



District Council of Franklin Harbour

COWELL COMMUNITY WASTEWATER MANAGEMENT SYSTEM – CIVIL WORKS

Tender Documents

Volume 2 – Specification

Part A – Preliminaries and Special Conditions

Part B – Technical Specification

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Part A

PRELIMINARIES AND SPECIAL CONDITIONS

A1. ORGANISATION

Unless otherwise notified from time to time the following key personnel are concerned with the carriage of the project.

Principal's Representative:	Mr Terry Barnes
Designer's Representative:	Mr Phil Castles
Superintendent:	District Council of Franklin Harbour
Superintendent's Representative:	Mr Darren Zechner or as nominated
Address for all Communications:	PO Box 71, Cowell SA 5602
Telephone:	(08) 8629 2019
Facsimile:	(08) 8629 2152

The Contractor's attention is drawn to the fact that the foregoing information does not authorise the Contractor, in normal circumstances, to deal other than with the Superintendent as required by the General Conditions of Contract, but note that where the general conditions provide, notices to the Principal should be sent to the Principal's Representative.

A2. SCOPE OF CONTRACT & EXTENT OF WORKS

A2.1 General Overview of the Works

The township of Cowell is located on the Lincoln Highway on the eastern coast of Eyre Peninsula, halfway between Port Augusta and Port Lincoln. It is a community based around farming, fishing and aquaculture, with most premises being residential, some commercial properties along Main Street and several oyster processing sheds. There is also a hospital, a school, two hotels and a caravan park. . Tenders are invited for construction of civil works for a Community Wastewater Management System (CWMS), comprising; 560 gravity property connections, 62 pressure connections, new gravity drains and new common (pressure) mains, five new pump stations, one emergency storage chamber, a new rising main network, a lined 14ML treated water storage pond (including leak detection), standpipe, irrigation transfer pump, shed and filter, irrigation mains, three 45kL irrigation storage tanks, irrigation pump, shed, controller and installation of three new irrigation systems ("the Works") for the Council named in Item 1 of the Annexure hereto. Tenders are to be on a lump sum basis. Tenders shall be subject to the terms and conditions hereunder contained.

Wastewater from Cowell will be collected via the gravity pipe network and pumped to the new Wastewater Treatment Plant (WWTP) approximately 1.8km north west of the township. All treated water will be stored in the new treated water storage pond adjacent to the WWTP. The stored water will returned to the treated water storage tank via a return sump & pump and then pumped to the new irrigation storage tanks at the town oval when required. A new irrigation pump at the oval will supply treated water to the existing oval irrigation system and to three new irrigation systems.

A2.2 Contract Requirements

Specific details of construction works to be completed are shown on the Drawings associated with the Works (refer Section A3), while the standard of construction works is detailed in the

technical specification. The following list indicates the main elements of the Works sufficient to ensure that the Contractor is aware of the scope of the Contract. It does not detail duties, actions or items of supply on minor works which are self-evident or inherent to the satisfactory completion of the scheme as described in the tender documents.

Preliminaries: This includes:

- The transportation of all personnel, plant and materials to and from the site and the provision of temporary site accommodation (if required).
- The provision of all personnel, facilities and amenities for the administration of the Works.
- All site establishment costs.
- All setting out of the Works.

Property Connections 1: Supply and install approximately 3,005m of 100mm diameter PVC-U Class DWV pipe to form 453 DN100 property connections, including inspection points and all other associated fittings, laid at locations and levels shown on the Drawings.

Property Connections 2: Supply and install approximately 1,610m of 150mm diameter PVC-U Class DWV pipe to form 107 DN150 property connections, including inspection points and all other associated fittings, laid at locations and levels shown on the Drawings.

Common Mains: Supply and install two 75mm diameter PN12.5 HDPE common mains totalling approximately 1,460m in length, including valves and valve boxes as required.

Domestic Pressure Reticulation Sewer Pumps: Supply and install 62 pressure reticulation sewer pumps, including pressure connections, boundary kits.

Gravity Drains 1: Supply and install approximately 10,650m of 150mm diameter PVC-U gravity drains including inspection points, maintenance shafts and maintenance holes, plus other standard and/or special fittings, laid at locations and grade shown on the Drawings.

Gravity Drains 2: Supply and install approximately 1,900m of 225mm diameter PVC-U gravity drains including inspection points, maintenance shafts and maintenance holes, plus other standard and/or special fittings, laid at locations and grade shown on the Drawings.

Pump Stations: Install five (5) new pump stations, i.e. PS1, PS2, PS3, PS4 & PS5 including control maintenance hole, reinforced pump chamber, two (2) submersible pumps per station, associated valves, pipework and venting, together with control panel, control system, switchgear, monitoring/alarm/telemetry systems and one emergency storage chamber, at the locations and levels shown on the Drawings.

Rising Mains: Supply and install approximately 4,120m of HDPE rising main of various diameters and pressure ratings, including air valves, scour valves, thrust blocks and other fittings along with marker posts, laid at the locations and depths shown on the Drawings.

Winter Storage Pond: Construct a lined 14ML winter storage pond at the treatment (including all earthworks to form the floor and embankments, lining of pond including anchor trenches, seals around pipe penetrations, installation of inflow and return flow pipework, leak detection, , perimeter fence and a return sump & pump) at the level and location shown on the Drawings.

Irrigation Transfer Pump Shed: Supply and install an irrigation transfer pump shed at the storage pond (including site preparation and all associated valves) as shown on the Drawings.

Irrigation Mains: Supply and install approximately 2,800m of HDPE PN12.5 irrigation main of various diameters, including air valves, scour valves, thrust blocks and other fittings along with marker posts, laid at the locations and depths shown on the Drawings.

Oval Irrigation Storage: Supply and install three (3) 46kL storage tanks at the town oval (including site preparation, slow closure valve, high & low level alarm telemetry and timer controlled motor activated valve) as shown on the Drawings.

Oval Irrigation Pump Shed: Supply and install an irrigation pump shed (including site preparation, fence and all associated valves) as shown on the Drawings.

Irrigation Controls: Supply and install central irrigation controller, anemometer, rain sensor and soil moisture meter at the oval as shown on the Drawings.

Irrigation Pump: Supply and install an irrigation pump with VF Drive to suite with a duty of 16L/s @ 60m in the pump shed.

Oval Irrigation System: Supply and install all pipe work required to connect the new irrigation pump at the oval to the existing oval irrigation system as shown on the drawings. Existing valve boxes and sprinkler heads are to be replaced lilac coloured ones. Solenoid valves are to be fitted with pressure a regulation device fitted between the solenoid coil and the valve body on each solenoid, as specified herein.

New Irrigation Systems: Supply and install new irrigation systems located in Area's 1, 2 and 3 (including all valves, associated pipework) as shown on the Drawings. Solenoid valves are to be fitted with pressure a regulation device fitted between the solenoid coil and the valve body on each solenoid, as specified herein.

Standpipe: Supply and install new 80mm diameter PN12.5 PVC-M irrigation main from the WWTP boundary to a 90mm PN12.5 HDPE standpipe at the WWTP, including installation of the standpipe, bollards and associated works as shown on the Drawings.

Other Civil Works: Carry out all siteworks, location and/or protection of existing services, bitumen reinstatement after trenching, de-watering, bunding, water supply, electricity supply, drainage and hardstands as shown on the Drawings and as specified herein.

Ancillary Works: Carry out any traffic control, noise control, vibration monitoring and/or liaison with the community, as specified herein or as required by applicable Australian Standards.

The Contract for the Works is a lump sum tender. The geotechnical report indicates the presence of rock in the area. Contractors will have different methods of excavation, construction and installation. Therefore, it has been decided that two separate schedules be requested:

Schedule (a) is a lump sum tender in which a Provisional Sum allowance has been included to cover the anticipated excavation of rock and the associated difficulties related to rock, that are likely to be encountered during the Works. This is a shared risk approach.

Schedule (b) is a lump sum tender in which there is no Provisional Sum allowance for rock or any associated difficulties. With this approach, the Contractor is invited to assess the extent of rock themselves and submit an all-inclusive price to cover all rock excavation and associated difficulties, including, but not limited to, dewatering, over excavation, import of backfill material, additional compaction, impact on construction program etc.

The items described above are only provided to assist the Contractor in assessing the order of magnitude of the works. They shall not be used as a basis for tender.

Quantities to be used by the Contractor and the nature of the prevailing site conditions adopted in preparing the tender are to be determined by the Contractor from the Drawings and documents referred to herein and a site inspection.

The Contractor shall allow for ancillary and site works as required to suit his plant to the minimum standards as shown on the Drawings and as specified herein.

A complete description and plans of proposed plant and equipment is to be included in the Tender Schedules, and any shortcomings, limitations or differences of the submitted tender to the requirements specified or as shown on the Drawings are to be highlighted at the time of tender. The Contractor may be asked to detail additional information on his proposed plant or to consider modifications or alterations to his proposal at the time of tender.

When the Specification and Drawings do not contain any mention of minor parts of work which, in the opinion of the Superintendent, are reasonably and obviously necessary for the satisfactory completion of the Works, such parts shall be supplied and installed by the Contractor without any extra charge.

