately side-compacted and then covered with a 70 mm layer of compacted sand.

The conduit trench shall be backfilled with excavated material cleared of coarse material and plant waste, compacted in layers of no more than 20 cm thickness.

8.1.5 Road crossings

Road crossings shall be formed by sinking or by opening from the surface.

The trench excavation procedure shall be as follows

- carefully cut the top surface
- excavate the trench and remove the excavated material
- place a sleeve of suitable size and type for the pipes to be laid
- backfill with sand up to a level of 20 cm above the top of the sleeve, compacting carefully
- backfill with well graded carefully compacted material
- restore the road surface, with a layer of gravel-cement mixture to permit heavy vehicle loads.

In the case of excavation in planted areas, the plants should, if applicable, be removed from construction area, maintained during the works and carefully replanted upon completion of the works.

Excavations in existing lawns and/or turf areas may be directly dug and the turf re-laid with specified turf over the width of the trench. All precautions shall be taken to minimise any damage to surrounding turf or garden areas.

All grass areas shall be mown short prior to excavating trenches. Plant shall be run over planking, if necessary, to avoid surface damage.

8.1.6 Backfilling

8.1.6.1 Surveying

Prior to final backfilling, the installed irrigation components shall be surveyed for use in preparation of the As-Constructed plans. The contractor shall accurately measure and record the final location (to appropriate coordinates and elevation) for inclusion on the “As-built” Drawings.

8.1.6.2 Trench Compaction

All trenches shall be backfilled and compacted in 150 mm layers to achieve 95% (+/- 3%) SMDD (Modified Maximum Dry Density) as determined in the field using a nuclear density gauge or electrical density gauge. A minimum of ten (10) tests per field or hectare are to be

undertaken when an irrigation mainline is being installed and/or when all new lateral irrigation lines are being installed.

Trench compaction shall be achieved via the use of a vibratory hydraulic compaction wheel attachment.

Trenches shall be finished flush with the surrounding levels.

8.1.6.3 In Subsoil

Pipe trenches shall be carefully backfilled and compacted to avoid subsequent settlement. If settling occurs the trenches must be topped up with the field growing medium until settling has stabilised.

8.1.6.4 Within Turfed Surfaces

The top 150 mm of backfill shall always be approved by the Superintendent.

Trenches through existing grassed areas are to be re-turfed. This is mandatory. The turf variety (https://turffinder.com/varieties) will be advised by the Superintendent. The cost for the supply, installation and maintenance is part of the contractor's project costs. The new turf must be level with the existing surrounding turf at project handover. Undulations greater than 20 mm under a straight edge, along an irrigation trench or between an irrigation trench and existing surface, will require sand topdressing using USGA sand or corrective actions will be required if more than 15 mm thickness of sand is required to rectify the issue(s). The cost to undertake rectification work will be payable by the irrigation contractor or Principal Contractor.

8.2 CONDUITS AND BORING

All required conduits must be indicated on the design drawings.

Where pipework is required to travel beneath footpaths, it shall be installed by under-path boring.

The irrigation main and potable water main shall be sleeved using uPVC Class 12 pipe. Sleeves shall be installed in straight lines between irrigated areas.

The ends of the sleeves shall protrude at least 100 mm past the hard edge. Conduits are to be sized such that the conduit is 1.5 times the diameter of the pipe to be enclosed.

8.3 PIPEWORK AND FITTINGS

8.3.1 General

There shall be two pipe types used in the works:

- mainlines (including ring main)
- laterals

All pipes shall be PE100 High Density Polyethylene (HDPE).

8.3.2 Mainline pipes

Mainline pipework shall be PE100 HDPE PN12.5 to Australian Standard AS 4130:2018.

8.3.3 Lateral pipes

All lateral line Pipework shall be PE100 HDPE PN 12.5 to Australian Standard AS 4130:2018.

8.3.4 Mark-Out

The contractor shall mark the location of the connection point, mainline and ALL sprinklers, valves, pipes and QCVs in accordance with the contract drawings. Once the positions are confirmed, the Contractor shall install all pipework, valves, and sprinklers in accordance with the drawings and this (and any other written) specification.

The contractor shall engage qualified surveying personnel to accurately set out the sprinklers, pipework, valves, etc. in accordance with tabulated coordinate data that shall be extracted from a digital issue of the “For Construction” Drawings and confirmed by the contractor on-site, prior to the commencement of installation by the contractor.

8.3.5 Laying PE Pipe

Bending and twisting are to be avoided during laying operations (tightening connections, positioning ends, etc.).

All bends will be supported by temporary wedges made of wood. Temporary wedging of pipes with stones is strictly forbidden. Thrust blocks made of 25MPa concrete are to be installed on all bends (horizontal and vertical), T-junctions and ends located on pipework greater than 63mm in diameter. The thrust block should be sized appropriately and located on compacted and undisturbed ground. At least two layers of polyethylene film should be installed between the block and pipework to prevent damage to the pipe should it move.

Any pipe that may accidentally have been allowed to fall from a height shall be rejected.

At the time of laying, the inside of all types of pipes shall be carefully inspected and carefully cleared of any foreign matter that may have entered. All filters and water meter dirt boxes installed in the system shall be removed and cleaned as often as necessary to remove particles collected during the flushing operation to ensure free flow and minimum pressure losses. If after the final flushing operation with clean water as outlined above, the water drained from the system or the condition of the strainers indicates that the system is still dirty, the entire flushing cycle as described above or whatever part of the cycle is deemed necessary shall be repeated.

All main line pipework shall have 100 mm wide blue detectable tracer wire tape marked with the text “Danger Buried Irrigation Main Below” installed 100mm above the installed pipe level. Alternatively, this is to be 100 mm wide lilac detectable tracer wire tape marked with the text “Danger – Non Potable Line Buried Below” (or similar). This must also be noted within the As-Constructed irrigation drawings.

8.3.6 Pipe Cuts

Cuts shall be made perpendicular to the axis of the pipe using a saw or special pipe-cutting tool, and then deburred.

All ends of the tube are to be chamfered. Where on-site cutting is performed, reform the chamfer as required.

8.3.7 Pipe Fitting Details

All PE100 fittings shall be:

- 75mm diameter and larger shall be electrofusion welded couplings and flanges or butt welded fittings
- 63mm diameter and smaller shall be Plasson (or approved equivalent) compression type manufactured to AS4129

Flanged joints shall only be electrofusion welded complete with galvanised steel backing rings drilled to Table C or D of AS2129, as required for the application, and conforming to AS 2129 in geometry and thickness.

All PE100 thermal welded joints shall be performed by an ISO certified HDPE welder using an ISO certified procedure. All joints shall be marked to identify that they have been formed to an ISO certified procedure by a certified welder.

Thrust blocks and anchors are required on all tees and elbows for pipe sizes larger than 63mm, despite the use of Electrofusion or butt-welded fittings.

8.4 POWER

Power supply to the site is to be appropriate for the equipment being served by the power supply.

Where a pump is installed, the contractor shall design, supply and install three-phase electrical power from the existing master switchboard to the pump site to service:

- 1N°, 3-phase 415VAC variable speed electric motor with soft-start/ soft-stop assisted starting
- 2N°, 240VAC, 40-watt, strip florescent overhead lights (if in a pump shed)
- 1N°, 10 amp, 240 VAC, double, General Power Outlet (GPO) to supply the any service tools required.

The contractor shall design and install the new power supply in accordance with the requirements of AS3000 and applicable power authority codes, with respect to allowable voltage drop under the expected Full Load and Start-Up/Inrush currents of the new pumping plant, in conjunction with all other potential concurrent loads. The contractor shall provide a dedicated circuit with appropriate circuit breakers and isolation switch at the power source and a switchboard within the pump shed.

The irrigation controller is to be connected to a single phase 240V (10 amp) supply which is to be designed and certified to the capacity specified by the connected equipment.

All electrical design works are to be carried out by an approved electrical contractor or sub-contractor to perform these works.

The contractor shall install a minimum 50mm dia HDPE orange electrical conduit for electrical wires, buried with a minimum of 600 mm cover.

A copy of a certificate of electrical safety is to be supplied to the Superintendent upon completion.

8.5 LAYING CABLE DUCTS

The cable ducts shall be placed in the bottom of the trench to either side of the water pipes if they run together.

All low voltage cable is to be laid on the opposite side to any 240V power supply cables.

8.6 CONTROL CABLE STANDARDS

8.6.1 Multi-WIRE Wiring

The contractor shall supply and install two (2) types of valve wire for use in the wiring looms:

Valve Active Wires – All wires servicing individual solenoid valves shall be 7/0.50 multi-stranded, high density polyethylene insulated cable (copper conductors), sheathed with PVC in groups. The cables shall be:

- Tyflo code WMWXX705, multicore irrigation cables (x Nº X 7/0.50, 1.5mm^2) polyethylene insulated cores and sheathed with PVC, or approved equivalent. These wires will service the solenoid valves
- the contractor is to allow at least four (4) spare wires within the bundles

Common Return Wires – All common return wires shall be 7/0.67 multi stranded, high density polyethylene insulated cable (copper conductors), sheathed with PVC in groups of two (2) wires. The cable shall be:

- Tyflo code WMW27067, two-core multicore irrigation cable (2Nº X 7/0.67, 2.5mm^2) polyethylene insulated cores and sheathed with PVC, or approved equivalent.

All common return wiring looms shall be looped through every solenoid valve box they pass, whether operating that particular valve or not. Within the common return wiring loom (i.e two-core cable), one core shall be utilised as the common return wire and the remaining core shall be retained as spare common return wire. The common return wires for Looms A & B shall not be joined where they converge where they leave the ring main to be installed in conduit to the controller location. Only one core of each common cable shall be used to wire the solenoid valve. The spares shall be retained intact with no breaks or cuts in the insulation whatsoever. The ends of each common wire shall be sealed with DBR/Y gel-filled caps.

Under no circumstances shall any two common looms be interconnected in the field. All common wires utilized shall be connected at the controller only and the spare active wires shall be terminated on the terminal strip. The spare wires are to be suitably labelled at both ends, marked on the as-constructed plans, shall not be jointed in the field and shall run the entire distance to the controller.

8.6.2 IVM Wiring

The remote solenoid control valves shall be activated using Integrated Valve Module (IVM) technology.

Each solenoid valve shall have its own, dedicated, single station IVM installed in the valve assembly box and wired into the two-wire control cable in accordance with the manufacturer's recommendations.

Solenoid valve wiring shall be a single pair, heavy duty, double insulated cable specifically designed for the purpose of operating valve modules. The cable shall be installed alongside

all mainlines in the washed sand bedding of the trench and in 40mm uPVC Grey conduit with sweep bends and changes in directions and specifically into and out off valve boxes to ensure easy removal and replacement if necessary.

The cable shall have the following features:

- 2.1mm^2, solid core, colour-coded, twisted pair, copper conductors
- High Density Polyethylene cable sheath.

Since both conductors of the cable must be cut and joined to the solenoid wire tails at each solenoid valve, the cable shall be looped between each and every solenoid valve in 40 mm LD (Grey) uPVC conduit. The conduit shall be laid alongside and at the same depth as the mainlines but shall rise into every valve box through slow radius sweep bends. The conduits shall be solvent welded and shall terminate in the valve box no lower than 100mm from the underside of the valve box lid. The gap between the conduit and the cables shall be sealed with a small plug of expanding styrene foam to exclude debris and moisture. The plug should not be too difficult to remove should the cable need to be replaced in the future. The following cable would be acceptable (or approved equivalent):

- Hunter IDWIRE2 (12AWG)
- Rain Bird “MAXI” cable
- Toro Two-Wire Decoder Communication Cable
- Tyflo “MAXI” cable

The contractor shall supply and install surge arresters along each two-wire path,according to manufacturer’s recommendations and they shall be connected to a grounding plate assembly and “earthed” to the grounding plate. The grounding plate shall be mounted on the nearest ground rod of a grounding grid in accordance with the controller manufacturer’s requirements.

Surge arrestors shall be installed at the following points:

- At the start of the two-wire path where it leaves the controller.
- Every 150m along the two-wire path, or every 15 IVM devices if within 150m of the last surge device.
- At the end of every two-wire communication path.

8.7 WIRE JOINTS

Each multicore irrigation cable shall be continuous with no joins wherever possible. Should it be necessary for a cable to be joined to reach the required length, the wire joining procedure described below shall be used.

Note: The use of gel-filled caps to carry out multiple wire connections at a single location will not be acceptable unless all joins are housed in solenoid valve wiring junction boxes. These shall be the same as solenoid valve boxes and shall house the multiple junctions using heat shrink caps. Multiple cable joints in trenches using gel-filled caps shall be housed within rectangular valve boxes. Cable tails shall be long enough to extend to 600 mm (min.) above finished surface level so that the joins can be accessed easily.

8.7.1 Solenoid Valve Wire Joins at Solenoid Valves

All wire connections carried out on the cables shall occur only at solenoid valves in the valve boxes. No joins shall be carried out between valve boxes or at other locations. All cable between valve boxes shall be continuous with no join.

Where joins are carried out (solenoid valve wire tails etc) only the specialised wire joiners and techniques specified by the manufacturer of the two-wire system shall be used. In the case of the Rain Bird two-wire system, the following joiners shall be used:

- Rain Bird WC20 direct-bury wire connectors.

8.7.2 Wire Conduits Entering Irrigation Controller

Any wire conduit installed from the playing surface soil profile to the irrigation controller shall be installed along a clearly defined and recorded route in As-Constructed Irrigation Drawings, at a depth to provide a minimum 400mm cover from finished level as free as possible from the risk of damage from anticipated future ground works. On entering the proposed Irrigation controller cabinet ALL wire conduits must be secured to the internal wall of the pump shed. All conduits shall be solvent welded uPVC or continuous polyethylene where they are installed below ground and under any building floor slabs.

Where installed above ground and exposed to areas accessible to the general public, all conduits shall be galvanized steel, saddled to masonry walls with Dynabolts or cladding with TEC screws or similar.

8.7.3 Identification

Cables shall be identified at each end (i.e. controller and valve box) and at each connection/wire join box using a 40 x 40 x 2 mm laser cut plastic identification tag (with type size 10mm) attached by a zip tie.

8.8 SPECIFIC SYSTEM COMPONENT REQUIREMENTS

8.8.1 Sprinklers and Swing Joint Risers

Turf areas shall be irrigated by fixed spray pop-up, stream rotors and single jet rotor sprinklers.

Sprinkler positions and types should be selected such that they minimise overspray onto paths, roads and structures at all times, and deliver uniform coverage across the field, as per the uniformity and performance requirements detailed in Section 1.4.

The statistical analysis used to confirm the performance requirements shall be carried out using only the Centre for Irrigation Technology (CIT), SPACE for Windows software, as supplied by the California Agricultural Technology Institute, California State University, Fresno, USA. The uniformity software shall be configured for analysis in the 5% Critical Window and the Uniformity Criteria (DU, CU & SC) shall be calculated for the proposed geometric layout.

The sprinklers shall conform to the following

- Shall be of the gear-driven, rotary type.
- Be no less than eight (8) nozzles discharging 27.5 to 120.7 l/min with anti-drain valve and stainless-steel riser, e.g. Rain Bird 8005-SS, Toro T7PSS or Hunter I-25SS series sprinklers or approved equivalent.
- Shall be full-circle and adjustable part-circle operation in a single unit.

- Shall be adjustable from 50° to 360° in 1º increments.
- Adjustable in all phases of installation (i.e., before installation, after installation while static, and after installation while in operation).
- Shall be equipped with a self-adjusting stator to ensure constant rotation speed regardless of nozzle installed.
- Shall have a non-strippable drive mechanism that allows the nozzle turret to be turned during operation, without damage. It shall also have an automatic arc return feature that returns the nozzle turret to its proper orientation if it is turned outside its intended arc of coverage.
- Shall be equipped with a drain check valve capable of holding back up to 3.0m of elevation change to prevent low head drainage.
- The sprinkler shall have a minimum of 12.5 cm pop-up stroke to bring the rotating nozzle turret into a clean environment.
- Shall have a rubber cover firmly attached to the top of the riser. When specified, the sprinkler shall have a cover moulded of purple Aldrin rubber to indicate the use of reclaimed water.
- The body cap shall be co-moulded with ABS plastic and black rubber and provide a protective rubber boot around the body cap when the sprinkler is in the retracted position.
- Shall have an exposed surface diameter after installation of no more than 5cm.
- Shall have a BSP or ACME thread on the inlet.
- Shall be serviceable after installation by unscrewing the body cap, removing the riser assembly, and extracting the inlet filter screen.
- The body of the sprinkler shall be constructed of corrosion resistant, impact resistant, heavy-duty ABS plastic. It shall have a stainless-steel spring for positive retraction of the riser when irrigation is complete.
- When specified, the riser and nozzle turret assembly shall be encased in stainless steel.
- Shall have a pre-fabricated/manufactured swing joint riser.

Installation

- Digging to install sprinkler heads is to be done manually with a shovel e.g. no excavator.
- The (imported) topsoil is to be clearly separated from the subsoil material and placed onto boards or plastic sheets when sprinkler heads are being installed and re-set. The Principal Contractor is to make sure this occurs. If this does not occur, The Principal, Superintendent or the Principal's Representative may instruct the Principal Contractor to remove the contaminated soil, replace and consolidate the topsoil surrounding each sprinkler head with the specified growing medium. This will be at the Principal Contractor's expense.
- Sprinklers shall be installed perfectly vertical. This is to be maintained until handover. A 'Rainbird Rotor Hold-Up Tool with Bubble Level' is to be used during installation and throughout the sports turf consolidation period to check and maintain conformance.
- Backfilling around and under sprinkler heads and swing joints is to be undertaken using the project specified imported topsoil, or in an existing field, washed sand to a minimum radius of 200mm around the sprinkler head. The material is to be adequately compacted to prevent subsidence. On an existing field, the exiting top 40mm of turf and soil can be replanted.

- The top of each sprinkler is required to be set at 15 mm to 25 mm below the turfgrass, using a 1 metre straight edge, at the end of the turf consolidation period when the turfgrass is mown at the height specified.

  The Principal Contractor is to check the installation height of all sprinklers 4 weeks after installation. The heights are to be clearly recorded on an As-Constructed irrigation plan and submitted within the Weekly Project Reporting for that period.

  Routine checks are then to be undertaken by the Principal Contractor during the sports turf consolidation period. Rectification works will be required until the latter specification is met.
- A blue irrigation flag is to be installed next to each sprinkler head to ensure the integrity of the sprinkler heads during ground preparation works and turfing. The flags can be removed after all turfing is complete.
- When line planting is being undertaken, a turf slab (400mm x 1200mm) of the specified turfgrass shall be installed around each sprinkler head. The turfgrass above the sprinkler head is to be neatly cut, not torn, to allow the sprinkler to rise through the turfgrass with no obstruction.
- See Detail in Appendix 1.

8.8.2 Quick Coupling Valves

Quick coupling valves (QCVs) shall be installed around the field perimeter and connected to the pipe network by means of a three-elbow double O-ring PVC swing-joint assembly, anchored to prevent rotation of the valves when removing the key.

A single QCV shall include the following

- PCV QCV's are not to be used.
- Be made of brass capable of a maximum operating pressure 8.6 bar.
- One-piece 25mm brass or stainless-steel quick-coupling valves with locking thermoplastic cover. The cover shall be yellow or blue where a potable water source supplies the system and lilac for non-potable water sources.
- Be installed with a nickel-plated brass (stainless-steel handle) or poly (e.g. Philmac) 25mm ball valve directly below the QCV to allow isolation for maintenance. PVC ball valves will not be accepted.
- Have a locking cover key for the 25mm locking valve.
- Include a threaded brass key for the quick-coupling valve. This will typically come in two parts. Plastic valve keys are unacceptable.
- Include a 25mm swivel hose elbow for connection to the threaded brass body key.
- The necessary connections to be able to run an irrigation hose or sumi soaker.
- All items listed above are to remain on site at the completion of the project/installation. Each locking cover key and QCV brass key is to be provided to the Superintendent or the Club at handover. They are not to be left inside the QCV valve box(es).

Each QCV shall be housed in the following

- Dura 175mm round (code 1017RND or VB7RND) plastic valve box (Top 175mm dia. x height 229mm x Bottom 235mm dia.), or approved equivalent.
- To include a stabilizer bracket and stainless u-bolt. The stabilizer bracket is to be installed into (the bar is to protrude through) the plastic valve box. A section of PVC pipe is not to sit or be installed inside the valve box to hold or support the stabilizer bracket.

- 111mm x 111mm section of recycled plastic post (Plasmar or approved equivalent) perimeter frame is to be installed to suit bearing flanges of the valve box.
- Bidim A14 geotextile fabric and drainage gravel are to be installed.
- See Detail in Appendix 1.

8.8.3 Solenoid Control Valves

All remote solenoid control valves shall conform to the following minimum requirements.

Body	High grade PVC or glass filled nylon
Configuration	Globe/angle with forward flow design (normally closed)
Bonnet Fasteners	Stainless-steel captive bolts or threaded brass inserts
Pressure Rating	1380 kPa (minimum)
Solenoid Coil	24VAC (with captive plunger and spring) with maximum 0.48 amp in-rush and 0.30 amp holding currents
Diaphragm	Heavy duty
Flow control	Flow control stem (with ability to retrofit operational pressure regulating module)
Manual Bleed	Internal and external
Pressure-Regulation	Manufacturer's recommended integral adjustable regulation module to be fitted to valve (where required by specification)
Servicing	Inline
Warranty	Three (3) year (min.)

The following solenoid valve will provide the above requirements (or approved equivalent):

- Rain Bird PEB (for potable water) or PESB-R (for non-potable water).
- Rain Bird PRS-D pressure regulators to be fitted where called for in the project specification.

Each sprinkler branch shall be operated by a single, solenoid valve assembly comprising the following:

- 24V AC, two-way solenoid control valve with flow control stem
- Nickel-plated brass with stainless steel lever handle or Poly (Philmac, or approved equivalent), isolating ball valve (pressure rating at least 1200 kPa), installed upstream of the solenoid valve and connected by a threaded nipple (connective fittings to be Polypropylene or glass fibre-reinforced nylon, not PVC). PVC ball valves shall not be accepted.

Install only one (1) automatic valve assembly, located centrally, per valve box. Identify each valve with its controller-station number on a 40 x 40 x 2 mm laser cut plastic identification tag (with type size 10mm) attached by a zip tie to the active control wire on automatic valves.

See detail in Appendix 1.

8.8.4 Valve Boxes

Valve boxes are to be installed facing the same direction e.g. the locking bolt kit end is closer towards the field of play and the valve box identification tag (attached to the top of the valve box lid), at the opposite end of the valve box lid, is closer towards the surrounds.

Each solenoid/gate valve assembly, unless otherwise indicated, shall be housed in a heavy-duty reinforced rectangular plastic valve box in the arrangement as specified within the drawings. Only one (1) solenoid/gate valve assembly shall be installed per valve box. The valve boxes for solenoid valve assemblies shall be:

- Carson 591-VB1419 Rectangular Series valve box (430 mm x 300 mm x 300 mm), or approved equivalent.

The contractor shall install all rectangular valve boxes and solenoid valve assemblies in the arrangement indicated on the drawing. All rectangular valve boxes shall be supported by two (2) layers of 111 mm x 111 mm recycled plastic post (Plasmar or approved equivalent) frame. The perimeter frame layers shall be screwed together, using galvanized screws, to prevent the frame from dislodging during construction.

The ends of the void below the base of the valve box assembly shall be sealed from the ingress of soil with blanks of 6mm mineral cement sheet installed on the exterior of the box. The contractor shall then install a Bidim A14 geotextile fabric around the entire valve box assembly, to 100 mm below the top of the valve box, to prevent the ingress of soil into the valve box cavity. The contractor shall compact a base of 12 mm aggregate beneath the plastic frame prior to the positioning of the frame. All valve wiring shall be protected from chaffing by the aggregate and crimping by valve box materials with flexible conduit. The valve box shall not be fastened to the recycled plastic post support frame.

All valve boxes (excluding QCV's) are to be lockable with a three (3) piece locking bolt kit fitted. This includes a hex bolt (capable of being fastened using a 14 mm socket), washer and threaded clip. These are to be installed by the Principal Contractor prior to handover. Any valve box lids or boxes that are damaged and can't be securely locked, are to replaced at no cost to The Principal.

Valve box extensions, compatible with the valve box used, may be required.

Valve box lids are to be installed so they are level with the surrounding turfgrass, using a 1 metre straight edge, at the end of the turf consolidation period when the turfgrass is mown at the specified height. A maximum -20 mm variation will be tolerated. Backfill around valve boxes shall be washed sand, with a 100mm topsoil layer to final lid level. The sand and topsoil around the valve boxes must also be well consolidated to prevent subsidence.

The Principal Contractor is to check the installation height of all valve boxes 4 weeks after installation. The heights are to be clearly recorded on an As-Constructed irrigation plan and submitted within the Weekly Project Reporting for that period.

Routine checks are then to be undertaken by the Principal Contractor during the sports turf consolidation period. Rectification works will be required until the latter specification is met. The Responsibility will fall upon the Principal Contractor. Disturbed turfgrass will need to be maintained (watered) by the Principal Contractor until the turfgrass has established.

White survey pegs with blue survey/flagging tape are to be installed next to each valve box after installation and left in situ until all turfing has been completed.

Each valve box lid is to be labelled using an engraved plastic label. They must:

- be either (i) green in colour with white text; (ii) black in colour with white text, or if non-potable water is used, the labels must be (iii) purple in colour with white text.
- Label sizes are to be 80 mm x 30 mm x 1.6 mm.

- The label edging is to be bevelled/rounded off so it is not sharp.
- Each engraved plastic label is to have two pre-drilled holes to fix self-drilling screws.
- Identification of the contents of the valve box, which is to match the As-Constructed irrigation drawings, must also include the following identification:
  - Water Meter: WM
  - Flow Meter: FM
  - Solenoid Valve: SV-xx (xx = number of valve in controller)
  - Quick Coupling Valve: QCV
  - Isolating Gate Valve: IV
  - Hydrometer: HYD
  - Air Valve: AV
  - Master Valve: MV
  - Wiring Joints: WJ
  - Drain Valve DV
- Each label is to be attached to the top outside of the valve box lid using two self-drilling screws; and
- The labels are to be installed when the valve boxes are refurbished or installed.

Synthetic Turf Cover

When synthetic turf is requested or specified to be attached to a single, multiple, or all valve box lids, the following shall be provided:

- include a 10 mm shockpad material (unless another thickness is specifically specified);
- the synthetic turf is to be “green” in colour;
- be high-density and durable under the anticipated use and environment;
- be non-directional;
- be short-pile (i.e. 25mm +5mm/-0mm); and
- the installation height of each valve box shall be that the top of the synthetic turf pile is at the specified mowing height.

8.8.5 Valve Box Refurbishment

Where existing valve boxes are to be refurbished and retained, the following steps shall be taken:

- The existing valve box shall be dug out and removed and checked for structural integrity. If lid or box replacement is necessary, photos of the defects are to be taken and provided to the Superintendent and the faulty part retained for possible inspection.
- The area around the valve assembly shall be cleared of dirt and vermin.
- Drainage material and geofabric as outlined in Section 8.8.4 is to be installed in the base of the box.
- If existing valve box supports are in good condition, these may be retained. If not, then they shall be replaced as per Section 8.8.4.

- The valve box shall be reinstalled level and at grade. If the existing valve box lid identification tags need updating they shall be installed as per Section 8.8.4.
- Any damaged valve boxes or valve box lids are to be replaced.

8.8.6 Pump-Irrigation Pressure Boosting

VFD (variable-frequency drive) models shall be used to provide the irrigation system with constant pressure across varying flow demands, along with soft start-soft stop functionality.

VFD continuously controls the motor speed, which makes it possible to set the pump station to operate at any duty point within the pump's capabilities and adjust the performance to a given requirement.

VFD models have no current peak at start-up.

Isolating butterfly valves shall be installed (sized to suit the suction and discharge pipework). For maintenance purposes a 25 mm BSP threaded priming port and 25 mm tested ball valve shall be installed on the suction line to allow priming of the suction line.