A3. DRAWINGS ASSOCIATED WITH THE WORKS

The Drawings associated with the Contract Works are:

Civil Works

CWMS215-00	LOCATION PLAN AND INDEX OF DRAWINGS
CWMS215-01	OVERALL LAYOUT AND TYPICAL TRENCH CROSS SECTION
CWMS215-02	DRAIN CONNECTION SCHEDULE
CWMS215-03	LAYOUT DETAIL SHEET 3
CWMS215-04	LAYOUT DETAIL SHEET 4
CWMS215-05	LAYOUT DETAIL SHEET 5
CWMS215-06	LAYOUT DETAIL SHEET 6
CWMS215-07	LAYOUT DETAIL SHEET 7
CWMS215-08	LAYOUT DETAIL SHEET 8
CWMS215-09	LAYOUT DETAIL SHEET 9
CWMS215-10	LAYOUT DETAIL SHEET 10
CWMS215-11	LAYOUT DETAIL SHEET 11
CWMS215-12	LAYOUT DETAIL SHEET 12
CWMS215-13	LAYOUT DETAIL SHEET 13
CWMS215-14	LAYOUT DETAIL SHEET 14
CWMS215-15	LAYOUT DETAIL SHEET 15
CWMS215-16	LAYOUT DETAIL SHEET 16
CWMS215-17	LAYOUT DETAIL SHEET 17
CWMS215-18	LAYOUT DETAIL SHEET 18
CWMS215-19	LAYOUT DETAIL SHEET 19
CWMS215-20	LAYOUT DETAIL SHEET 20
CWMS215-21	LAYOUT DETAIL SHEET 21
CWMS215-22	LAYOUT DETAIL SHEET 22
CWMS215-23	LAYOUT DETAIL SHEET 23
CWMS215-24	LAYOUT DETAIL SHEET 24
CWMS215-25	LAYOUT DETAIL SHEET 25
CWMS215-26	LAYOUT DETAIL SHEET 26
CWMS215-27	LAYOUT DETAIL SHEET 27
CWMS215-28	LAYOUT DETAIL SHEET 28

CWMS215-29	LAYOUT DETAIL SHEET 29
CWMS215-30	LAYOUT DETAIL SHEET 30
CWMS215-31	LAYOUT DETAIL SHEET 31
CWMS215-32	LAYOUT DETAIL SHEET 32
CWMS215-33	LAYOUT DETAIL SHEET 33
CWMS215-34	LAYOUT DETAIL SHEET 34
CWMS215-35	LAYOUT DETAIL SHEET 35
CWMS215-36	LAYOUT DETAIL SHEET 36
CWMS215-37	LONG SECTIONS G1A, C1A, G1B AND G2A
CWMS215-38	LONG SECTIONS G2A, G2B, G2C, G2D, C2B AND G2E
CWMS215-39	LONG SECTIONS G2F, G2G, G2H, G2I, C2H, G2J AND C2J
CWMS215-40	LONG SECTIONS G2K, C2K, G2L, G2M AND G3A
CWMS215-41	LONG SECTIONS G3A, G3B, C3B, G3C, G3D, C3D, C3E, G3F, G3G AND G3H
CWMS215-42	LONG SECTIONS G3I, G3J, G3L, G3K, C3M, G3M AND C3N
CWMS215-43	LONG SECTIONS G3N, G3O, G3P, C3P, G3S, C3S, G3T, G3U, G3V, G3W, C3W AND C3X
CWMS215-44	LONG SECTIONS G4A, G4C, G4B, G4E, G4F, C4G, G4G, G4H, G4I, G4K, C4K, G4N, G4O, C4O AND G4P
CWMS215-45	LONG SECTIONS G4Q, G5A, C5A, G5B, C5B AND C5C
CWMS215-46	PUMP STATION 1 LAYOUT & LEVEL DETAIL AND SINGLE CHAMBER
CWMS215-47	PUMP STATION 2 LAYOUT & LEVEL DETAIL AND DUAL CHAMBER CONNECTION SCHEMATIC
CWMS215-48	PUMP STATION 3 LAYOUT & LEVEL DETAIL, PUMP CHAMBER AND LEVEL SENSOR DATA
CWMS215-49	PUMP STATION 4 LAYOUT & LEVEL DETAIL, RISING MAIN JUNCTION AND PURGE VALVE SCHEMATIC
CWMS215-50	PUMP STATION 5 LAYOUT & LEVEL DETAIL
CWMS215-52	WINTER STORAGE POND LAYOUT DETAIL
CWMS215-53	POND INLET CROSS SECTION AND PIPE INLET/OUTLET PENETRATION DETAIL
CWMS215-54	POND OUTLET CROSS SECTION AND ANCHOR TRENCH DETAIL

Irrigation Works

IR-37-001	SITE PLAN (for information only. Irrigation Main details as per the set of CWMS 215 drawings above)
IR-37-002	AREA 3
IR-37-003	AREA 1
IR-37-004	AREA 1
IR-37-005	AREA 2

LGA Standard Drawings

SD-2B	House Connection Details
SD-3A	Flushing Point & House Conn. Details
SD-4A	Manhole 1200Ø to 2100Ø
SD-5A	Drop Manhole Details
SD-6A	Manhole Junction Details
SD-7A	Thrust Block Details

SD-8B	Pump or Valve Chamber Access Cover
SD-9B	Submersible Pumping Station Details
SD-10B	Submersible Pumping Station Details
SD-12A	Vent Details
SD-13A	Pump Station Electrical Details
SD-18A	Marker Post & Warning Sign Details
SD-17C	Lagoon Fence

WSSA Standard Drawings

SEW-1300-V2.2	Maintenance Holes: Sewers ≤ DN 300 Precast Types P1 & P2
SEW-1301-V2.2	Maintenance Holes: Sewers ≤ DN 300 Cast In-Situ Types C1 & C2
SEW-1302-V2.2	Maintenance Holes: Pipe Connection Details
SEW-1303-V2.1	Maintenance Holes: Sewers ≤ DN 300 Changes In Level Details
SEW-1304-V2.1	Maintenance Holes: Sewers ≤ DN 300 Typical Channel Arrangements
SEW-1308-V2.2	Maintenance Holes: Typical MH Cover Arrangements
SEW-1314-V2.2	Maintenance Shafts: Typical Installation
SEW-1315-V2.2	Maintenance Shafts: MS & Variable Bend Installations
SEW-1316-V2.2	Maintenance Shafts: TMS And Connection Installations
SEW-1317-V2.1	Maintenance Shafts: Typical MS Cover Arrangement

A4. CONTRACT PROGRAM AND IMPLICATIONS

The following clauses are in addition to Clause 33 of the General Conditions of Contract.

A4.1 The Contract Program

The Contractor shall prepare a detailed construction program in the form of a bar chart (or critical path if thought necessary). The contract program shall have key dates as set out in the Annexure to the General Conditions of Contract, and as may be from time to time amended in accordance with the General Conditions of Contract.

A4.2 Use of Contract Program as a Reference

The program shall be displayed at site in the Contractor's Office.

The Contractor shall daily keep himself informed of the progress on all parts of the Works and of their interactive effect on the commencement of any section of the Works, and correlate that information with the approved program, keeping a record of actual progress on the displayed program. Such progress record shall be of a form approved by the Superintendent.

If the Superintendent considers it necessary in order to co-ordinate the work of other independent activities on the site, the Superintendent may give such directions as he deems appropriate regarding any deviation from the approved program in accordance with Clause 33.2 of the General Conditions of Contract.

A4.3 Sequencing of Works

Sequencing of works shall be as approved by the Superintendent through the mechanism of the contract program.

The program of works shall be submitted to the Superintendent for approval prior to work commencing on site.

A5. CONTRACT BUDGET AND IMPLICATIONS

A5.1 Status of Contract Budget

The Tendered Sum for completion of the Works, including Provisional Cost Items and any allowance for Contingencies, shall form the Contract Budget which shall be contractually binding in the following ways:

- a. It shall be the means by which the financial status of the Works and the costs and expenditure of the Scheme may be judged.
- b. The Contract Budget cannot be exceeded without the Principal's approval. Therefore, if there are indications that the Contract Budget is to be exceeded, the Superintendent may issue a variation or variations as stated in (c) hereof.
- c. If there is evidence that legitimate Contract variations and prolongation costs are being incurred, and that no reasonable action by the Contractor or Superintendent can be taken to avoid cost overruns, then the Superintendent may:
 - i. reduce the extent of the Works by variation as he deems necessary to keep the Scheme within the Budgeted funds; or
 - ii. seek approval from the Principal to increase the Contract Sum by the relevant amount.

A6. PROVISION OF SECURITY

Pursuant to the General Conditions of Contract, security shall be provided as a bank guarantee which shall be returned following issue of the Final Certificate in accordance with Clause 42.7 of the General Conditions of Contract.

A7. GOODS AND SERVICES TAX

All materials and services supplied under the Contract are to be inclusive of Goods and Services Tax (GST). The Contractor shall quote GST inclusive prices at the time of tendering and for all variations. The Contractor shall clearly state the amount of GST on tax invoices presented with each progress claim.

A8. STATUTORY AND OTHER REQUIREMENTS**A8.1 General**

The Contractor shall comply with all relevant requirements in accordance with the provisions of the General Conditions of Contract.

A8.2 Industrial Awards

The employment of labour by the Contractor shall be in accordance with the appropriate provisions of relevant industrial awards. In particular, the Contractor shall be required to comply with the provisions of Clause 9 of the Local Government Employees (SA) Award.

A8.3 Workers Compensation

The Contractor shall be registered as an employer with WorkCover pursuant to the Worker's Rehabilitation and Compensation Act.

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No part of the Contract Works shall be undertaken by the Contractor, or any subcontractors, unless the Contractor and the subcontractors are so registered.

The Contractor shall produce the appropriate Certificate of Registration, for inspection by the Superintendent, prior to the undertaking of any part of the Contract Works.

A8.4 Health, Safety and Welfare

- a. The Contractor shall comply with all requirements of South Australia's work health and safety legislation – which includes the Work Health and Safety Act 2012 (SA) and the Work Health and Safety Regulations 2012 (SA), supported by Codes of Practice – as applied to the persons employed and the type of work executed on the Contract and shall ensure that his employees also comply with such requirements.
- b. The Contractor acknowledges that the Principal has obligations under the Work Health and Safety Act 2012 (SA) and has the right/obligation to ensure that the Contractor is complying with the Act.
- c. The Contractor shall acknowledge in writing that he has been provided with, read and understands the Work Health and Safety policies and statements of the Principal (reference Council's Contractors Handbook) and undertakes to ensure they are brought to the attention of his employees.

Link to District of Franklin Harbour's "Contractors Handbook";
<http://www.franklinharbour.sa.gov.au/page.aspx?u=245>

- d. The Contractor shall ensure compliance with any advice and/or direction issued by the Council and/or its agent.
- e. The Contractor shall provide, for themselves and their employees, all necessary protective equipment and enforce the correct usage and maintenance of any such equipment.
- f. The Contractor shall exercise due skill, care and expertise in the performance of the Contract.

A8.5 Construction Industry Training Board

The Contractor shall be registered with the Construction Industry Training Board (Civil Construction Industry Sector).

The Contractor shall register the project with the Construction Industry Training Board prior to the commencement of the works on site, based on the contract price. Evidence of registration shall be submitted to the Superintendent prior to the first progress claim. The Contractor shall allow for the CITB levy in the total contract price – no separate payment will be made for this item.

The appropriate training levy, based on the actual total contract payments made to the Contractor (including variations), shall be **paid by the Contractor** at the completion of the works on the site. Evidence of payment shall be submitted to the Superintendent prior to issue of the Certificate of Practical Completion.