A pressure gauge is to be fitted to the pump discharge manifold.

VFD Series

- The VFD unit shall be mounted on the pump with motors up to 7.5 kW and delivered with five (5) m of cable for wall mounting with larger motors.
- Welded steel enclosure, size depending on pump, IP54.
- Speed regulation by 4-20mA signal from pressure transmitter.
- Pressure transmitter in stainless steel.
- Built-in overload protection.
- Operator's panel for adjustment of settings (desired pressure, operating margins, time delay etc.).
- Pressure shown in operator's panel.
- Build in PTC resistor in motor protects the motor from overheating caused by overload or low voltage.
- Pressure tank and pressure switch to be included.
- A no-flow protection device (e.g. Kelco flow switch) shall be fitted to the discharge manifold.

A laminated chart displaying pump model details, serial numbers, installation date and scheduled service dates for the first 5 years of operation shall be mounted inside the pump shed in a clearly visible location.

8.8.7 Isolating Valves, Air Valves and Drain Valves

8.8.7.1 Isolating Valves

Zone isolating valves shall be installed where necessary to provide adequate isolation of various parts of the irrigation system. They shall be selected according to the following criteria.

Where required, and upstream of all solenoid valves, or where specified herein, the contractor shall supply and install high quality, tested isolating gate or ball valves to enable valves or sections of pipework to be isolated. These valves shall be conforming to AS 1628 and shall be equivalent to:

- 50 mm nominal bore and smaller.

Zone isolating gate valves up to 50 mm nominal bore shall be DR-rated bronze, nickel-plated brass (with stainless steel handle) or Poly (Nylon/ABS – e.g. Philmac). Size as indicated on the drawing or the same as the solenoid valve. PVC ball valves shall not be accepted.

- greater than 50 mm.

Zone isolating gate valves greater than 50 mm nominal bore shall be John Fig 59M bronze gate valve fitted with a solid cast iron hand wheel (John handle code 00A) or brass T-bar handle and sized as indicated on the drawing. The contractor shall note that the quality and weight of the cast iron hand wheel or brass T-bar is important. Lightweight, “cage” style metal handles, designed for above ground applications, will not be acceptable.

All isolating gate valves shall be installed in a reinforced plastic valve boxes as detailed in Section 8.8.4.

8.8.7.2 Air Valves

Where required at isolated high points and end-of-line in the mainline, the contractor shall supply and install air valves to exhaust accumulated air in the irrigation mains and hydraulic control pipes. The air valves shall be connected to the mainline by way of a manufactured riser of the same size bore as the air valve. Air valves shall be the large orifice, combination air/vacuum relief rated to a minimum working pressure of 12bar.

For mainline pipe sizes up to and including 90mm O.D., 1” (25mm) air valves shall be used. For pipe sizes above 90mm, 2” (50mm) air valves shall be used.

Air valves shall be housed in a 250mm round valve box (VB10RND or approved equivalent), installed as per specification in Section 8.8.4.

8.8.7.3 Drain Valves

The contractor shall install drain valves, housed within a valve box, and arranged to free discharge to the drainage system for the purpose of draining the system for maintenance purposes. The drain valves shall be of equivalent type to the isolating valves in Section 8.8.7.1.

All drain valves shall be installed in a reinforced plastic valve boxes as detailed in Section 8.8.4.

8.8.8 Valve identification

All valves shall have a 40 x 40 x 2 mm laser cut plastic identification tag (with type size 10mm) attached by a zip tie to the active control wire on automatic valves. The tag shall be white with black font. This identification is separate to the valve box identification requirement.

Valve identification tags shall be installed according to the following:

- Water Meter: WM
- Flow Meter: FM
- Solenoid Valve: SV-xx (xx = number of valve in controller)
- Quick Coupling Valve: QCV
- Isolating Gate Valve: IV
- Hydrometer: HYD
- Air Valve: AV
- Master Valve: MV
- Wiring Joints: WJ
- Drain Valve DV

All tagged valves shall correspond with the stations setup in the controller and be identified on the As-Constructed irrigation plans.

8.9 WATER SUPPLY AND TANK INSTALLATION

8.9.1 Water Isolation

Where isolation of water services to any properties is required, notification of no less than 10 business days is required. The Principal Contractor is to advise of date, duration of impact and properties affected. The Principal Contractor is to seek approval in writing from the Superintendent before proceeding.

8.9.2 Water Connection to Main

All potable water connections must have a water meter, suitable backflow prevention device and any other equipment to meet the requirements of the water supply authority. Connection and supply of material and labour shall be part of the nominated works.

The Contractor shall obtain all necessary approvals in writing from the water supply authority for the installation, inspection and registration of the backflow prevention device. The Contractor shall ensure the device is installed in accordance with the requirements of AS 3500 and any other requirements of the water supply authority.

The pipe size from the town water supply to the irrigation system shall be nominated by the Superintendent but will generally need to meet the minimum delivery at the sprinkler.

8.9.3 Self Cleaning Filter and Filtration

If not connecting to potable water, filtration shall be installed on all irrigation projects at the installation intake.

Each system to contain a 500 micron filtration that will protect the entire installation without generating a high maintenance level.

Each system requires a self-cleaning screen filter which utilises system pressure to clean itself.

The filter shall be a rigid cylinder screen that strains particles from a water source, trapping debris on the inside.

Self-cleaning screen filters are used in a variety of applications where continuous water flow is crucial, including industrial equipment protection and irrigation nozzle protection.

Sufficient space must be left around the filter to allow for screen removal and insertion for servicing.

8.9.4 Irrigation Compound

Where a tank is or tanks are required for above-ground water storage, it or they should be sized appropriately based on the area being irrigated, future field expansion, water source(s), the tank filling rate and the number of irrigation cycles required etc.

The tank shall only be sited following approval of plans and **by the Superintendent.**

- The tank compound shall have adequate tree clearance (tree protection zone) and shall be positioned so there are no small, narrow or triangle shaped turfed areas surrounding the compound which would require hand mowing.
- A minimum 3.5m clearance is to be provided between the irrigation tank compound fencing and adjacent infrastructure. This is to provide a clear mowing passage.
- A minimum 2m clearance is to be provided around each tank and between the tank-fencing.
- The base of the irrigation compound shall be either (i) retained or (ii) have a concrete slab. This is to be confirmed in the site specific specifications or by the Superintendent. Requirements for the two options include:
    - <u>Retained:</u>
        - The tank and pump shed compound shall have a retaining wall around entire perimeter to retain the sand base. As a minimum, this is to include treated H4 200mm x 50 mm sleepers with vertical galvanised steel post supports at the corners (corner posts) and joins (H joiners) (star pickets, timber stakes and/or treated H4 timber posts are unacceptable).
        - The subsoil base under the irrigation compound pad must be compacted to a minimum of 50kPa before the sand base is installed.
        - The water tank shall be installed on a level base, not less than 150 mm thick. The material used for the base will be free-draining clean sand, level over the entire area (max variation permitted +/- 10mm), free of any sharp objects and stones.
        - Adequate drainage must be installed to divert water run-off away from the tank. The tank overflow pipe shall be routed to the nearest culvert, drain, or a sump installed if no drain is available. The pipe is not just to be directed to exit on the irrigation compound floor or adjacent grass. If the overflow pipe is to be directed into an open culvert or drain, a frog flap valve is to be fitted using Type N Blue Cement Solvent and at least two (2) Pan Head Self-Drilling Screws.

        - Following tank installation, a 75mm thick by 400mm wide layer of blue metal or crushed rock (20mm size) is to be placed around the base of the tank to prevent erosion.

    - Concrete:

        - Tank/s are to be installed in the preferential order (i) as per the Engineer's specifications and drawings; (ii) as per manufacturer's specification; or (iii) on a concrete slab min 100mm thick, with the concrete slab to have to a have min. 72 mesh reinforcing throughout.

- The complete tank and pump station/shed area (the irrigation compound) is to be fenced.
- Install 2.4m high black powder coated posts fitted with end caps; end, gate and corner posts are to be 65mm OD and inter posts are to be 50mm OD at approx. 3m centres. Black 2.5 mm PVC-coated steel chain wire fence to be 1.8m high and is to be attached to 50mm OD top and bottom rails which are to be installed around the perimeter of the compound. Three (3) strands of black HD barbed wire are also to be installed around the exterior of the tank compound. The barbed wire is to be attached using black powder coated u-clips attached using black hex self-drilling screws. The barbed wire is not to be wrapped around the posts.
- The compound shall have a lockable double gate of 3m width installed with a welded 200 mm long black powder coated chain link fitted on the outside of one gate. A BCC TP1 padlock is to be supplied by the Superintendent. The access gate is to be positioned so that it doesn't need to be relocated should the compound's footprint be extended at a later date to install additional tanks. Each gate panel shall have a black powder coated drop down bolt welded on the inside of the fence. Also to be installed, are two zinc plated tubular receivers:

    - which is to be pre-drilled and fitted into the concrete irrigation base/slab; or
    - (where a concrete slab/base is not installed) into a singular cement footing within the ground. The footing is to be a minimum 100mm diameter and 300mm deep. The footing and receivers are to be at the same height, flush with the top of the timber or concrete retaining.

- A dual padlock system is to purchased from Gibson Engineering (http://www.gibsonengineering.com.au/) or an approved equivalent supplier. The system is to be able to attach two padlocks on a u-bolt to the irrigation compound gate chain. This includes the TP1 key specified above, and a padlock is also to be supplied by the Club.
- To supply and install 2 x aluminium (non-painted) tree tags attached using 2 mm gal wire per 3 m top wire span for bird deterrence.
- All posts, rails and fittings are to be powder coated black.
- The irrigation contractor is to allow for the preparation, installation and establishment of a 2-metre wide strip of turfgrass to be installed around the perimeter of the compound once all irrigation components have been installed. Unless specified by the Superintendent, the turfgrass variety is to be 'Wintergreen'.

8.9.5 Irrigation Tanks

The irrigation tank/s shall meet the following specifications:

- Heritage Tanks model CT25, with a nominal capacity of 110kL, measuring 7.84m diameter and 2.27m height; or Pioneer Water Tanks model GT110, with a nominal capacity of 110,166L, measuring 8.02m diameter and 2.18m height; or similar (unless otherwise specified)
- Zincalume/Colorbond steel construction with corrugated walls.
- 100% BPA-free reinforced liner manufactured to AS4020:2005.
- Tank gutter system to collect rainwater from the tank roof.
- External tank level indicator.
- A heavy-duty waterproof label positioned on the irrigation tank near the inlet pipe(s) is to identify the inlet water supply type(s) e.g. potable, non-potable and pipe diameter (mm).
- 100mm overflow with pipes.
- Stainless steel leaf strainer basket.
- Each tank to have a lockable access hatch (Min load rating of 5 MPa) and secured ladder. A BCC TP1 padlock to be installed on each tank immediately after tank delivery to site for safety reasons. The Contractor is to organise this in advance with the Superintendent.
- Outlet with metal ball valve sized to match pump suction line (minimum 80mm).
- The tank colour shall be supplied and installed in Mangrove Green or Cottage Green unless otherwise specified by the Superintendent.
- At all times the manufacturers recommendations shall be followed with regard to the tank installation.
- The tank shall have a ball float installed within the tank connected via a six (6) mm hydraulic tube to a 40 mm hydraulic level control valve located underground within a Carson 1320-B valve box.
- An identification plate is to be installed on each tank, facing an open side. The tanks serial number and manufacturing date is to be engraved.

8.9.6 Pump Shed

The pump shed shall be sized appropriately to suit the pump station and associated equipment and shall feature the following:

- Minimum dimensions 1800mm wide x 1200mm deep x 1600/1650mm high (sloped roof).
- 40mm x 40mm x 3mm thick welded alloy frame.
- Checker plate alloy folded infill panels (2mm thickness), riveted to frame.
- Double doors on front (opening to 1200mm), with internal latch bolts at top and bottom and external keyed lock matching standard CH501 lock. Each door to have external

hook-and-eye latch mechanism fitted to enable it to be secured in the fully-open position when accessed.

- 32MPa reinforced concrete slab as base, with pad 50mm wider than pump shed footprint.
- Shed secured to base with M12 x 75mm dynabolts mounted to internal walls of shed.
- Twin louvred vents on each end of the pump shed for ventilation.
- Hinged lifting handles at each end of pump shed to allow removal for maintenance.
- Separate access conduits installed through concrete base pad for power cables, irrigation manifold pipes, control and sensor cables. One spare conduit ND 50mm to be installed with draw wire.
- An alloy checker plate (3 mm thick) document holder is to be mounted on the inside the pump shed for system plans, maintenance manuals, etc.
- Irrigation control cabinet to be mounted to south-facing external wall of pump shed.

During the construction and consolidation period, information signage detailing the contractor's contact details are to be listed in event of a major irrigation fault (e.g. blow-out).

All equipment inside the pump shed is to be labelled using heavy duty waterproof labels, white with black font.

8.9.7 Flow Sensor

- The flow sensor shall be an in-line type with a nonmagnetic, spinning impeller (paddle wheel) as the only moving part.
- The electronics housing shall be glass-filled PPS.
- The impeller shall be glass-filled nylon or Tefzel with a UHMWPE or Tefzel sleeve bearing.
- The shaft material shall be tungsten carbide.
- The electronics housing shall have two, ethylene propylene O-rings and shall be easily removed from the meter body.
- The sensor electronics will be potted in an epoxy compound designed for prolonged immersion.
- Electrical connections shall be two (2) single conductor 18 AWG leads 48 inches (1.2 meters) long.
- Duration shall be direct burial "UF" type coloured red for the positive lead and black for the negative lead.
- The sensor shall operate in line pressures up to 400 psi (27.5 bars) and liquid temperatures up to 220° F (105°C) and operate in flows of 1/2 foot (0.15 meters) per second to 15 feet (4.5 meters) per second with linearity of ±1% and repeatability of ±1%.

8.9.8 Rain Sensor / Weather Station

- Each project shall include at minimum a wireless rain sensor. Where specified, an industrial grade Weather Station shall be installed.

- The rain sensors shall be wireless and be capable of temporarily suspending watering by the irrigation controller.
- The Weather Station shall be capable of turning the system off when the area has rainfall.
- The rain sensor is to be installed on a raised pole to avoid interference from trees and buildings.

8.9.9 Flow Meter and Master Valve

- Each project is to accommodate a flow meter and master valve at each point of connection.
- This meter and valve shall be connected as close as possible to the point of connection to the primary water supply of the irrigation system (i.e. just downstream of the water meter (mains water supply) or pump connection) at each site.
- This meter and valve shall be capable of providing flow rate information to each field controller and relaying this information to the irrigation controller to provide flow information of each valve as it waters.
- This flow sensor (see Section 8.9.7) will be capable of sending a signal to the irrigation controller which will then in turn close the master valve.

8.9.10 Controller

- Controller required shall be compatible with Council's central control water monitoring system (currently Rain Bird IQ platform).
- Current models to be used are Rain Bird ESP-LXIVM Pro (two-wire systems) and Rain Bird ESP-LXME2 Pro (multi-wire systems).
- Data Communications Capabilities.
- GPRS Cellular Modem: The communication cartridge shall be installed and interfaced with Council's central software.
- The controller cabinet is to be locked with a BCC TP1 padlock is to be supplied by the Superintendent.

8.9.11 Function Specification – Software Required

The system shall conform with the following.

- Be compatible with series two (2)-wire path controllers with one (1) to 240 station capacity, or be compatible with a multi core cable path.
- The system shall have an adjustable satellite controller capacity allowing the customer to expand the system capacity over time.
- The system shall allow log-on passwords to administer access privileges to multiple users of the system and give administrator and users internet cloud access.
- The system shall also support user defined date/time, number, and unit formats.
- The system shall incorporate program adjust values for each satellite controller program.

- The system shall also include a site-level daily or monthly seasonal adjust percentage that adjusts the station run times for all satellite controllers in the site.
- The system shall have an adjustable satellite controller capacity allowing Council to expand the system capacity over time.
- The software shall be capable of manually starting a program, test program, or station on any satellite controller.
- Irrigation controller shall have a learn flow utility to measure the nominal flow rate of each station.
- The learn flow rate shall be compared to the actual flow sensor flow rate each time the station operates.
- A manual master valve water window shall be provided to automatically open the master valve and account for manual watering flow rates without turning off the flow sensing functions of the satellite controller.
- Both normally closed and open master valves shall be supported.
- All flow sensing features shall be programmable through the software.
- The system shall offer user definable station-level priorities and a program-level water window.
- If a program cannot complete the run time of all stations in the water window, the station operation shall be paused and resumed at the start of the next water window.
- The system shall offer optional software feature pack to expand the features of the system. Feature packs shall include: advanced communications; advanced programming; advanced evaporation transpiration; advanced flow sensing.
- A system equipped with the advanced programming feature pack shall provide satellite controller PIN-code lock-out and 2-way programming. Each satellite shall have minimum of five (5) assigned PIN-codes. Lockout options shall include full or partial lockout. All PIN-codes shall be programmed through the software.
- The system shall not be limited to the control of irrigation only, but shall also be capable of controlling other functions such as lighting, security systems, valves, fountains, etc. In addition, control-type instruments for the monitoring of such things as pressure, flow, moisture, wind speed, pumps, etc., shall be able to be integrated into the system.
- The system shall include a Flo-Watch™ feature to automatically locate excessive flow in the irrigation system and monitor for low or no flow and respond with a user- defined action. The system operator shall have the ability to set a flow rate for each station in the system and a percentage over and under that IQ shall watch. If the system flow is higher or lower than the flow programmed, the system shall respond as directed.
- The system shall include a Flo-Manager™ feature to automatically optimize the flow demand on the water source(s). The system operator shall have the ability to set a maximum litres/minute flow rate for a water source(s). The field controller shall be capable of interfacing the litres/minute database, automatically selecting from the active schedule(s) which stations to operate that will match as closely as possible the output of the system's water source.

- The system shall enable Cycle+Soak™, which, when populated with appropriate data, will automatically readjust the total station run time into smaller increments (maximum station cycle times) to prevent puddling and runoff. If more than one cycle is required to achieve the total run time, a minimum soak time is automatically inserted between cycles.

8.9.12 Field Devices (where used)

Mounting: In valve box. Model numbers as follows:

- LXIVMSOL For use with Rain Bird solenoid valves
- LXIVM-OUT For use with other branded valves (DC latching solenoids)
- LXIVM-SEN For use with weather or flow sensors
- LXIVM-SD Surge Device
- FD-101TURF For use with legacy ESP-LXD controllers

8.9.13 Surge Protection

- Surge Protection: Surge protection required at the controller, end of the two-wire path and every 150m (or 15 devices) along the two-wire path, using the LXIVM-SD Line Surge Protector.
- Each surge protection device must be connected to a suitable earth connection (ground rod or plate) to achieve a resistance to ground of 10 ohms or less.

8.9.14 Water Meter

To install an independent water meter inside a lockable valve box near the irrigation connection point (as per the requirements of the flow sensor in Section 8.9.9). The water meter shall be either a single-jet, multi-jet or turbine-type water meter with pattern approval under AS4747 to meet the requirements of NMI-M10.

The meter shall feature a standard register display for manual reading of accumulation, allowing the Club and Council to monitor irrigation water usage both during redevelopment/construction/project works and as a sustainable maintenance tool moving forward. Installation shall meet the manufacturer's required specifications to ensure accuracy.

The rate for the water meter in the BOQ/Agreed Pricing shall include supply and installation, including provision of the lockable valve box, valve box identification plate and all required fittings.

9 FILLING AND TESTING THE PIPEWORKS SYSTEM

9.1 FILLING AND EMPTYING PIPES

The entire network shall be flushed with pressurized clear water prior to attaching the sprinklers. The client shall make available a water supply of the required capacity at the time requested by the installer for this purpose.

9.2 PRESSURE TEST

When the thrust blocks are in place, trenches partially backfilled and as soon as mainlines are connected and flushed out and valves are installed, outlets shall be closed, and the piping systems shall be tested in accordance with the following procedures.

9.2.1 Copper Mainlines, Isolating Gate Valves and Pressure Reducing Valves

All copper piping shall be tested hydrostatically to a pressure of not less than 1400kPa, or to twice the normal working pressure (whichever is greater). The testing pressure shall be maintained for a period of not less than two hours. All items of equipment which are not designed for pressures of this magnitude shall be blanked off while the testing is in progress. Tested pipework may be blanked off from the remainder of the system during testing.

9.2.2 PE100 Mainlines, Sprinkler Risers, Irrigation Control Assembly

Open all gate valves and hydrostatically test the mainline to a pressure of 1200kPa. The test pressure shall be maintained for the period detailed in AS/NZS 2566.2:2002 for flexible pipelines. The contractor shall provide a pump and pressure test rig to elevate the pipe pressure above the mains pressure available so that the test can be conducted at 1200kPa.

All leaks or defects indicated by tests shall be rectified by replacing with new material, and the test repeated until all defects are removed.

All mainlines, fittings and valves with the exception of solenoid valves, but including the isolating gate valves upstream of solenoid valves, shall be subjected to pressure tests both during and on completion of the installation in accordance with AS/NZS 2566.2:2002: "Buried Flexible Pipelines - Installation - Part 2", Section 6: "Field Testing" and Appendix M: "Field Hydrostatic Testing for Pressure Pipelines". Should any section of mainline pipe not satisfy the requirements of the test, the cause of the leak shall be located and rectified until the section of pipe conforms to the Australian Standard requirements.

When the thrust blocks are in place, trenches backfilled and as soon as individual sections of the mainline are connected and flushed out and valves are installed, the sections of mainline pipework shall be hydrostatically tested to a pressure of not less than 1200kPa. The full length of any new mainline pipework shall be subjected to a hydrostatic pressure test in sections under the supervision of the Superintendent. The Contractor shall not wait until all mainlines have been installed before pressure testing. Sections of mainline that have been completed shall be pressure tested as soon as possible to detect problems before subsequent works proceed.

9.2.3 Procedures to Account for Pipe Expansion

Pressure testing shall be carried out in accordance with Australian and New Zealand Standard AS/NZS 2566.2:2002 – "Buried Flexible Pipelines: Part 2 – Installation", Section 6 "Field Testing", and Appendix M "Field Hydrostatic Testing for Pressure Pipelines". The contractor will be expected to have a copy of the Standard prior to the test and to have appreciated what is required. The test procedure and allowable volume of make-up water for uPVC and PE mainlines are different for the two types of pipe, under the requirements of the Standard:

uPVC Pipelines: Refer Clause 6.3.4.1 Constant pressure (water loss) method and Appendix M, Paragraph M4. Minimum test period – one (1) hour.

PE Pipelines: Refer Clause 6.3.4.2 Constant pressure (water loss) method for visco-elastic pressure pipelines and Appendix M, Paragraph M5. Minimum test period – five (5) hours.

Prior to testing, mainlines shall be slowly filled with water. Under no circumstances shall mainlines be permitted to be fully pressurised by the site domestic supply before all pressure testing has been successfully carried out and approved. The full cost of labour, materials and portable pumps (i.e. mobile, generator driven, centrifugal multi-stage pump and small tank) for the pressure testing shall be borne by the contractor. A typical test rig is detailed schematically in Figure M2 in Appendix M of AS/NZS 2566.2:2002, page 72.

The test rig provided by the contractor must have an accurate means for measuring the volume of make-up water pumped into the test section, so that pipe expansion and air absorption can be accounted for. This can be achieved by measuring the volume of water added to a tank with each re-pressurisation to return the total volume to the same tank level each time. The test shall be performed with the solenoid valve or valve-under-head isolating gate/ball valves firmly closed.

Once each section of pipework and fittings to be tested has been installed, the contractor shall fill the test section of pipework with water and pressure test to confirm the absence of leaks. The pressure test shall be carried out at 1200kPa for not less than that stated in AS/NZS 2566.2:2002. Any leaks shall be rectified, and the test repeated until all pipework is fully sealed. Any make-up water at the end of the test shall be accounted for only as pipe expansion.

All equipment shall be tested and adjusted as it is installed where required to ensure proper operation.

9.3 SYSTEM TESTS

Upon completion of the irrigation system and after sufficient time has been allowed for all junctions to achieve full strength, the entire system shall be tested. All air shall be bled from the system: wiring, valves, sprinklers etc., and all components shall be checked for proper operation.

Before carrying out final adjustments ensure that all valves on all stations of the central control system are functioning and that all valves have been entered correctly in the Controller Programs and Schedules. Ensure that valve times that are representative of the final watering programme have been entered into the Programs.

Balance and adjust the various components of the sprinkler system so the overall operation of the system is most efficient. This includes adjustments to pressure regulators, flow controls and other individual adjustments.

The Council's Representative shall conduct a system inspection after commissioning and prior to handover. This shall include inspection of, but not limited to:

- All stations in operation (automatic valve operation, system operating pressure)
- Sprinklers (installation, arc adjustment, correct nozzle type, performance)
- Valve boxes (installation, support, clear of debris, ID tags)
- QCVs and air valves
- Trench and turf reinstatement
- Pump, tank and water connection installation
- Controller and sensor setup and operation

9.4 CONFIRMATION OF PERFORMANCE

The confirmation of performance serves to check the compliance of the uniformity and distribution performance requirements set out in Section 1.4.

A catch can test shall be undertaken by the Council's Representative to confirm system compliance with performance criteria and the design details initially submitted by the Contractor.

10 WET WELL MAINTENANCE

- To remove the pup from the wet well. Carry out a service on the pump as per the manufacture's recommendations. Following a service and/or necessary repairs, reinstall and recommission the pump in the wet well.
- Debris found in the wet well is to be removed.
- The wet well chamber is to be cleaned using a high-pressure hose.
- The contractor shall then report on any recommendations for improvement of the chamber/pump intake setup, including budget costing to the Superintendent.
- The wet well lid must contain a fixed metal plate with the wording "Irrigation pump station DANGER voltage [e.g.] 415V + Power".

11 SITE CLEANUP

Following irrigation installation and prior to turfing, all surplus irrigation materials, fittings and rubbish are to be removed off site by the irrigation contractor.

12 SITE RESTORATION

The Principal Contractor shall always ensure the cleanliness of the site throughout the work and shall take all necessary measures to prevent damage to turf or vegetation. Any areas of the fields that have been altered or damaged due to the works, and in particular by the movement of construction equipment or the storage of equipment, shall be restored to their original state by and at the expense of the Principal Contractor.

The following activities are to be undertaken to make good damaged ground and turf, including within access areas, within and surrounding the work site:

- USGA sand, as per Council's Soil and Drainage Material Specifications for Sports Fields and Lawns current specification, topdress surface damage from vehicles and/or machinery. This is to be no more than 20 mm thick.
- Where silt fencing has been removed, the surface is to be flat. Rolling and topdressing may be required.
- Turf replacement is required where grass previously growing has been destroyed. Ground preparation and turfing using premium 'Wintergreen' green couch (*Cynodon dactylon*) turf as a minimum is required.

13 PRACTICAL COMPLETION

13.1 WARRANTY

A written guarantee will be supplied that the contractor shall without charge repair, replace or re-instate any part of the system that has failed due to defective equipment, unspecified equipment or poor workmanship within 12 months of the date of practical completion. The guarantee shall include details of any extended warranties offered by manufacturers on any of the system components.

The Contractor must provide a statement that all workmanship is complete and complies with the contract documentation and is covered by a five-year replacement warranty on all items, parts and labour. The Superintendent shall progressively sign off the construction schedule at each stage of completion according to the projects specified Hold Points.

To comply with a five-year warranty, all components must comply to manufactures warranty terms and conditions.

13.2 HANDOVER AND ACCEPTANCE

- The contractor shall provide three (3) copies of the following operating documents.
- Simple, yet precise and detailed operating and maintenance instructions.
- Diagrams (those referred to in the contract instructions).
- Evidence of a successful pressure test certification.
- Sign-off certificates for the Hold Points by the Superintendent or Council Representative

Acceptance shall take place after the checks described previously, in the presence of the Superintendent or Council Representative, in accordance with the applicable regulations. The Council Representative reserves the right to delay final acceptance of the works in the event that a lack of quality or malfunctions have been noted during acceptance.

13.3 AS-CONSTRUCTED IRRIGATION DRAWINGS

Refer to Section 5.1 herein.