A9. SITE OF THE WORKS

A9.1 Site of Works

The site of the Works is the whole of the land space within crown land and council reserves required for the construction of the Works, subject to the following conditions and as defined by the Drawings, which precincts shall include areas and access ways as from time to time in writing agreed with or instructed by the Superintendent.

The Contractor may only use, for access or any other purpose, any remaining private property with the express consent of the property owner.

A9.2 Traffic Routes

The following streets are not to be used as a construction traffic thoroughfare:

- None identified

A9.3 Construction Restrictions

There are no specific construction restrictions placed on the Contractor's activities, apart from general requirements detailed elsewhere in this Specification.

A10. SITE ORGANISATION, MANAGEMENT AND CONTROL

A10.1 Site Organisation

Except as otherwise provided in the contract, delivery of any materials for the purpose of the works, space for storage of materials and for building sheds, offices and workshops will only be permitted as provided for herein and as arranged and approved by the Superintendent.

When flammable or combustible material is to be stored or used, the Contractor shall adhere strictly to any statutory requirements and any instruction given by the Superintendent.

No new tracks shall be formed, existing tracks altered, camps erected, trees or shrubs removed, fences cut, water, sewerage or power lines cut or any other such thing done without the prior approval of the Superintendent.

Under no circumstances shall fires be lit without the prior approval of the Superintendent.

A10.2 Site Management

The Contractor shall have a Contractor's Representative at the site in the position of Site Supervisor who shall carry the Contractor's sufficient authority to make day-to-day decisions and control the execution of the Works in detail.

The Contractor's Representative shall, to the Superintendent's satisfaction, be supported by sufficient qualified and experienced staff to ensure that the Superintendent's and Contractor's Site Supervisor's instructions can be properly and effectively executed. There shall, in addition, be sufficient and experienced labour, including machine operators, to ensure that the Works are efficiently executed within the Contract Program.

The Contractor's Representative shall carry personal responsibility for managing the Contractor's activities in all respects to allow the achievement of the Works within the Contract program.

The Contractor, his servants or agents shall observe all Rules and Regulations in force on the site and shall comply with all notices and instruction issued by the Superintendent.

A10.3 Site Meetings

There shall be regular Site Meetings with the Superintendent and/or Superintendent's Representative. The Superintendent (or Superintendent's Representative in the absence of the Superintendent) shall conduct Site Meetings at such times as he deems necessary and shall keep and distribute minutes of all meetings. Such minutes shall constitute the only recognised records of the Site Meeting. The Contractor shall attend all Site Meetings.

Minutes of the previous meeting shall be confirmed at the commencement of each Site Meeting and signed by both the Superintendent (or Superintendent's Representative in the absence of the Superintendent) and Contractor's Site Representative.

The Superintendent (or Superintendent's Representative in the absence of the Superintendent) shall chair such meetings.

At the first meeting, the Contractor shall submit to the Superintendent the names and telephone numbers of persons who may be contacted for after-hours calls during the course of the Contract.

A10.4 Working Hours

The Contractor shall be responsible for the working hours of his work force which shall generally be in accordance with the hours set down below.

Any works within property boundaries affecting an owner's or occupier's use or enjoyment of the property may be the subject of the Superintendent's specific written instructions to adjust working hours within such property.

Normal working hours shall be up to 56 hours per week, comprising 5 days of 10 hours, between 7.30am and 5.30pm and 1 day of 6 hours between 7.30am and 1.30pm.

Industry rostered days off shall be taken. Each fourth Friday and Saturday (on average), as identified to and approved by the Superintendent, will therefore not be worked.

A10.5 Supervision and Inspection

Supervision and inspection will be available between the following times, subject to the Contractor providing a minimum of 24 hours' notice of the requirement for specific inspections (for gravity drain and common main installation) or 48 hours' notice (for other works):

Mondays to Friday 9.00am to 5.00pm

No supervision or inspection will be available on weekends or public holidays, without prior arrangement with the Superintendent, including payment of any additional supervision or inspection costs incurred by the Superintendent.

The Contractor shall arrange his work in such a manner that any work carried out beyond the times stated above will be of a nature that direct Supervision is not required, as may be agreed with the Superintendent.

A10.6 Assistance for Measuring and Checking

The Contractor shall make available to the Superintendent and/or his representative any such assistance as may be reasonably required to inspect and measure the constructed Works.

A10.7 Environmental Control and Nuisance

The Works are to be executed in the environment of the Cowell precinct which includes residential and commercial areas and the performance of work in easements on private property. This warrants an approach to the Works which has consideration for the effect on the occupied properties and the users of the region's facilities. The Contractor shall instruct his employees therefore on their behaviour and their attitude towards affected people.

The Contractor shall be responsible for ensuring that the provisions of this clause and any other environmental protection provisions in the Contract are complied with and that the requirements of any statute, by-law, standard and the like related to environmental protection are observed.

The Contractor shall, prior to the commencement of the work on the site, submit to the Superintendent his proposals for temporary structures, cleaning up, erosion control and the like. After the proposals have been approved by the Superintendent, the Contractor shall be responsible for ensuring that the approved proposals are observed. Any changes to the approved proposals shall be subject to the prior agreement of the Superintendent.

Throughout the term of the Contract, the Contractor shall take care to avoid unnecessary or untimely activities which will inhibit reasonable use and enjoyment or access and which may cause nuisance.

This will include careful control of the following:

- a. Dust raised on the Works shall be abated by watering, and by careful location and protection of soil or quarry material stock piles.
- b. The Contractor shall minimise excessive noise caused by work activities. Particular emphasis shall be placed on noise limitations for Works carried on outside the hours of 7.30am to 5.30pm, in all areas adjacent to residential and like premises. The Contractor shall comply at all times with the provisions of the Noise Control Act.
- c. Trucks traversing the site with earth or quarry materials or other loose debris shall be loaded in such a manner as will prevent dropping of materials on to road surfaces and so as to prevent dust nuisance being caused from the load.
- d. The wheels, tracks and body surfaces of all plant and vehicles traversing the site shall be free of mud so that mud is not carried on to road surfaces or other paved areas.
- e. The quantities of excavated material stockpiled adjacent to roadways shall be minimised where mud nuisance is likely to occur.
- f. All mud, sand, screenings, debris and detritus shall be removed regularly from all access ways, including roads footpaths and gutters.
- g. The Contractor shall ensure that all personal rubbish left by workmen shall be regularly removed and deposited in appropriate places.
- h. The Contractor shall minimise the impact of any other action or condition likely to affect or cause serious offence to residents, occupants of premises, or affected persons generally.

A11. SITE RECORDS AND DAILY DIARIES

The Contractor shall where required for Variation Works keep Daily Work Sheet records of all labour and plant usage and site activities in accordance with the provisions of the Seventh Schedule hereof.

The Superintendent shall sign in approval of the Contractor's Daily Work Sheets when they are used for the purpose of authorised Variations. He may delegate authority to an assistant to check and initial the sheets daily and himself check and sign them not less than twice weekly. Before signing the work sheets the Superintendent may make alterations to the records and initial such alterations, which shall be made only on the basis of factual evidence.

The Contractor's Daily Work Sheets as signed by the Superintendent shall form the basis of the material by which the Superintendent assesses the Contractor's claims.

When claims pursuant to any Day Work variation are submitted by the Contractor, including claims made for any purchased items, such claims shall be accompanied as appropriate by Daily Work and Plant Usage Record Sheets, and by original receipts invoices, purchase orders

and daily diary records or the like. In this context, it should be noted that purchased items do not include materials covered by lump sum variations.

For the purpose of this clause:

- A Day Work Variation means a variation whose works are executed as Day Work as defined in the General Conditions of Contract;
- A Purchased Item is a physical item purchased by the Contractor for use in the variation works; and
- A Lump Sum Variation is a variation which is covered by a comprehensive lump sum amount and which does not entail Day Work.

A12. TEMPORARY BUILDINGS, AMENITIES AND SERVICES

A12.1 Storage Sheds

The Contractor shall provide a compound and all storage sheds necessary for the storage of all plant and materials, site offices and amenities as follows, for his own use.

The provision of security, services and the like shall be the responsibility of the Contractor.

The Contractor shall remove any such compound, storage sheds, offices and amenities upon Practical Completion and reinstate the area to its original condition.

Storage sheds shall be of an acceptable standard approved by the Superintendent and shall be located in the area or areas designated.

Site for Compound

The nominated site for Contractor's storage of all plant, shed/s, materials, site offices, amenities etc. shall be at a site provided by the Principal in the vicinity of the Works. This is open to discussion and can be negotiated upon award of the Contract.

The exact location within the nominated site shall be determined in consultation with the Superintendent.

A12.2 Amenities

The Contractor shall provide portable toilet facilities and other amenities at appropriate positions near work areas in accordance with the provisions of the Work Health and Safety Act. The amenities shall be maintained in a clean and sanitary condition at all times and shall be removed from the site upon completion of the Works.

A12.3 Water for the Works

The Contractor shall make his own arrangements for the supply of water necessary for the works, amenities etc.

The use of groundwater for construction purposes shall not be permitted.

Water shall at all times be used in a judicious manner to avoid obvious wastage.

Temporary devices used to control or shut off water flow whether installed in hose lines or otherwise shall comply with the supply authority's requirements.

A12.4 Electricity for the Works

The Contractor shall make all necessary arrangements for the supply of electrical power for temporary use on the works and shall pay all fees, charges etc. in connection with any temporary supply.

A13. WORK ON AND ADJACENT TO PRIVATE PROPERTY**A13.1 Community Goodwill**

The Contractor is required to act so as to maintain and wherever possible enhance the goodwill and relationships which have been established with landowners and occupiers whose land is associated with or adjacent to the site of this project.

A13.2 Notice to all Residents

Before commencing work on the site, or in any area within the site, the Contractor shall give three (3) days written notice, to the occupiers of all property in the area, of his intention to conduct works in the area advising of possible restrictions to traffic movement and access to properties. The notice shall contain a contact telephone number to enable contact with the Contractor. The notice may be placed in the letter box on the property or be handed to the occupier in person.

A13.3 Temporary Security of Property

The Contractor shall be required at all times and at his own expense, to provide such temporary measures as may be necessary to maintain the safety and security of private property and its occupants, including animals, at all times relative to all works carried out on or adjacent to such property.