13.4 MAINTENANCE MANUALS

The irrigation maintenance manuals shall be provided to the Superintendent in hard copy and a digital copy via USB drive. As a minimum they shall include:

a) cover sheet stating project name and date of installation

b) table of contents

c) warranties and certificates

d) contact details of contractor (include after hour's details)

e) controller manuals and information

f) sprinkler technical data and maintenance instructions

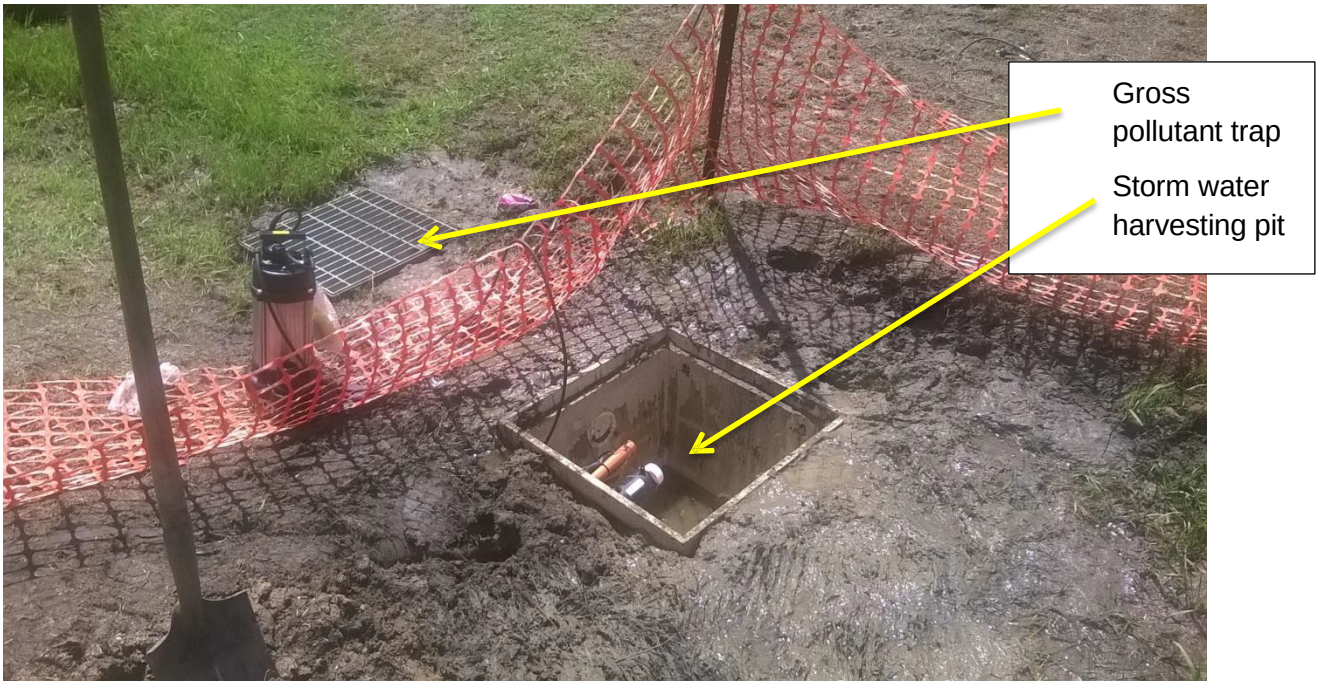
g) AutoCAD 2017 or later drawing files on USB storage device

h) all irrigation drawings suitable for re-printing in PDF format and one (1) copy of all drawings in hard copy inserted into the manual for viewing without removal

i) all tagged valves and valve boxes shall correspond with the stations setup in the controller and be identified on the As-Constructed drawings/irrigation plan.

13.5 STORM WATER HARVESTING AND FLOW SENSOR

Storm water harvesting will, where applicable, be installed on irrigation sites and the following requirements shall be included.



A requirement to the storm water harvesting will be the installation of a water flow sensor to indicate water flow and harvested water volume.

It is anticipated that the ***flow sensor*** will be fitted into the pipe work from the storm water harvesting feeding into the water tank and connected to the IQ LXM series irrigation controller that will relay water harvesting yields back to the irrigation central control computer located in Brisbane City Council office located on level 10, 266 George Street, Brisbane.

The water harvesting pump shall deliver a minimum of 400 litres per minute as guideline for pump requirements.

Pit sizes depend on water requirements:

- 400 litres per minute fill 60,000 litre tank
- 800 litres per minute fill 120,000 litre tank
- 1000 litres per minute above 120,000 litre tank.

14 DEFECTS LIABILITY PERIOD

From the date of the practical completion a defects liability period of 52 weeks shall commence, during which time the contractor shall rectify any fault that can be attributed to material or component failure or poor workmanship, at the Contractor's own cost.

The contractor shall correct any defects within 5 working days of notification.

15 CONSTRUCTION SCHEDULE

OPERATIONS AND/OR PRODUCTS	CONTRACT REF.	DOCUMENT TO BE PRODUCED BY THE CONTRACTOR	COMPLETION DATE
Programme of works Construction schedule		Gantt chart	Five (5) days from the work order instructing the work to proceed
Pipes		Letter, technical data sheet, sample	
Rotor pop-ups		Letter, technical data sheet, sample, tests	
Quick-coupling valves		Letter, technical data sheet, sample	
Fittings, SWING PIPE, elbows and accessories		Letter, technical data sheet, sample	
Electric valves		Letter, technical data sheet, sample	
Electrical cables and connectors		Letter, technical data sheet, sample	
Valve boxes		Letter, technical data sheet	
240V controllers		Letter, technical data sheet, tests	
Central Control Systems		Letter, technical data sheet, tests	
2-wire control system		Letter, technical data sheet	
Weather stations		Letter, technical data sheet	
Pump and pump stations		Letter, technical data sheet, tests	
Origin and approval of materials		Letter, technical data sheet, documentation	Ten (10) days from the date of the order instructing the work to proceed
Detailed prices		Completed document	
Environmental compliance plan		Completed document	Before commencing works
Specific health protection and safety plan		Completed document	
Survey		PDF and electronic format As-Constructed Data compliant with ADAC standards	Seven (7) days after survey
As-Constructed drawings		PDF, DWG, ADAC XML and laminated plan	Seven (7) days after installation

16 APPENDICES

APPENDIX 1: TYPICAL IRRIGATION DETAILS

Refer to Brisbane City Council's Typical Drawings which are to be adhered to:

- Detail A – Sprinkler Installation
- Detail B – Quick-Coupling Valve Installation
- Detail C – Air/Vacuum Relief Valve Installation
- Detail D – Control Valve Assembly
- Detail E – Mainline Pipe
- Detail F – Lateral Pipe
- Detail G – Shared Main/Lateral Pipe Trenching
- Detail H – Control Cabinet Layout
- Detail I – Pump Shed Detail
- Detail J – Pump Station
- Detail K – Fencing (QLD Govt Standard)
- Detail L – Tank Compound Layout

APPENDIX 2: FORM TEMPLATES

Refer to the following standard forms:

- BCC Irrigation Handover Template
- BCC Irrigation Inspection Template
- BCC Irrigation Audit Worksheet

Brisbane City Council
Irrigation Installation Detail Drawings 2023

The information within this drawing set is outlined as follows:

Detail A - Sprinkler Installation

Detail B - Quick-Coupling Valve Installation

Detail C - Air/Vacuum Relief Valve Installation

Detail D - Control Valve Assembly

Detail E - Mainline Pipe

Detail F - Lateral Pipe

Detail G - Shared Main/Lateral Trench

Detail H - Controller Cabinet Layout

Detail I - Pump Shed Detail

Detail J - Pump Station

Detail K - Fencing (Qld Govt Standard)

Detail L - Tank Compound

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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AUSTRALIAN SPORTS TURF CONSULTANTS

Mottech Parkland

BRISBANE CITY

Irrigation Detail Drawings

Brisbane City Council

Designer:	BFR
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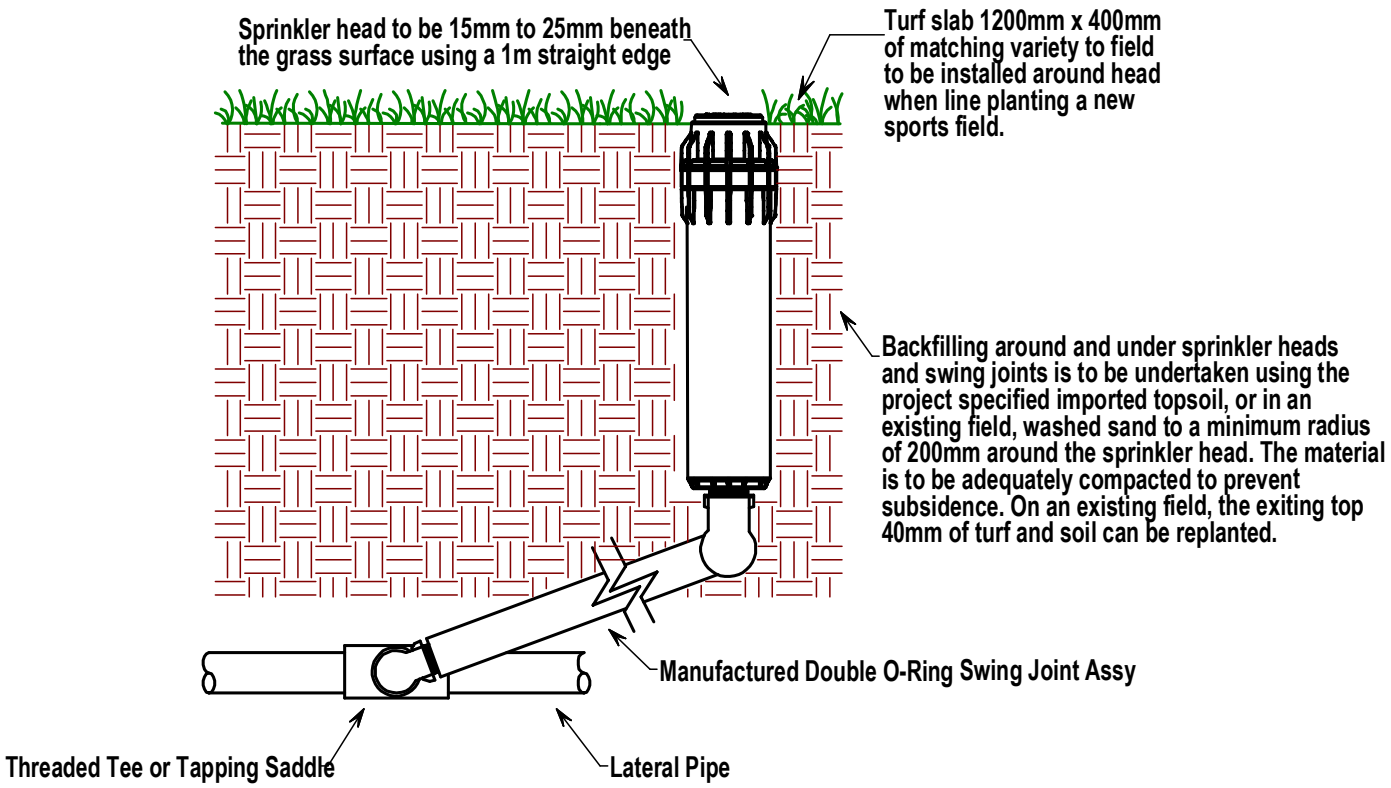

Detail A - Sprinkler Installation

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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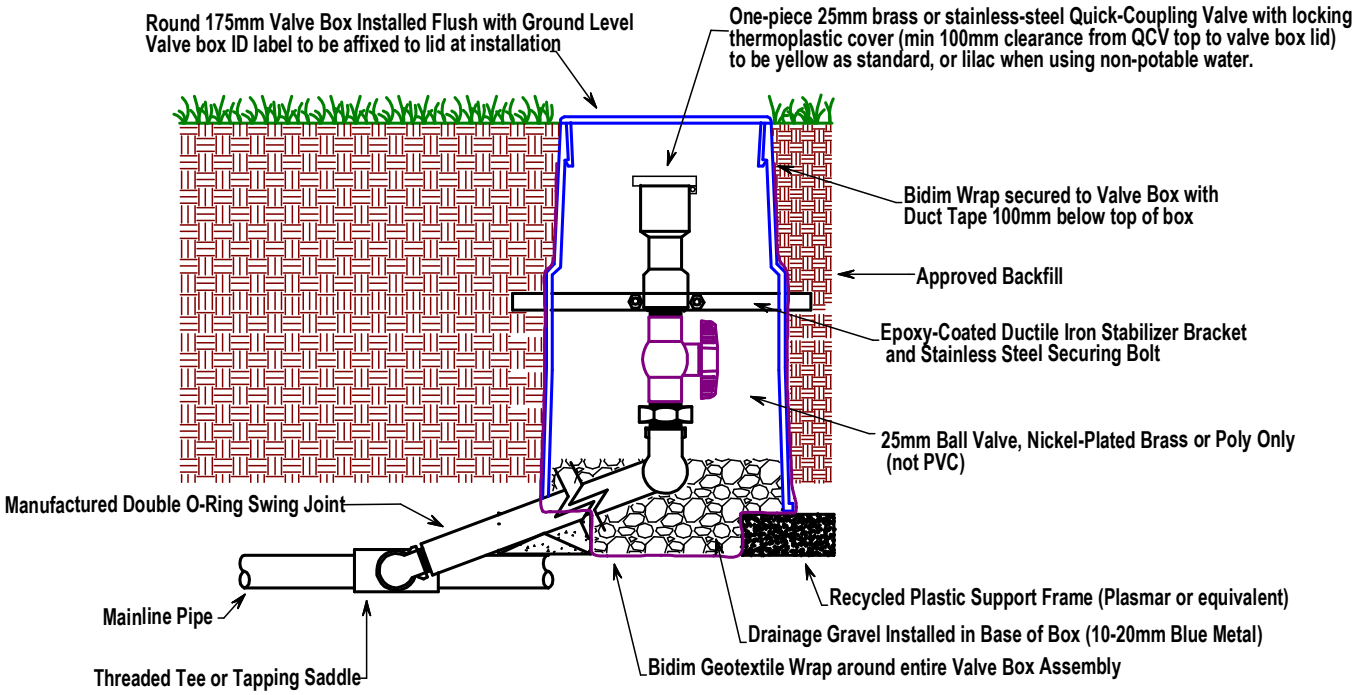