Where works are to be constructed within an easement or occupied property and where the security of persons, property or animals may be at risk, the Contractor shall at his expense erect such temporary fencing as may be necessary to suit the purpose, to isolate the work and secure the property and its occupants, before commencement of work within the property.

A13.4 Entering Private Premises – Not Applicable**A13.5 Retention of Access to Properties**

The Contractor shall provide the occupiers of any property with 24 hours' notice of the intention to restrict access. Any restriction shall be for not longer than 6 hours in any one week day between the hours of 9am and 4pm.

The Contractor shall provide a safe and adequate means of access from roads, lanes and the like to private and public properties for vehicular and pedestrian traffic at all other times, unless otherwise approved by the Superintendent in writing, following consultation with property owners or occupiers.

A13.6 Progressive Cleaning Up

Immediately upon the completion of each section of works, the Contractor shall clean up the site, road or allotment and leave it in a neat and tidy condition to the satisfaction of the Superintendent.

Any proposed re-sealing program shall be submitted to the Superintendent with the construction program. The re-sealing program will be reviewed by the Superintendent monthly. Contractors should be prepared to discuss their re-sealing program at any post tender interviews and at site meetings.

A13.7 Reinstatement of Private Property

All backfilling, making good and reinstatement shall be carried out as soon as possible after the installation of the drain or structure and in no case shall such period exceed 48 hours.

Any surplus trench material which is not required to return the ground surface to its original level must be removed from the property.

Within non-paved areas, topsoil shall be removed from the trench line and when backfill and compaction of the trench is completed the topsoil shall be replaced to its original depth.

In the event that topsoil has to be imported for the above purpose, the Contractor shall ensure that the imported topsoil is free from any noxious weeds and/or is obtained from an area free from noxious weeds. The source of the topsoil shall be approved by the Superintendent.

All fencing and other improvements are to be reinstated as soon as the works and all reinstatement is completed.

All reinstatement of property shall be to a condition as near as practicable to that existing prior to commencement of the works, using the same or equal approved material.

A14. PROTECTION OF PROPERTY, MATERIALS AND FINISHED WORKS**A14.1 Protection of Property**

In addition to the provisions for public safety and protection of persons and property, under the General Conditions of Contract and Clause A15 hereof, the Contractor shall do the following:

- a. Erect protective guards or barriers in all locations where any works or working areas adjoin existing physical property in the form of buildings, structures, facilities, service appurtenances or the like, and leave such barriers in place until works likely to cause damage are complete.
- b. Take all due care to avoid damage to property and carry out all instructions issued and within any time specified by the Superintendent to prevent damage to property, land, roads, road surfaces, kerbs, footpaths, etc.

A14.2 Preservation of Flora in Streets, Parks, Public Places and Private Property

The Contractor shall refrain from destroying, removing, clearing or trimming trees and shrubs to an extent greater than is necessary for the execution of the works under the contract.

Areas to be cleared shall be inspected by the Contractor and the Superintendent's approval shall be obtained before any trees or shrubs are destroyed, removed, cleared or trimmed.

The Contractor shall take every reasonable precaution not to damage any tree or shrub which is nominated to be retained including its root system.

Before any excavation is carried out over or under roots of trees or shrubs to be retained, the Contractor shall obtain a ruling from the Superintendent as to whether the levels in the vicinity of the tree or shrub can be adjusted to protect the roots.

The Superintendent may direct the Contractor to repair any damage or injury to any tree or shrub that it nominated to be retained. The work shall be carried out by an approved tree surgeon engaged by the Contractor. The work shall be carried out promptly at the Contractor's expense.

A14.3 Surface Waters

The Contractor is to note that the site may be subject to surface water in the form of flood flows or base flows during the construction period.

The Contractor shall allow to divert and/or manage all surface water flows flood or base, during the construction period so as to protect property and the works, and shall make due allowance in his tender for all costs involved.

A14.4 Protection of Materials and Finishes

All protection of materials supplied pursuant to the provisions of the General Conditions of Contract shall be installed at the appropriate time and shall be removed at Practical Completion, or at such later time as the Superintendent directs.

A15. DILAPIDATION RECORDS

The photographic and written record of the condition of all existing properties, buildings, road surfaces and other relevant structures or facilities adjacent to, within 10 metres of the works, or in the opinion of the Contractor likely to be affected by the Works, shall be provided by the Contractor and used among other things as a means of assessing the responsibility for damage and/or making good arising out of the performance of the work under the Contract.

A copy of each record shall be made available for inspection, at the Principal's office.

Access to property for the purpose of making such records shall be effected through the Superintendent or a nominated officer of the Principal.

In respect of the provision of dilapidation records, the following shall prevail:

- a. The Contractor shall provide to the Superintendent, the dilapidation record of each affected property, etc., not less than seven (7) calendar days before any work starts within the precincts of that property.
- b. The Superintendent may suspend those parts of the Works for which dilapidation reports have not been provided until up to seven (7) calendar days after such reports have been provided to him.
- c. Notice of intent which shall have been approved by the Superintendent shall be given by the Contractor to the landowner. The notice shall define the Contractor's need for access to undertake a dilapidation survey, and the way in which arrangements will be made. The Superintendent will, where required, act as a facilitator to enable the Contractor to gain access, using such powers as the Principal shall vest in the Superintendent for that purpose.
- d. The dilapidation report shall be of a standardised format approved by the Superintendent.

A16. DAMAGE AND MAKING GOOD

A16.1 General

All fences and property of any description on the site of the works that is found necessary to be removed temporarily, or that may be disturbed or damaged, is to be made good or replaced by the Contractor in the same order and condition and in the same or equal approved material as were there at the commencement of the Contract, to the satisfaction of and within a time specified by the Superintendent. In this context, "property" shall be deemed to include planted areas, plants and trees.

Making good shall be applied to property or constructions demonstrably affected by settlement, soil subsidence, ground vibration, machinery impact or the execution of the Works generally.

A16.2 Road and Footpath Reinstatement

Roads and footpaths damaged by the Works shall be repaired in accordance with the relevant provisions of this Specification having regard for the following general provisions:

- a. Any concrete, paved surface, masonry surfaces, roadway, footpath, garden, planting strip, car park, kerb or other like property damaged and/or destroyed by the execution of the Works, or as a consequence of the execution of the Works, shall be replaced and/or made good by the Contractor at the Contractor's own expense, to the condition prior to commencement of the Works in the locality to the satisfaction of the appropriate authority and the Superintendent.

If after 48 hours of the completion of any drain or appurtenance in any area the Superintendent considers the cleaning up, making good or reinstatement to be unsatisfactory he will visit the area with the Contractor and in writing direct the Contractor to bring the area to the same condition as it was before the work commenced.

A16.3 Release of Obligation

Any works or structures passed as satisfactory pursuant to the provisions of this Clause shall not release the Contractor from his obligations under the Contract or to make good or maintain any settlement or damage caused by settlement to the date at which the Defects Liability Period expires.

A17. UNDERGROUND AND OTHER SERVICES**A17.1 Underground and Other Services**

- a. The Contractor shall give at least fourteen (14) days' notice to the appropriate Local Government Authority, Department for Transport, Energy and Infrastructure (DTEI), Department of Environment and Natural Resources (DENR), ETSA Utilities, Telstra, SA Water and any other authority or person, advising them of all works proposed to be constructed or installed. Special conditions applying to DTEI roads are contained in the Technical Specification (refer to Part B).

The location of services prior to commencing any work in any area shall be the responsibility of the Contractor.

The Contractor shall negotiate with all authorities and or owners of public and private services to determine the location of such services.

Notwithstanding that the Drawings may indicate locations of various services they are meant to be a guide only and the Principal shall not be held responsible for any inaccuracies or omissions. Every assistance will be given for the location of services but the Contractor will be responsible for any damage which may occur.

- b. In the event of any damage being caused to any structure or service in the execution of any excavation or works under the Contract, the Contractor shall immediately notify the Superintendent and the authority or person in control of the particular service.
- c. The Contractor shall repair or renew any damaged service or structure which he is permitted to do by the authority or person concerned and within a time limit if specified, to the satisfaction of such authority or person and the Superintendent.
- d. The Contractor shall be fully responsible, at his own cost, for any damage which in the opinion of the Superintendent has been caused to any water, sewer, gas, telecommunications, or other main or to any services, cables or fittings appertaining thereto by any works or operation under the Contract.

The Contractor shall also be responsible and at his own cost under his insurance for any damage caused to the Works by any fault not clearly attributable to another cause that may develop in any such mains or services while the Works are in their immediate locality.

- e. Any charges made by any Authority resulting from the repair or replacement of any damaged service pursuant to the foregoing (a) to (d) shall be borne by the Contractor.
- f. Charges by Service Authorities

The Contractor shall allow in his Tender for all other costs associated with his efforts in respect to locating, exposing, deeping of services and for the conduct of the works in and around such services.

Refer to Clause A17.2 for special conditions relating to work adjacent services.

A17.2 Special Conditions Relating to Work Adjacent Services

Works adjacent to and or crossing services in the following locations shall be subject to the special precautions and conditions set down by the Service Authority and as follows:

- No specific locations have been identified that will require special precautions to be taken during construction. However, the Contractor shall take all precautions necessary to avoid any damage to existing services. All services are to be located prior to works progressing in the immediate vicinity of the service.

A17.3 Alteration to Public Utilities

If, during the course of constructing the Works, the Contractor deems it necessary to have public utilities removed or altered to enable easier or quicker construction such removal or alterations will be arranged for by the Contractor and any costs incurred shall be paid by the Contractor unless such removal or alteration was necessary because of design anomalies in which case any costs incurred shall be paid by the Principal.

No alterations to public utilities, temporary or otherwise, shall be undertaken without the approval of the Superintendent.

A17.4 Undocumented Existing Underground Services

Where the location of existing underground services cannot be determined, after reasonable inquiry to the relevant authority or in the case of private property, the landowner or occupier, and services are encountered, obstructed and/or damaged in the course of executing the works, they shall be dealt with as follows:

- a. **IF THE SERVICE IS TO BE CONTINUED**, repair, divert or relocate it as the Superintendent instructs. In the case of water mains and property services in any road access way or easement, the Superintendent will instruct the Contractor to carry out or engage SA Water (or other Statutory Authority) to pre-cut and post-repair such services before or after trenching and pipe-laying operations. The Superintendent will issue a Variation to cover the cost of the work including any assistance required by the Contractor in excavating, backfilling, or otherwise supporting SA Water's (or the Statutory Authority's) activities in this regard.
- b. **IF THE SERVICE IS TO BE ABANDONED**, cut and seal or disconnect it as the Superintendent instructs.