Detail B - Quick-Coupling Valve Installation

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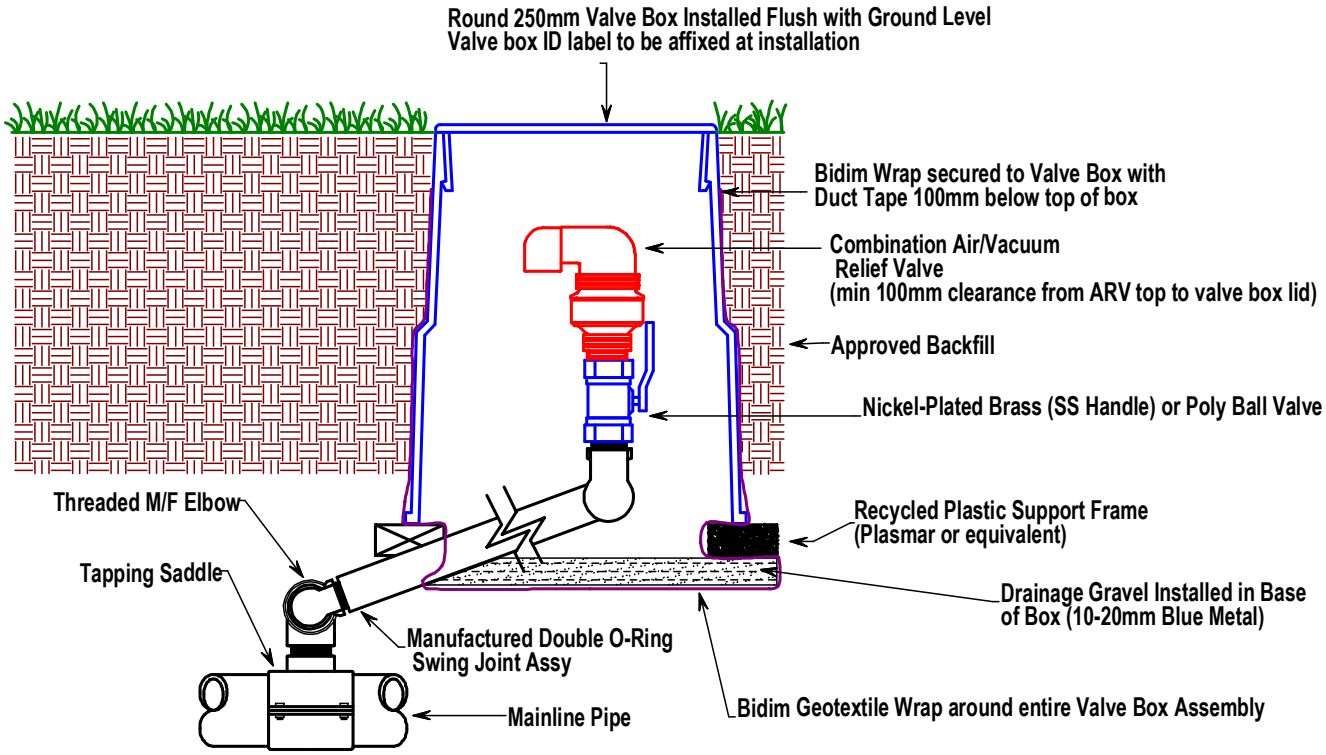

Detail C - Air/Vacuum Relief Valve Installation

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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Irrigation Detail Drawings

Brisbane City Council

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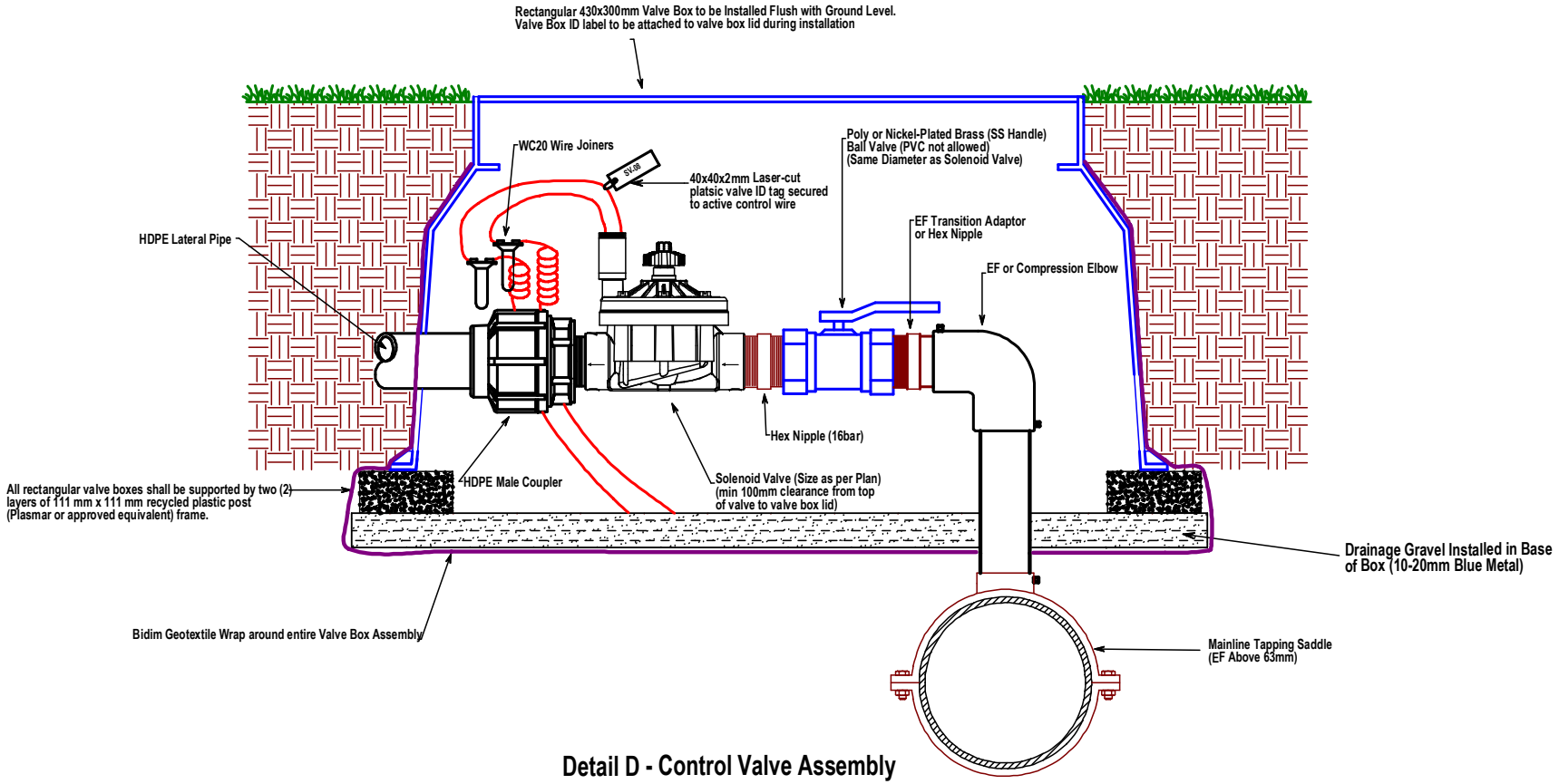

Detail D - Control Valve Assembly

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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Irrigation Detail Drawings

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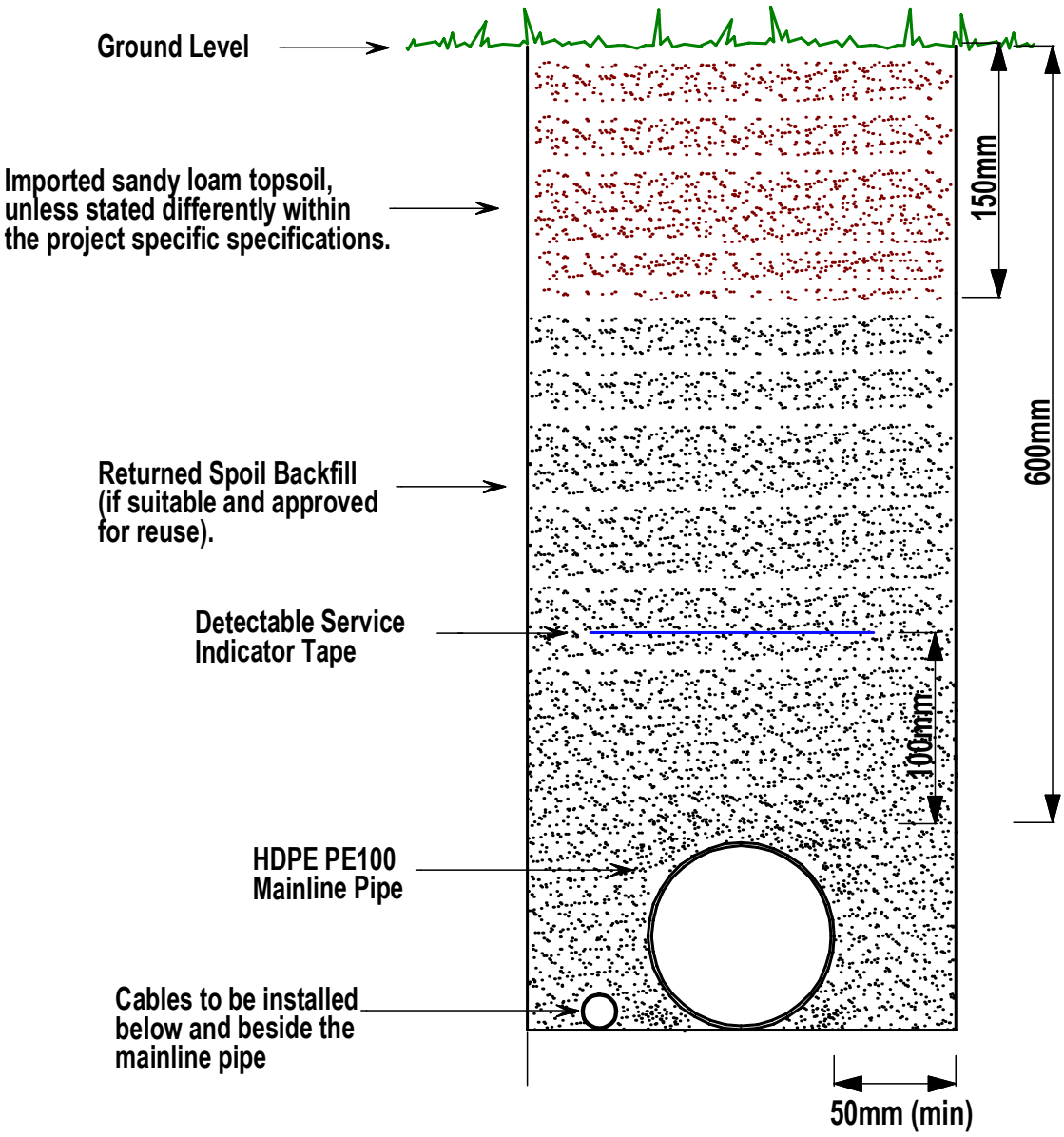

Detail E - Mainline Pipe

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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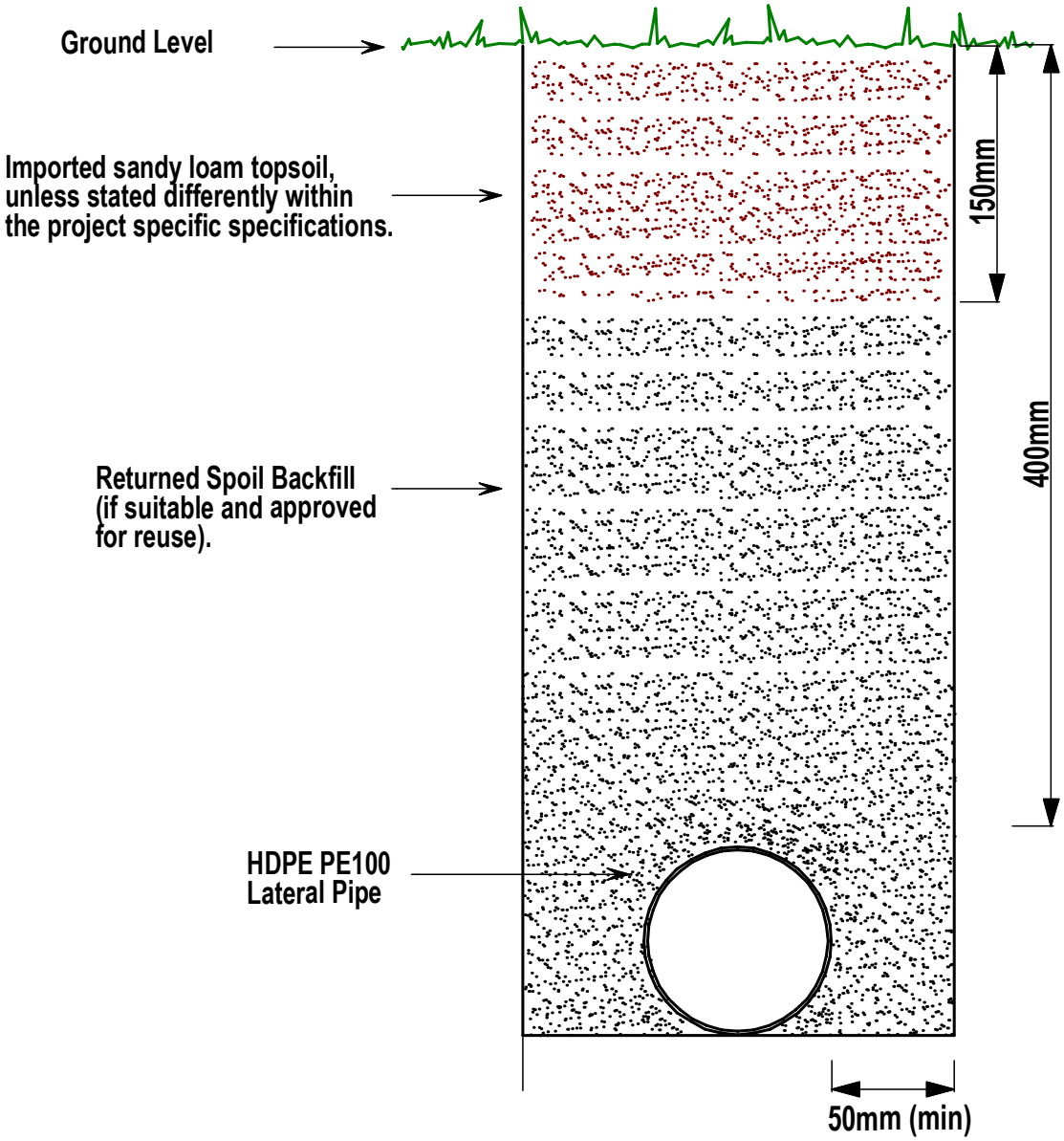

Detail F - Lateral Pipe

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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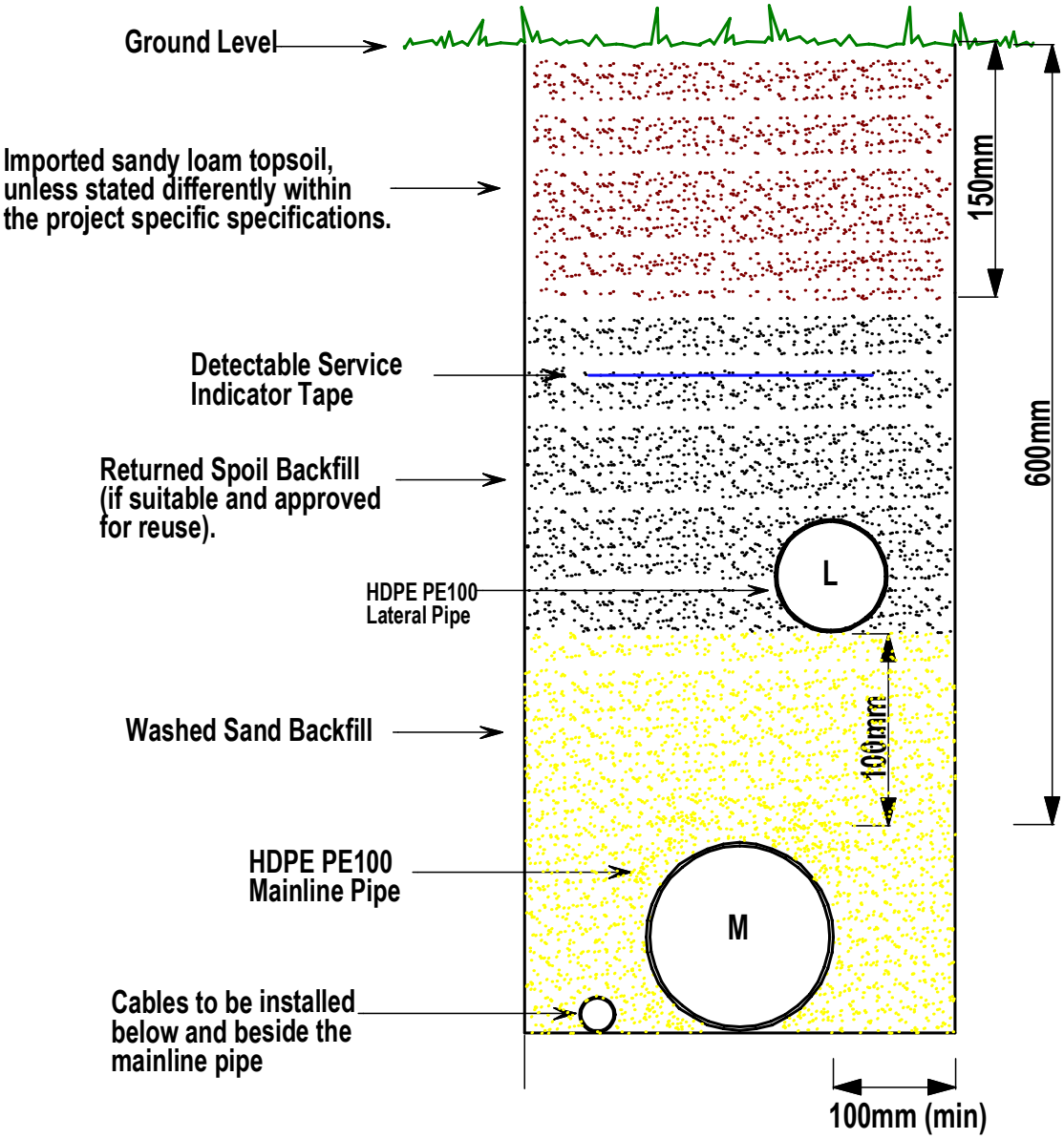

Detail G - Shared Main/Lateral Trench

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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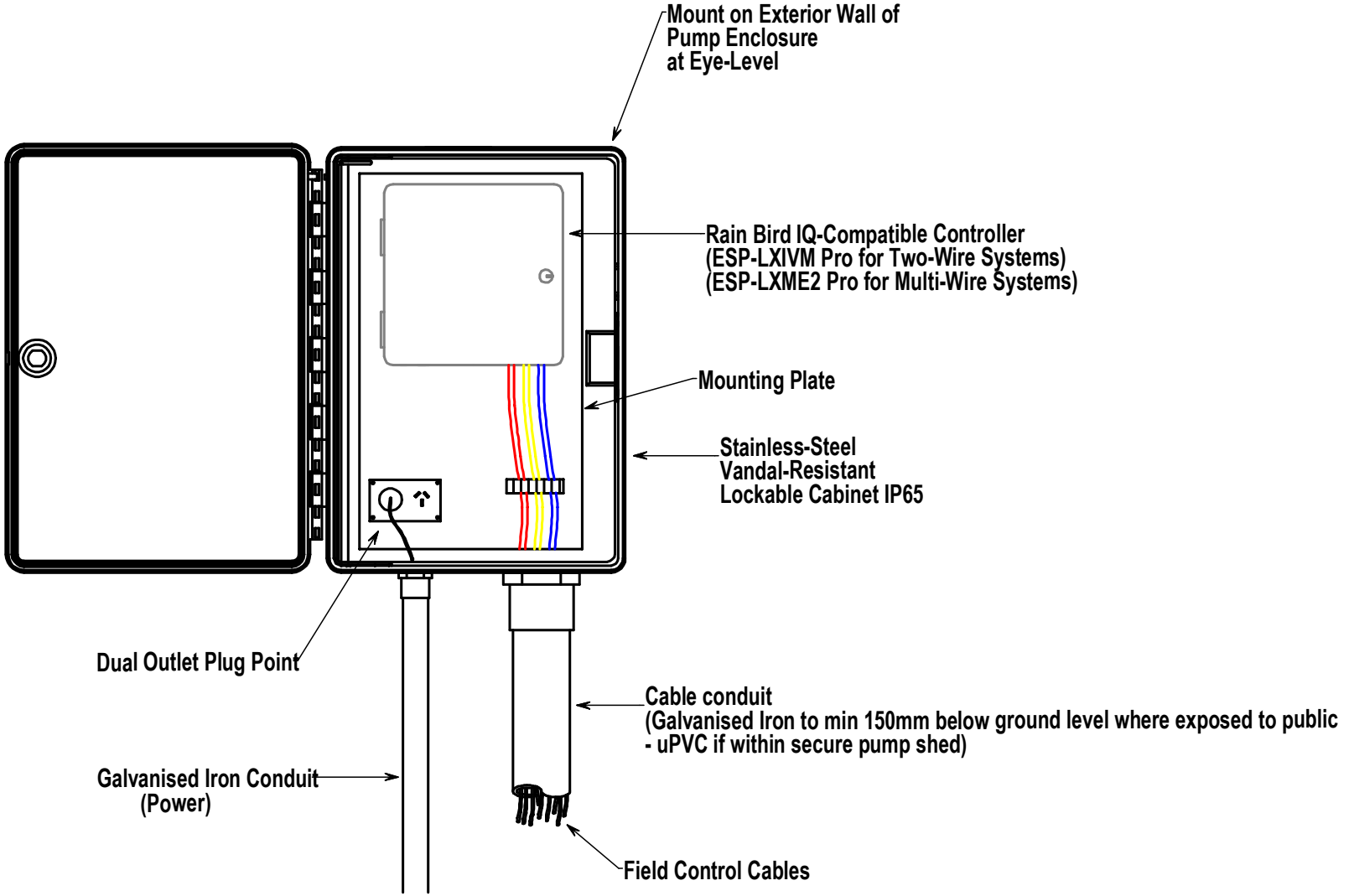

Detail H - Controller Cabinet Layout

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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Irrigation Detail Drawings

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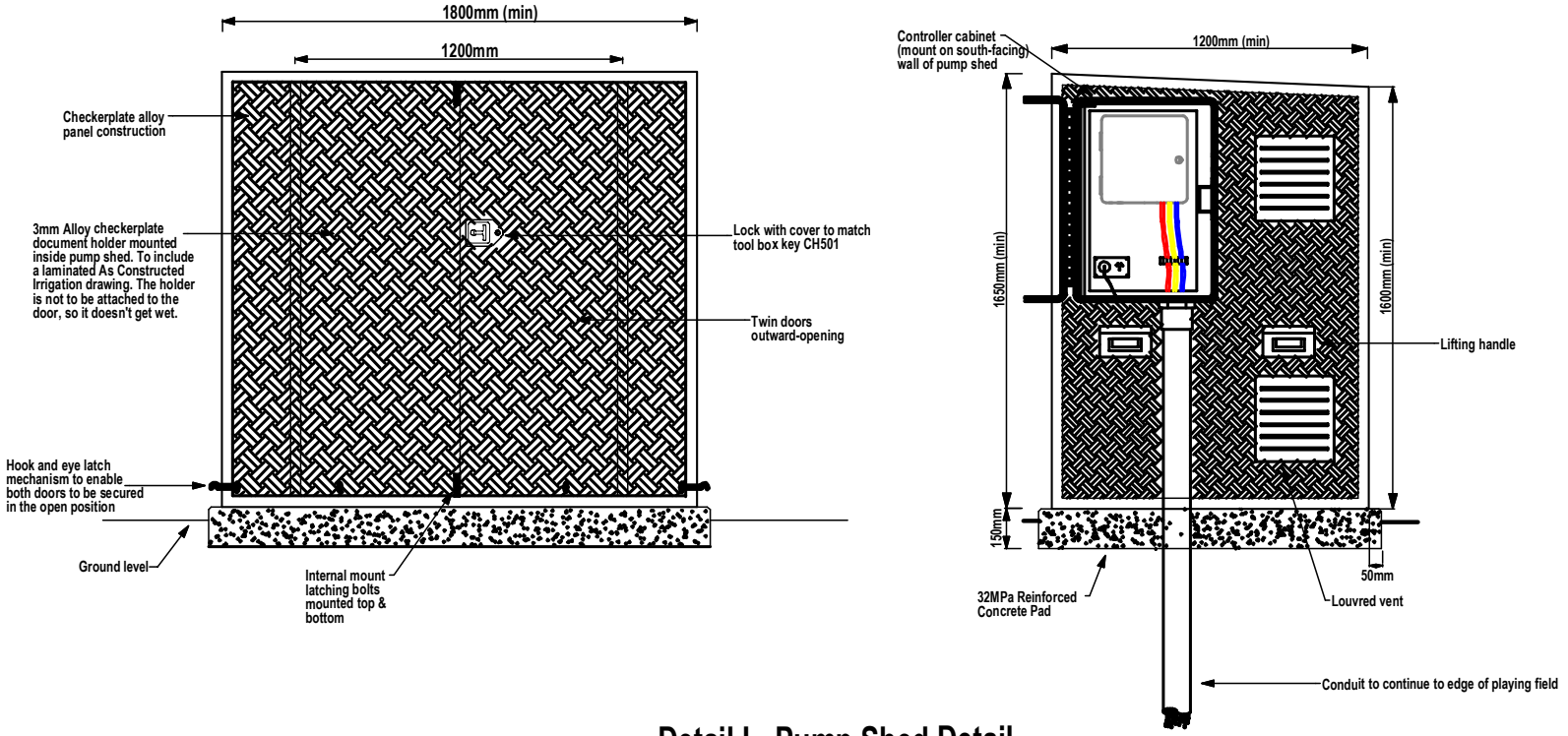

Detail I - Pump Shed Detail

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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BRISBANE CITY