In either case the requirement of any concerned authority shall be satisfied.

The Contractor shall endeavour to determine all underground service locations including previously undisclosed and undocumented services before commencing excavation in any location, and shall minimise the cost of dealing with them.

Having regard for the foregoing, the cost of dealing as above with "live" services not visible or whose location could not be ascertained by the Contractor from the appropriate authority or from the Contract will be allowed as a variation to the work under the Contract provided that the Contractor has taken all reasonable precautions before undertaking any relevant trenching, re-levelling, roadmaking, demolition or similar operations are concerned.

A18. TRAFFIC CONTROL AND SAFETY**A18.1 Traffic Control**

The Contractor shall, prior to the commencement of the work on the site, submit to the Superintendent his proposals for traffic movement around the works. After the proposals have been approved by the Superintendent, the Contractor shall be responsible for ensuring that the approved proposals are observed. Any changes to the approved proposals shall be subject to the prior agreement of the Superintendent.

The Contractor shall stage the works and provide adequate traffic control devices and the like to allow traffic flow to minimise traffic disruption at all times.

No Roadway shall be closed for any time without the express approval of the appropriate Authority and the Superintendent.

All lights, signs and barricades necessary for the protection of the public and to control traffic shall comply with the requirements of AS 1742 Part 3, and shall be supplied, placed and maintained by the Contractor.

A18.2 Public Safety

The Contractor shall supply and keep erected sufficient barricades to ensure public safety. Sufficient approved flashing lights and/or lanterns shall be supplied by the Contractor and kept lighted to give adequate warning to the public.

Approved flashing lights and/or lanterns shall be spaced at intervals not exceeding 30 metres along all roadways, lanes or properties where the work is in progress. All intersections involved shall be clearly lit. A penalty of two hundred dollars (\$200) per day per location will be imposed for failure on the part of the Contractor to fulfil the above conditions with respect to the lighting of work in progress.

Warning signs visible at night are to be supplied and erected in cross streets as well as in the particular streets in which work is proceeding, and also for warning motorists and pedestrians at night.

Any work, excavation or obstruction in any road shall also have speed restriction and warning signs erected.

The Contractor shall, before placing the restrictive speed limit sign, make arrangements with the Local Government Authority for the authorisation and issuing of a permit for the use of such signs.

The Contractor shall comply with all requirements and recommendations of the Code of Practice, Traffic Control at Works on Roads for the safety of workmen and motorists 1973 and subsequent amendments issued by the Road Traffic Board of South Australia.

The Principal shall have the right, upon the failure of the Contractor to erect adequate and sufficient barricades, warning signs, lights, etc., to carry out the necessary works and deduct the costs involved from payments due under the Contract.

A18.3 Unsafe Working Conditions

If at any stage during the course of the works conditions exist which in the opinion of the Superintendent are hazardous and threaten the safety of the Contractor's workmen, the general public or any private or public property, the Superintendent shall order the Contractor to cease operations and make good the unsafe portions of the works.

Work shall not recommence until the Superintendent shall have approved of the work made good as no longer being of a hazardous nature.

Should the Contractor fail to fully comply to the satisfaction in all things of the Superintendent with the Superintendent's instruction to make good the hazardous or unsafe portions of the work within the time ordered by the Superintendent, the Superintendent may without notice to the Contractor arrange for the carrying out of any works which in his opinion are necessary to relieve the hazardous and unsafe conditions and all costs incurred shall be borne and paid by the Contractor to the Principal who may deduct and retain the said costs from the Contract Sum.

A19. GEOTECHNICAL INVESTIGATION REPORT

A geotechnical investigation report has been prepared and included in the Contract documents. The report covers the main location involving the Works. It forms part of the Contract documents and is provided in association with the Technical Specification. It shall constitute in part the geotechnical evidence upon which the Contractor has priced and planned the Works.

The Contractor shall be entitled to discuss the geotechnical investigation with the Superintendent prior to commencing construction. It is an express condition that, prior to commencement of construction, the Contractor has fully informed himself regarding the contents of the geotechnical investigation report and satisfied himself as to its interpretation pursuant to Clause 12.1 of the General Conditions of Contract. If ambiguities or inconsistencies exist in the report and the Contractor has not queried them prior to commencement of construction, he shall be deemed to be liable for the consequences of such ambiguities or inconsistencies.

The Contractor is deemed to have made his own assessment of the geotechnical investigation report and as such is responsible for any information or interpretation he may derive from it. The geotechnical investigation report shall not be taken as any indication of the amount, extent or location of any rock, or water that may be encountered. If required, dewatering of the works and the excavation of rock shall be paid for in accordance with the provisions of the Technical Specification. No additional claims relating to the extent or location of groundwater or rock shall be considered.

The Contractor should pay close attention to any relevant section of the geotechnical investigation report in assessing the shoring requirements for the project. As stated in Clause B3.6.1 of the Technical Specification, the Contractor shall allow for all shoring requirements for this contract. No additional payments shall be made for shoring.

A20. LEVELS, SETTING OUT AND SURVEY MARKS

Existing levels at the time of the most recent survey are supplied for the assistance of the Contractor and are not intended to indicate every detail of the surface profile.

The Superintendent will provide on the Drawings, sufficient detail to enable the Contractor to establish the alignment and or location of drains and associated structures, and will give the level datum for convenient bench marks.

In addition to the provisions of the General Conditions of Contract:

- a. From this information the Contractor shall set out the whole of the works and shall accept the full responsibility for the alignment, levels and dimensions for all parts of the works. Any errors due to his inaccuracies shall be rectified at his own cost.
- b. The Contractor shall exercise proper care in the preservation of all alignment, reference and level pegs or marks set out for his use and that of the Superintendent. If such pegs

or marks are injured, lost or removed by the Contractor's operations, they shall be reset by or on behalf the Principal at the Contractor's expense.

- c. The attention of the Contractor is drawn to the appropriate sections of the Crown Lands Act and the Surveyors Act in regard to the care of survey marks.
- d. The Contractor shall not vary or amend the alignment, location or level of any drain line unless written approval is obtained from the Superintendent.

A21. INSPECTION

A21.1 Liability in Calling for Inspection

The Contractor shall notify the Superintendent as far in advance as possible and in no case less than 24 hours beforehand of his intended inspection program (for gravity drain and common main installation) or 48 hours' notice (for other works) under the requirements of any conditions of the Contract or this Specification.

No claim for delay shall arise from the giving of insufficient or unreasonably short notice.

If the Superintendent fails to inspect within reasonable time, the Contractor may proceed at his own risk only after he has given notification to the Superintendent of his intention to do so.

Notwithstanding the Superintendent's approval, the Contractor shall remain fully responsible for all workmanship and materials in accordance with details and dimensions of the Drawings and the Technical Specification.

A21.2 Inspection Before Concealment

Notwithstanding anything else in the Technical Specification or herein provided, all works to be concealed by the placement of further work on it, or be covered up or put out of view shall not be concealed, covered up or put out of view without prior inspection by the Superintendent.

A22. TESTING

All drain lines, tanks and pressure mains shall be tested to the satisfaction of the Superintendent prior to any claim for payment of the works.

If any replacement work or renewals carried out during the Defects Liability Period are of such a character as may affect the operational performance of the CWMS system or any portion thereof, the Superintendent shall give to the Contractor notice in writing requiring that tests on completion be made, in which case such tests shall be carried out forthwith. In considering the result of the test, due allowance shall be made for the conditions under which the plant or work has been used.

A23. LIABILITIES IN THE CASE OF MISTAKES MADE BY THE CONTRACTOR

Where as a result of poor workmanship or bad materials within the control of the Contractor, special testing, redesigning, or additional particular effort is required by the Principal, any consultant engineer or the Superintendent, the Contractor shall be liable to bear the costs of such testing, redesign or additional particular effort and such sum shall be deducted from payments due under the Contract.

A24. STANDARDS

A standard applicable to the Works shall be the edition last published prior to the closing date for Tenders unless otherwise specified.

Overseas standards and other standard documents named in the Specification shall be applicable in the same manner as Australian Standards to relevant materials and workmanship. Copies of any standards quoted or referred to in the Specification shall be kept on the site if so specified, or directed by the Superintendent.

A25. PLANT AND EQUIPMENT**A25.1 Constructional Plant**

Constructional plant necessary for the efficient execution of the works shall be heavy duty, in good mechanical condition, and not requiring other than routine maintenance during the tenure of the Contract. It shall be of such size and type, as will allow the Contractor to perform the work satisfactorily within the Contract Program and be adequate for the purpose.

Where in the opinion of the Superintendent the plant is inadequate for its purpose or in poor mechanical condition and not capable of satisfactory performance, the Superintendent may instruct the Contractor in writing to cease using the particular item of plant forthwith and to replace it at the Contractor's own cost with appropriate alternative plant which the Superintendent shall approve.

The Superintendent reserves the right to instruct the Contractor on the size, type and actual machinery to be used to complete works that are the subject of payment of PC items or work completed on a schedule of rates basis.

A25.2 Equipment, Gear, Tools, etc.

The Contractor shall supply, and make suitable and adequate provisions for the safe and proper storage of all tools, gear, materials, etc., as may be necessary for the complete performance of the works under the Contract.

A25.3 Idle Plant, Equipment, Gear, etc.

Where Variation Works are based on time charges, the Contractor may, in the event that it is required for no other purpose, be asked by the Superintendent to justify the retention of idle plant, etc. at the Site. If the Contractor cannot satisfy the Superintendent that it should be retained, the Superintendent may instruct on its removal and the time at which payment for the plant etc., will cease.

A26. MATERIALS AND WORKMANSHIP**A26.1 Generally**

Where possible, materials of Australian manufacture shall be used. Unless otherwise specified all materials shall be new. Condemned materials shall be immediately removed from the site.

All workmanship shall be such as to take account of movements of materials due to seasonal changes or other causes in the opinion of the Superintendent should reasonably be anticipated during construction and the Defects Liability Period.

A26.2 Sealed Containers

Manufactured products which are distributed in closed or sealed containers shall not be taken on to the Site unless in the original container and with the manufacturer's seal intact.

Failure to comply with this requirement may result in rejection of the material or product.

A27. MANUFACTURER'S DIRECTIONS

Where by way of instructions on containers, user manuals, manufacturers' pamphlets, specifications or the like, the manufacturer of any product used in the Works gives directions as to their use, operation, installation or the like, the manufacturers' directions so given shall be strictly observed.

A28. PROPRIETARY ITEMS

A proprietary item shall be any item identified by graphic representation on the Drawings, or by naming one or more of the following: manufacturer, supplier, installer, trade name, brand name, catalogue or reference numbers, and the like.

The identification of a proprietary item shall not necessarily imply exclusive preference for the item so identified, but shall be deemed to indicate the required properties of the item, such as type, quality, appearance, finish, method of construction, performance and the like.

A similar alternative item having the required properties may be offered by the Contractor. The Superintendent may in his absolute discretion adopt or reject the alternative. No claim shall arise from any rejection, nor, unless otherwise agreed, shall adoption of an alternative be ground for any claim for variation to cost or time.

When offering an alternative for approval, the Contractor shall provide all available technical information, and any other relevant information requested by the Superintendent. If so requested, the Contractor shall obtain and submit reports on relevant tests by an independent testing authority.

The Contractor shall state whether the use of the alternative will require alteration to any other part of the Works. If the alternative is adopted, the Contractor shall carry out any such alteration without extra charge.

A29. SALVAGED ITEMS

Unless otherwise specified, materials, plant, equipment or other things salvaged from the Works shall remain the property of the Principal and shall be disposed of by the Contractor within the Principal's area of jurisdiction as directed by the Superintendent.

A30. UNOBTAINABLE MATERIALS – SUBSTITUTION

The Contractor shall make every effort to obtain the materials and goods required for the carrying out of the works in the units of measurement as set out in the Contract.

Notwithstanding the preceding paragraph, if, during the progress of the Works, the Contractor discovers that any materials or goods are not reasonably procurable in the units of measurement set out in the Contract in time for inclusion in the performance of the Contract, he shall notify the Superintendent in writing and seek his instruction.

Where the Contractor seeks to substitute any other material for a specified material, in the interests of the Contract for whatever reason, he shall first obtain the Superintendent's written approval. In seeking such approval, the Contractor shall allow ample time for discussion, decision, ordering and delivery.

A31. PROVISIONAL COST ITEMS

The "Unit Rates" tendered for Provisional Cost Items shall include allowance for all incidental and consequential costs, such as overhead, profit, direct and indirect costs, and any effect on the work to be carried out and paid for as a Provisional Cost, including any consequential costs incurred by the Contractor as a result of any effect on the Contractor's rate of production.

A32. HANDOVER

A32.1 Certificates and Guarantees

The Contractor shall obtain and hand over all certificates and guarantees required by the Contract to be provided to the Principal through the Superintendent on completion of the Works.

A32.2 Appointed Person

The Principal shall before the date of Practical Completion have appointed a person ("The Appointed Person") to be responsible for receiving the works at Hand Over (Practical Completion) and thereafter be responsible for their operation and maintenance. The Contractor shall co-operate with the Appointed Person and the Superintendent to:

- a. Explain the details of the Works to the Appointed Person;
- b. Demonstrate the operation of all installed plant and equipment;
- c. Demonstrate procedures in gaining access to the plant and equipment;
- d. Demonstrate trouble-shooting procedures;
- e. Demonstrate plant and equipment replacement procedures, and
- f. Provide copies of all brochures, manuals, manufacturer's instruction, valving and wiring diagrams to the Superintendent and explain them to the Appointed Person.

In making the foregoing provisions, the Contractor shall allow, in his tender, a sufficient number of days to inform and instruct the Appointed Person.

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Part B

TECHNICAL SPECIFICATION

B1. MATERIALS AND EQUIPMENT

B1.1 GENERAL

The Contractor shall supply all materials and equipment required for the Contract. Materials and equipment may include the following and shall conform with the Standards specified herein.

B1.2 PIPES, FITTINGS AND JOINTING MATERIALS

B1.2.1 Pressure Mains

Pipe material shall be either medium density polyvinyl chloride (PVC-M) or high density polyethylene (HDPE) as shown on the Drawings.

Where PVC material is specified, pipes shall have ends formed for rubber ring joints or be solvent welded and shall be PVC-M and of a class as detailed on the Drawings, conforming with AS 1477. Fittings for Class 9 pipe shall be Class 12, with all other fittings matching the class of the adjacent pipe and shall be conforming with AS 1477.

Irrigation mains shall either be manufactured in lilac, have a lilac stripe or be plain black or white with marker tape stating Reclaimed Water installed 200mm above the pipe.

B1.2.2 Rubber Rings

Rings shall be of Styrene-Butadiene or Natural Rubber with a Durometer hardness in the range 41 to 50 measured at 10 seconds delay at 20°C and shall conform with AS 1646.

B1.2.3 Gravity Drains

Pipes and fittings shall be of PVC-U Class DWV, plain/solid wall complying with AS 1260.

Pipe ends shall be formed for solvent welded joints.

B1.2.4 Cleaning Fluid and Solvent Cement

Supply solvent cement, coloured, suitable for use with PVC-U pipe and fittings in accordance with the manufacturer's directions. Solvent cement to be of the slow-setting type unless otherwise approved.

Supply cleaning fluid compatible for use with and of distinctively different colour to the solvent cement in accordance with the manufacturer's directions.

B1.2.5 Ductile Iron Cement Lined (DICL) Pipes and Fittings – Not Applicable

B1.2.6 Nuts, Bolts, Washers & Gaskets for Pipe Flanges, Checker Plate Covers, Frames and Fittings

Bolts shall be in accordance with AS 1110. Sizes used shall be in accordance with AS 2129 for the flange diameter and table being joined.

Nuts shall be in accordance with AS 1112.

Washers shall be in accordance with AS 1237.

Nuts, bolts and washers shall be high tensile stainless steel (refer to Clause B1.2.9).

All prefabricated brackets, rails, checker plate covers, frames and fittings shall be hot dipped galvanised after manufacture in accordance with AS 1650.

B1.2.7 Galvanised Steel Tube and Fittings

Galvanised tube and fittings shall comply with the requirements of the latest editions of the relevant Australian Standards unless otherwise specified.

B1.2.8 Polyethylene Pipe and Fittings

Polyethylene pipe and fittings shall be HDPE PE100, with a PN rating as detailed on the drawings, for pressure applications conforming with AS 1159.

All joints shall be made by electro fusion welding or with flanges using stainless steel backing rings, with stainless steel bolts, washers and nuts.

B1.2.9 Stainless Steel

Stainless steel piping, fittings, brackets, fixings, bolts, nuts etc. shall be grade 316 conforming with the latest edition of AS 1204.

B1.2.10 Pipe Brackets, Supports and Fixings etc.

All pipe brackets, supports and fixings, etc., shall be hot dip galvanised unless coming into contact with the effluent, in which case they shall be stainless steel. Any brackets, supports and fixtures, etc., that require fabrication shall be hot dip galvanised after manufacture. All nuts and bolts used shall be high tensile stainless steel.

B1.2.11 Sealant for Openings in Concrete Structures

Sealant for pipe penetrations through concrete structures shall be Fero-Pre, Mega-Poxy Paste P1 or other equal approved material.

Only unopened containers shall be supplied to the site and any sealant shall be liable to rejection if the shelf life specified by the manufacturer has been exceeded.

B1.2.12 Geotextile Fabric

Geotextile fabric shall be a non-woven needle punch Geotextile weight not less than 180g/m²

B1.3 VALVES

Valves shall be located within a separate valve chamber or within the pump shed as shown on the Drawings and be of a size matching the pump outlet port.

B1.3.1 Gate Valves

Less than 80mm nominal bore shall be dezincified bronze or equivalent to AS 1628.

80mm nominal bore and greater shall have a flanged, cast iron body with stainless steel spindle, gun metal wedge and be fully coated with fusion bonded epoxy coating internally and externally to AS 2638.

B1.3.2 Non Return Valves

80mm nominal bore and greater shall be a flanged, cast iron body, swing check valve to AS 3578, and shall be fully coated with fusion bonded epoxy coating internally and externally to AS 2638. Where no flow switches are specified, use Amiad wafer style check valve "NR-020" with microswitch to activate a no-flow signal.

B1.3.3 Air Release Valves

Air release valves for pressure mains shall be Amiad valve Models AV-010 and D-025. Air release valves shall be sited during construction in the approximate locations shown on the Drawings.

B1.4 PIPE BEDDING

The Contractor shall allow in his tender to import all pipe bedding material for all drains.

B1.4.1 Sand

The sand shall be clean, sharp, non-plastic and obtained from naturally occurring deposits or from the crushing of rock.

At least 95% of the material shall pass a 6-7mm sieve and not more than 10% shall pass a 0.075mm sieve.

It shall be free from clay lumps, stones, organic material, or other deleterious matter including noxious weeds and shall be of such a quality as to be capable of being wetted and proper and adequate compaction to the specified standards.

B1.4.2 10mm Aggregate

The coarse aggregate shall be clean quarry screenings or approved screened gravel, free from loam, soft particles and foreign matter and shall meet the following laboratory requirements.

Passing a 9.05mm sieve - at least 95%

Retained on a 2.36mm sieve - at least 95%

B1.5 BACKFILLING

The Contractor shall assume in his tender that all initial fill can be sourced from site, unless:

- the trench is being constructed under Clause B3.4 Dewatering,
- 10mm screenings are required as a pipe bed, or
- the pipe invert is below the prevailing water table level.

B1.5.1 Sand

Sand for backfilling shall be as per Clause B1.4.1.

Subject to the above, where sand is naturally occurring in the excavation this may be used for the backfilling of trenches (where the invert of the pipe is above the naturally occurring ground water level) provided it complies with the requirements of the last paragraph of Clause B1.4.1.

B1.5.2 Ordinary Fill

Ordinary fill shall be any soil or soil-aggregate mixtures, excluding expansive clays with a maximum lineal shrinkage of 2% to 8%, which have a maximum aggregate size of 75mm. It shall be free from organic and foreign matter and be capable of compaction in layers to form a dense, stable fill.

B1.6 PAVEMENT MATERIALS**B1.6.1 Quarry Rubble**

Quarry rubble shall conform to DPTI Specification PM 1/20QG or be otherwise approved by the Superintendent.

B1.6.2 Crushed Rock

As specified in DPTI Specification PM 2/20QG.