Irrigation Detail Drawings

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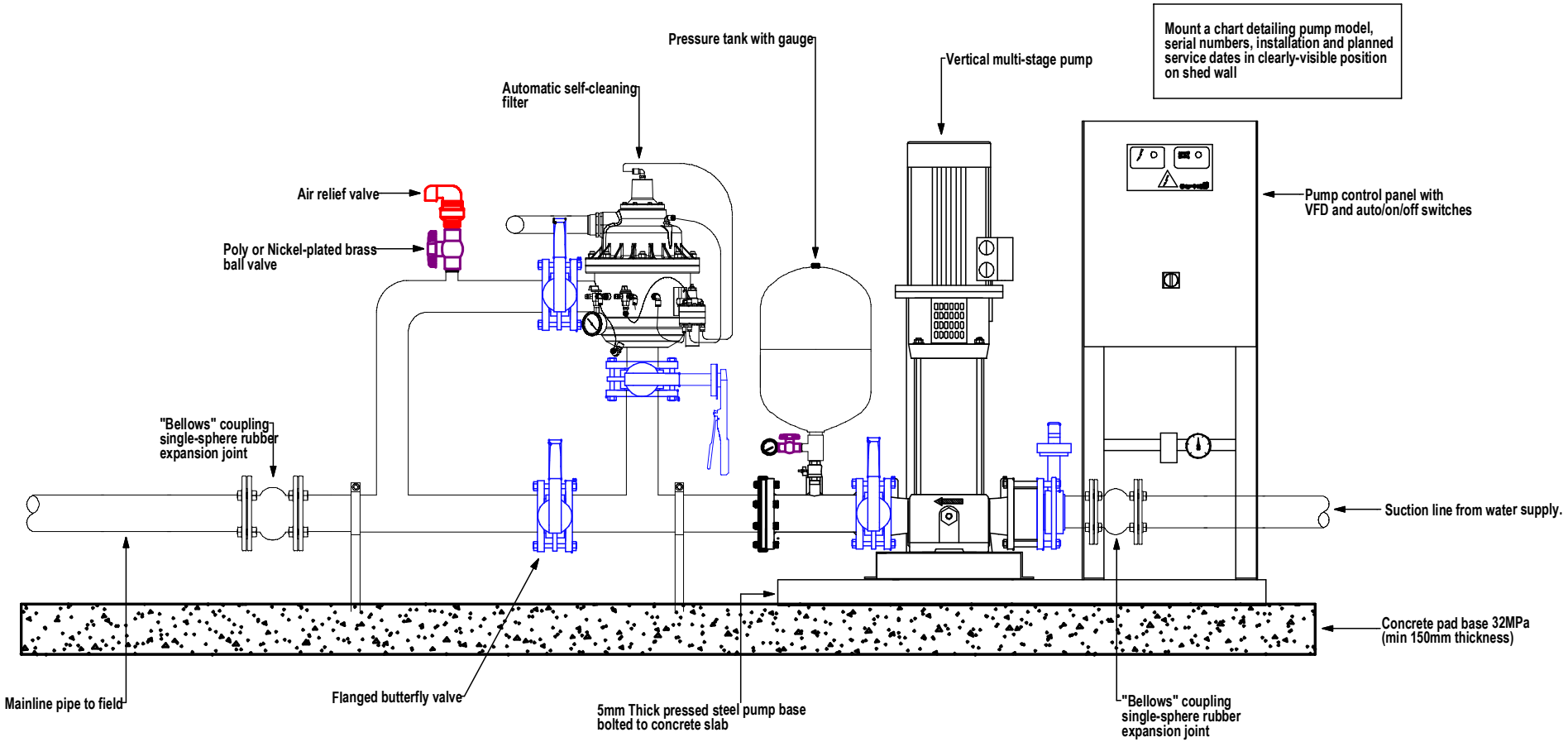

Detail J - Pump Station

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

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Irrigation Detail Drawings

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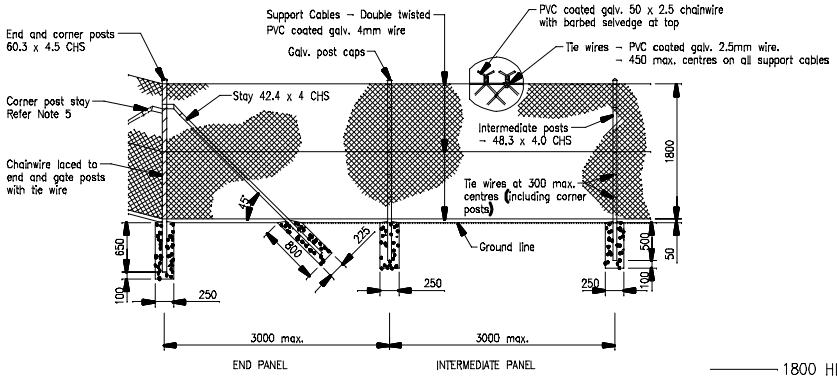
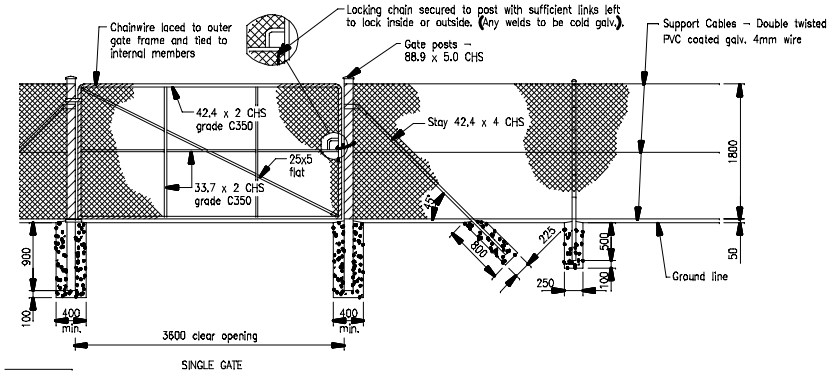
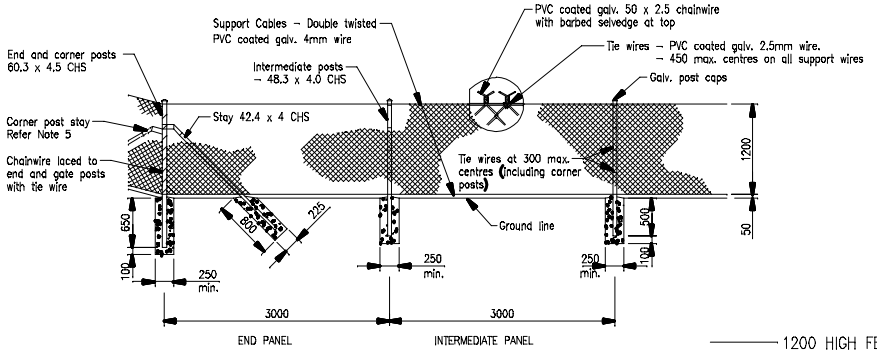
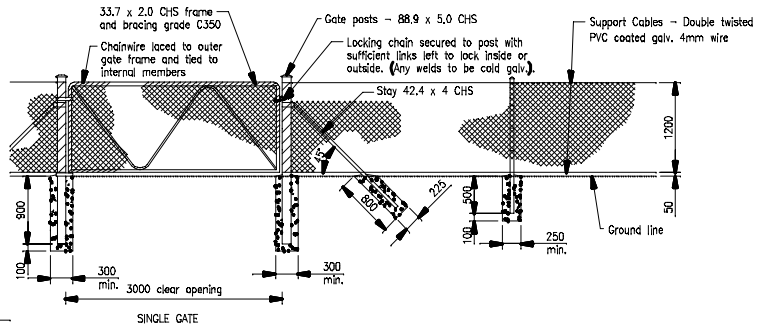


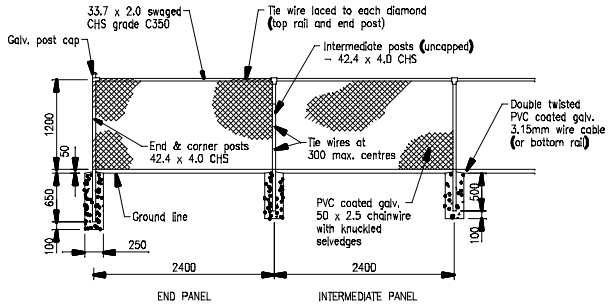


1800 HIGH FENCE

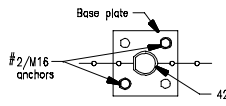




1200 HIGH FENCE

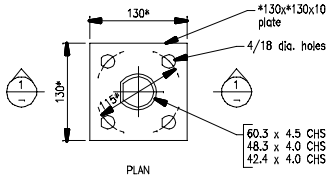


1200 HIGH FENCE
WITH TOP RAIL

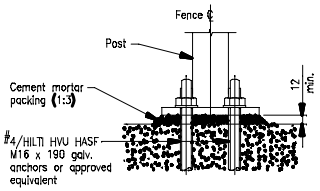


1200 FENCE WITH TOP RAIL

*Increase these dimensions by 40mm to suit 88.9 x 5 CHS gate posts where required

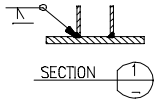


PLAN



ELEVATION

POST ON BASE PLATE



NOTES:

1. CIRCULAR HOLLOW SECTIONS (CHS) to be grade C250 to AS 1163 unless indicated otherwise.
2. CONCRETE GRADE shall be N32/20.
3. GALVANIZED CHAINWIRE shall conform to AS 2423, with a mesh size of 50mm and 2.5mm diameter wire, and coated with green PVC.
4. SELVEDGES : Barbed selvedges shall be used at top except on gates and fences where a top rail is specified, where knuckled selvedges are used top and bottom.
5. CORNER POSTS to be adopted where the change in angle in horizontal alignment exceeds 20 degrees.
6. TIE/LACING WIRE shall be 1.57mm green PVC coated galvanized wire unless specified otherwise.
7. BOLTS, NUTS AND WASHERS to be hot-dip galvanized to AS 1214.
8. WELDING shall be to AS/NZS 1554.1.
9. ALL STEELWORK AND FITTINGS shall be hot-dip galvanized to AS/NZS 4680.
10. GALVANIZED FENCING WIRE to AS 2423.
11. DIMENSIONS are in millimetres unless shown otherwise.

ASSOCIATED DOCUMENTS:
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads
REFERENCED DOCUMENTS:
Standard Specifications:
Road Furniture
Australian Standards:
AS 1163 Structural Steel Hollow Sections
AS 1214 Hot-dip Galvanized Coatings on Threaded Fasteners (ISO metric coarse thread series).
AS/NZS 1554.1 Welding of Steel Structures
AS 1725 Galvanized Rail-less Chainwire Security Fences and Gates
AS 2423 Galvanized Wire Fencing Products.
AS/NZS 3679.1 Hot-Rolled Structural Steel Bars and Sections
AS/NZS 4680 Hot-Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

FENCING	Queensland Government Department of Main Roads	
CHAINWIRE FENCES AND GATES	Size A3	Drawing No 1602
	Scales as shown	Date 6/02
		A B

1602

ASTC AUSTRALIAN SPORTS TURF CONSULTANTS

Mottech Parkland

Detail K - Fencing (Qld Govt Standard)

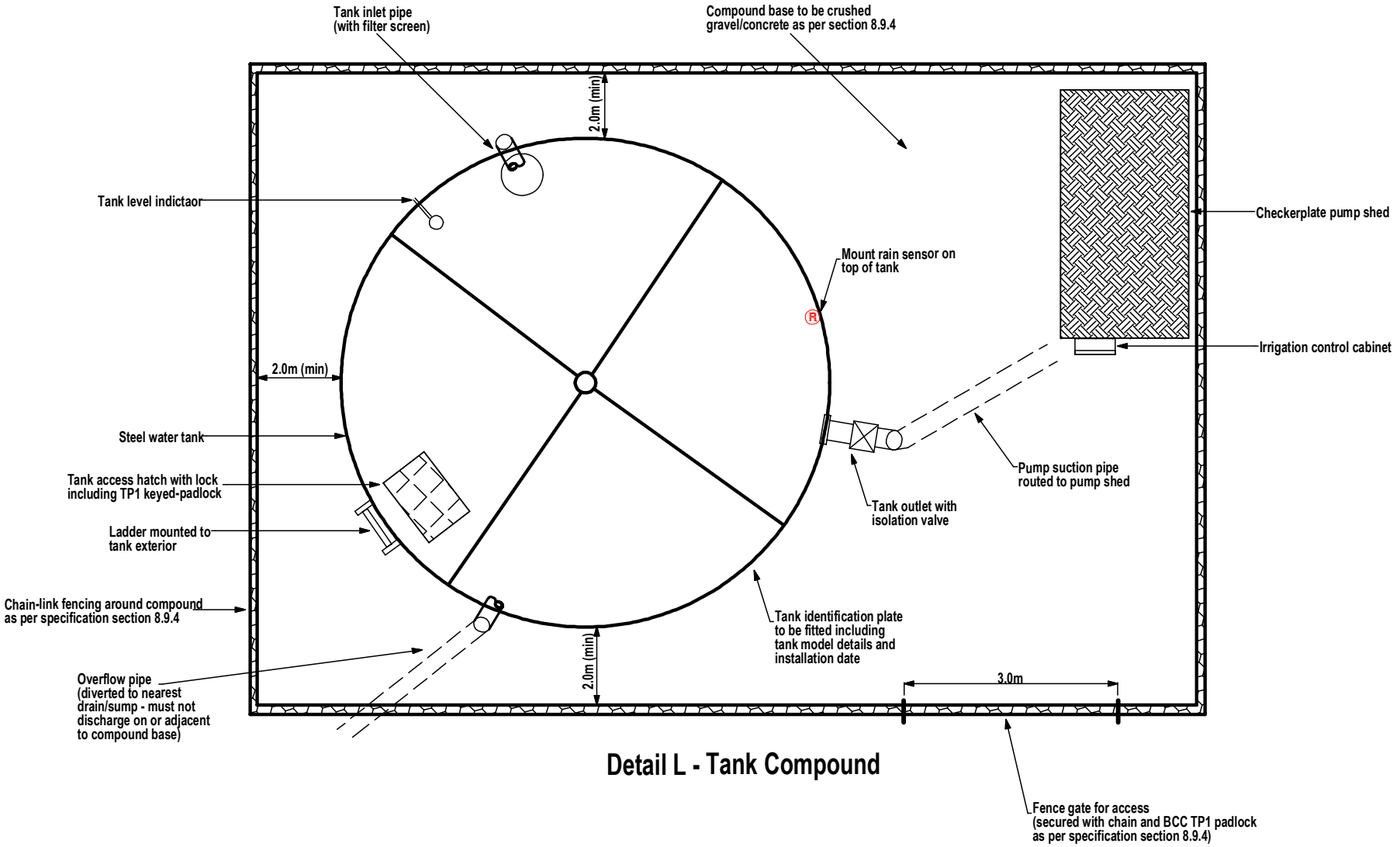
Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

BRISBANE CITY

Irrigation Detail Drawings

Brisbane City Council

Designer:	BFR
Date:	22 April 2023
Scale:	Not To Scale
File:	BCC_IDD_01



Detail L - Tank Compound

Drawings are to be in conjunction with the project specific technical specification (when available) and BCC's Master Irrigation Specification.

Note:
A minimum of 3.5m clearance is to be provided between the irrigation tank compound fencing and adjacent infrastructure to provide a clear mowing passage.

ASTC
AUSTRALIAN SPORTS TURF CONSULTANTS

Mottech Parkland

BRISBANE CITY

Irrigation Detail Drawings

Brisbane City Council

Designer:	BFR
Date:	22 April 2023
Scale:	Not To Scale
File:	BCC_IDD_01