B1.6.3 Bituminous Emulsion

Shall be grade ARS Class 170 conforming with AS1160.

B1.6.4 Aggregate

Shall be clean dry crushed rock having the following properties:

Sieve Size	% 10mm Passing	% 5mm Passing
13.2	100	
9.5	85 - 100	
6.7	0 - 15	100
4.75	0 - 5	85 - 100
2.36	0 - 2	0 - 15
1.18	0 - 1	0 - 5
0.425	-	0 - 2

Flakiness Index – 35 Max
Los Angeles Hardness – 35% Max
Sulphate Soundness – 12% Max Loss

B1.6.5 Cold Mix

Cold mix shall consist of:

Aggregate: Aggregates shall be as clean as possible (washed if necessary) and shall meet the following sieve analysis.

Sieve Size	% Passing
9.5 mm	60 - 100
4.75 mm	40 - 60
2.36 mm	36 - 45
0.75 mm	0 - 2

Emulsion Content: A bitumen content of 5 to 6% is required.

B1.6.6 Materials Sampling and Testing

The sampling and testing of all materials used in the construction and formation of pavement works, trench bedding and backfilling, shall be arranged and carried out at the expense of the Contractor.

The sampling and testing shall be carried out in accordance with the relevant requirements of AS 1289. The testing shall be carried out by an independent N.A.T.A. registered testing laboratory.

Copies of the test results shall be provided to the Superintendent for his approval at least seven (7) days before use of the material in the Works.

If during the progress of the works the materials, from sources originally approved, change in properties, or alternative sources are proposed, further samples shall be tested and the results submitted for the Superintendent's approval.

Any material which does not meet the specified requirements may be rejected and shall then be removed from the site by the Contractor and replaced at his own expense.

B1.7 CONCRETE MATERIALS**B1.7.1 Cement**

Portland cement - Type D (**Sulphate resistant**) shall be of approved brand to comply with the current Australian Standard Specification. **Sulphate resistant cement shall be used in all concrete or mortar that will come into contact with the septic tank effluent.**

B1.7.2 Water

Water shall be clean potable water free from deleterious substances.

B1.7.3 Fine Aggregate

The fine aggregate shall conform with AS 1465 and be clean sharp calcareous sand free from loam, clay, silt, vegetable matter, fine dust or other impurities.

B1.7.4 Coarse Aggregate

The coarse aggregate shall conform with AS 1465 and be clean, free from loam, soft particles and foreign matter and shall meet the following gradings.

Passing a 19.05mm sieve - at least 95%
Retained on a 4.76mm screen - at least 95%

Calcareous aggregate shall be used where the concrete will come in to contact with the septic tank effluent.

B1.7.5 Cement Mortar

Cement mortar not in contact with stormwater and unless otherwise specified shall be composed of one part Portland Cement, two parts fine aggregate properly mixed with a minimum amount of water necessary to render the mix workable.

B1.7.6 Concrete

Concrete not in contact with stormwater and unless otherwise specified shall be composed of Portland Cement, fine aggregate, coarse aggregate and clean potable water thoroughly mixed and comply with the following:

General concrete	characteristic compressive strength, F'C of 25 MPa at 28 days, 80mm slump
Concrete used in pump sumps	characteristic compressive strength, F'C of 40 MPa at 28 days, 80mm slump

B1.7.7 Steel Reinforcement

Supply reinforcement as detailed, together with tie wire and support chairs necessary for fixing, generally complying with AS 1480 Section 6, free from loose scale, rust, oil, grease or other coatings, bundled and tagged for identification.

Use reinforcing bars complying with AS 1302, fabric complying with AS 1304 and wire for wrapping structural steel members complying with AS 1250.

B1.7.8 Precast Concrete Components

Maintenance holes (if required) shall be totally precast manufactured, using **sulphate resistant cement and calcareous aggregate**, as shown on the Drawings or otherwise approved by the Superintendent. The minimum cover to reinforcement bars and tendons, on the internal surface of the maintenance hole, shall comply with the requirements of AS 3735, exposure classification "D", Table 4.2 and/or 4.3.

Pump sumps (if required) shall be totally precast, manufactured using **sulphate resistant cement and calcareous aggregate**, as shown on the Drawings or otherwise approved by the Superintendent. The minimum cover to reinforcement bars and tendons, on the internal surface of the pump sump, shall comply with the requirements of AS 3735, exposure classification "D", Table 4.2 and/or 4.3.

Certificates from the manufacturer certifying the use of sulphate resistant cement and calcareous aggregate shall be submitted to the Superintendent prior to the installation of any precast concrete component.

Pump sump covers shall be checker plate covers manufactured as shown on the Drawings and complying with Clause B1.2.6 of this Specification.

Openings through precast components shall be precast or saw cut. Chiselled openings shall not be permitted.

B1.8 FERROUS COMPONENTS**B1.8.1 Maintenance Hole Covers (Cast Iron) – General**

Maintenance hole covers shall consist of a cover and its metal frame as a unit. Circular covers manufactured by one maker shall be interchangeable in any frame.

The Contractor shall provide a corrosion-inhibiting coating to all cast iron surfaces. Details of the proposed coating shall be submitted for approval prior to application.

The makers name shall be cast into the top surface of the cover or frame.

The cover shall consist of cross webbed, cellular construction with the ribs uppermost to allow later infilling with concrete. Cover keyholes shall positively locate lifting keys and shall be fitted with plastic plugs. Keys shall rotate clockwise to stop in key holes.

B1.8.2 Materials

Cover and frame shall be of cast iron grade T200 in accordance with AS 1830.

Frame bolts shall be hot dip galvanised.

B1.8.3 Tolerances and Dimensions

The maximum tolerance on mating face alignment and segmented cover surface level shall be 0.25mm. The horizontal and vertical mating faces of the cover and frame shall be machined to permanently eliminate movement due to traffic and to provide a gas tight and waterproof seal when coated with the equivalent of 0.25mm of grease.

Bearing surfaces shall be at least 20mm wide for light duty covers and 30mm wide for heavy duty covers.

Matched covers and frames shall provide a clear opening of 600mm diameter for circular covers as specified or shown on the Drawings.

B1.8.4 Identification Disk

The identification disk shall be made from cast iron grade T200 in accordance with AS 1830 cast as detailed on the Drawings.

B1.8.5 Checker Plate Covers, Frames and Fittings

Shall be fabricated as detailed on the Drawings and hot dip galvanised all in accordance with Clause B1.2.6.

B1.9 FENCING

All fencing shall be constructed and positioned as shown on the Drawings:

B1.10 STORAGE POND LINERS

B1.10.1 HDPE Liner

The HDPE liner shall be 1.5mm thick and shall have the following properties:

PROPERTY VALUE	UNIT	NOMINAL
Thickness	mm	1.5
Density	g/cc	0.94
Tear strength at break	lbs/in	243
Tensile strength at yield	lbs/in	130
Dimensional stability each direction	%	+/-2
Puncture resistance	lbs	119

B1.10.2 Tender Allowance

The Contractor shall allow in his Tender for the use of 1.5mm HDPE liner.

Alternative proposals will be accepted for the use of a GSL to seal the base of the lagoon.

The Contractor shall ensure that all penetrations through the liner such as inlet pipes etc. are booted, to seal the lagoon.

B1.11 PUMP SHEDS AND HOUSINGS

All pump sheds and pump housings shall be manufactured using only galvanised steel tube, C-sections, channels, etc. and shall be clad with colorbond steel sheeting. All bolts, rivets and fixings shall be galvanised. All external cladding shall be fixed with colour coated fixings to match cladding.

B2. CONCRETE CONSTRUCTION STANDARDS**B2.1 SCOPE**

Unless concrete components are made by an approved pre-cast concrete manufacturer, they shall be cast on site using ingredients complying with Section B1 of this Technical Specification and conform with the following mixing and construction standards.

B2.2 MIXING

The selection of the mix materials and proportions of the mix to achieve the specified concrete standard shall be the responsibility of the Contractor.

B2.2.1 Site Mixed Supply – Concrete

STANDARD: To AS 3600, Clause 19.1, in an approved plant complying with the relevant requirements of AS 1379 including Sections 1, 2, 3, 4, 5, 6 and Appendix A.

ELAPSED TIME: Site mixed concrete is liable to be rejected if the elapsed time between the wetting and the discharge of the mix exceeds 45 minutes.

MIXING TIME: Not less than 90 seconds for mixes of 1m³ or less. Increase by 30 seconds for each additional cubic metre or part thereof.

EMERGENCIES: Mixing by hand in emergencies is not permitted.

B2.2.2 Ready-Mixed Supply – Concrete

STANDARD: To AS 1379, from an approved supplier. Deliver in agitating trucks.

ELAPSED DELIVERY TIME: Concrete is liable to be rejected if the elapsed time between the wetting of the mix and the discharge of the mix at the site exceeds the following:

CONCRETE TEMPERATURE at time of discharge	MAXIMUM ELAPSED TIME (hours)
10°C - 24°C	2.0
24°C - 27°C	1.5
27°C - 30°C	1.0
30°C - 32°C	0.75

DELIVERY DOCKET: The Contractor shall obtain a docket with each batch, containing the information required by AS 1379 Clause 1.7.3, and stating in addition:

- the concrete element or part of the works for which the concrete was ordered;
- the total amount of water as delivered and the amount to be added at the site; and
- the source of the coarse aggregate.

The Contractor shall keep all dockets and make them available to the Superintendent on request.

SITE ADDITIONS: The Contractor shall not add water or any other material to the concrete at the site without approval.

B2.2.3 No-Fines Concrete – Concrete

MATERIALS: Cement and coarse aggregate.

Aggregate grading:	Sieve size (mm)	% passing
	37.5	100
	19	95-100
	9.5	0-5

PROPORTIONS: (Aggregate: cement): 6:1 to 8:1 by weight.

WATER/CEMENT RATIO: 0.35 to 0.45 by weight.

B2.2.4 Inspection

The Contractor shall give the Superintendent 24 hours' notice (for gravity drain and common main installation) or 48 hours' notice (for other works) so that an inspection may be made of the following:

- completed form work,
- reinforcement fixed in place,
- cores and embedments fixed in place, and
- placing concrete.

B2.2.5 Rejection – Concrete

The Superintendent may reject concrete on the basis of:

CRITERIA: To AS 3600 Clause 19.1.7.

The Contractor shall remove rejected concrete to the extent determined by the Superintendent at no cost to the Principal.

The Superintendent may permit the retention of concrete liable to be rejected, on the basis of:

- An appraisal of the statistical information related to the concrete strength;
- A structural investigation;
- Additional tests (e.g. to AS 3600, Clause 19.1.7.3); and/or
- Approved remedial work.

B2.2.6 Formwork

Formwork shall conform to AS 3610 so that concrete, when cast in the forms, will have the dimensions, shape, location and surface finish required by the Contract.

The Contractor shall be, responsible for the sufficiency of the formwork, except to the extent, if any, that formwork design is shown on the Drawings or specified.

If formwork fails to meet the requirements of the Contract, the Superintendent may reject it and any concrete which has been cast in it. In that case, remove the rejected concrete, form construction joints, reconstruct the formwork and recast the concrete.

B2.2.7 Dimensional Tolerances – Concrete

The formwork shall conform with Class 3 as described in AS 3610 and shall have a:

- maximum deviation of 20mm from the correct position; and
- maximum misalignment of 2mm between pours or across joints with a maximum finish or recess of 3mm.

B2.2.8 Formed Surfaces

Formed surfaces shall be Class 3 for exposed surfaces and internal faces of maintenance holes and pump stations and Class 5 on all other surfaces.

B2.2.9 Lost Formwork – Concrete

Permanent or lost formwork, if required, shall be incombustible, shall not contain calcium chloride, and shall not impair the structural performance of the concrete.

B2.2.10 Form Coatings – Release Agents

FORM COATINGS – shall conform to AS 3610, Clause 5.4.1

RELEASE AGENTS – shall conform to AS 3610, Clause 5.4.2

FORMWORK REMOVAL – shall conform to AS 3610, Clause 5.4.3

B2.3 PLACING**B2.3.1 Weather Conditions**

Concrete shall not be mixed or placed in temperatures less than 5°C and above 32°C unless approved by the Superintendent.

B2.3.2 Placing

Placing procedures shall generally comply with AS 3600 Clause 19.1.3.

The Contractor shall:

- Not attempt to move a mass of concrete along the forms to its final position. Movement may be by means of suitable clean chutes, troughs or pipes. The Contractor shall not use water to facilitate the movement.
- Limit the free fall of concrete to 1500mm per 100mm element thickness, by means such as enclosed chutes, access hatches in forms, and the like. As far as practicable keep chutes vertical and full of concrete during placement, with ends immersed in the placed concrete.
- Place concrete in layers not more than 300mm thick. Each layer shall be compacted before the preceding layer has taken its initial set, so that the two are blended by the compaction process.

Concrete exposed to rain before it has set, including during mixing, transport or placing, shall be liable to rejection.

B2.3.3 Compaction

Concrete shall be compacted in accordance with the provisions of AS 3600 Clause 19.1.3 using approved concrete immersion vibrators. Concrete shall be vibrated to achieve a dense concrete. Care shall be taken not to over-vibrate concrete or for vibrators to come in contact with partially set concrete.

B2.4 CURING

Curing procedures shall conform to AS 3600 Clause 19.1.5.

The Contractor shall protect fresh concrete from premature drying and excessively hot or cold temperatures. Concrete shall be maintained at a reasonably constant temperature with minimum moisture loss for the curing period.

Unless otherwise specified, concrete shall be cured continuously until the cumulative number of days or fractions thereof, not necessarily consecutive, during which the air temperature in contact with the concrete is above 10°C, totals not less than the following:

- Concrete made with normal or sulphate resistant, Portland cement: = 7 days

B2.5 PROTECTION

The Contractor shall:

- protect the concrete from damage due to load over stresses, heavy shocks and excessive vibrations, particularly during the curing period; and
- protect finished concrete surfaces from damage from any cause, including mortar splashes and stains, timber stains, rust, stains, chemical attack, additives, curing compounds, protective coatings, rain, running water, and the like.

B2.6 PRECAST UNITS

B2.6.1 Standard

Precast units shall conform to AS 3850 Clause 24, to the other subsections of this Specification and, where applicable, to AS 3735. They shall be manufactured by an approved sub-contractor.

B2.6.2 Marking and Identification

Marking and identification shall conform to AS 3850, Clause 24.10. A replacement unit shall not have the same marking as the rejected unit it replaces.

B2.6.3 Handling Precast Units

Handling precast units shall conform to AS 3850, Clause 24.2.2.

The Contractor shall not place lifting attachments, holes and other temporary fixings for handling purposes on visible faces of units unless otherwise approved. Recess lifting attachments such as ferrules, or other types of cast-in fixings shall be provided and these shall have approved plugs for sealing. Remove temporary attachments after erection and seal or otherwise make good to approval any residual recesses.

B2.6.4 Installing Precast Units – Concrete

The Contractor shall fix precast units securely in their final positions within the specified tolerances. All necessary components and materials shall be supplied and fixed in place, including fixings, temporary fixings, braces, shims, jointing strips, sealant, flashings, grout, mortar and the like, as shown on the Drawings.

B2.6.5 Precast Dimensional Tolerance

Precast dimensional tolerances shall conform with tolerances stated in AS 3850.

B3. EXCAVATION, BACKFILL AND REINSTATEMENT**B3.1 NOTICE BEFORE COMMENCEMENT OF WORKS**

Before commencement of the works in any area and/or before entry into private property to carry out the works of the Contract, the Contractor shall give notice to the occupier(s) of land as set out in Clause A13.

B3.2 SITE PREPARATION**B3.2.1 Site Preparation**

The Contractor shall take all necessary precautions and care to avoid damage to existing services, fences or other improvements on or in the vicinity of the site and to minimise disturbance of any trees which are to remain after construction.

Trees shall be removed only where necessary for the construction of the works, where nominated on the Drawings or as otherwise authorised by the Superintendent. Where trees are removed, stumps and root systems shall be removed as directed by the Superintendent. The excavation shall be backfilled with Class "C" Ordinary Fill, material compacted in accordance with Clause B3.7.5.

The site shall be cleared only in those parts on which the works are to be carried out.

All clearing shall be carried out by the Contractor at his expense.

All materials resulting from the clearing shall be removed from the site, with the exception of any materials required to be retained by the property owner, by the Contractor at his expense.

B3.2.2 Topsoil

Topsoil shall be stripped from all areas where works are to be constructed and shall be stockpiled on the site to reinstate footpath areas, nature strips, batter slopes, allotments (including easements) and all other such areas to make good. Topsoil shall be imported if required. Minimum topsoil thickness to be 100mm.

Imported topsoil shall be clean, free from clay, stones, lumps, organic material and be obtained from an area free from noxious weeds and seeds. The source shall be approved by the Superintendent.

B3.3 EXCAVATION**B3.3.1 General**

All excavations shall have uniform vertical sides to the dimensions, levels, clearances and tolerances prescribed unless otherwise approved by the Superintendent.

The floor of excavations shall be trimmed to remove all intrusions and loose material to produce a firm sub-grade of a depth which will provide for a uniform sand or aggregate bedding beneath the drain or structure.

All excavated trenches shall have a uniform excavated width of not less than 450mm. The trench width shall otherwise be determined by the Contractor and shall be sufficient to allow unrestricted access for the preparation of pipe bedding and installation of the pipe and to allow for the thickness of all necessary shoring.

Not more than 200m of trench shall be opened by a drainage gang on a drain line unless approved by the Superintendent.

Excavation for maintenance holes, pump stations etc. shall be uniform in shape and of the minimum clearance outside the walls of the structure to permit safe access for making pipe connections and sealing joints.

B3.3.2 Hand Digging of Trenches

The Contractor shall allow in his tender for hand digging and backfilling of trenches in the following allotments to provide for areas which are made inaccessible by sheds and large trees.

Lot No.	Address	Length of Trench to be Hand Dug (in metres)
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None identified.

If the extent of hand digging varies from the length tendered, the Lump Sum shall be varied using the rate per linear metre tendered for Hand Digging.

The Contractor may determine that other sections of drain will have to be hand dug. If this is the case, these should be identified in the tender.

For the Contractor to be eligible to claim hand digging rates for a length of drain line, the section of trench must be inspected by the Superintendent and approval given to hand dig that section of trench.

B3.3.3 Mechanical Boring & PVC Sleaving

The installation of pipes by underground mechanical boring will be permitted, to avoid disruption to property, subject to the approval of, or at the direction of the Superintendent.

B3.3.4 Tolerances

The permitted tolerance of excavations shall not exceed:

- Sides of excavations $\pm 50\text{mm}$ from the specified position.
- Floor of excavation $\pm 25\text{mm}$ from the specified depth.

B3.3.5 Over Excavation

Over Excavation in Clean Sand

Over excavation in clean sand shall be backfilled to the design floor level with the excavated sand, compacted to 90% Standard Dry Density.

Over Excavation in Stable, Dry Conditions

Over excavation in stable, dry conditions shall be made good with lean mix concrete of approved strength characteristics.

Over Excavation in Soft Clays

Over excavation in soft clays shall be made good by placing an approved geotextile fabric on the over excavated trench floor, extending up the sides of the trench to at least the mid height of the pipe

The over excavation shall then be backfilled to the design trench floor level with imported material similar to the pipe bedding material, with cement treated quarry waste or other material

approved by the Superintendent, and shall be compacted to the satisfaction of the Superintendent.

All over excavation shall be made good by the Contractor at the Contractor's expense.

B3.3.6 Excess Soil and Rock

The Contractor shall remove, at his own expense, all excess soil and rock to a site or sites determined by the Principal. Such site or sites shall be within five (5) kilometres of the scheme limits.

The nominated site for disposal of excess soil and rock will be nominated by the Principal. This is open to discussion and can be negotiated upon award of the Contract.

The exact location within the nominated site shall be determined in consultation with the Superintendent.

B3.3.7 Excavation Under Obstructions

The Contractor shall allow, in his tender, for all hand digging involved in exposing and excavation adjacent to and under services, pipes, spoon drains and road kerbings etc., and all excavation shall be as far as practicable, be carried out by tunnelling. Any damage incurred shall be reinstated at the Contractor's expense to the satisfaction of the Superintendent.

The Contractor shall ensure that due care is taken to compact the backfill material under kerbs and services to the satisfaction of the Superintendent.

B3.3.8 Responsibility for Damage by Floodwaters, etc.

The Contractor shall be deemed to have fully informed himself concerning the rise and fall of any adjacent water courses in as far as it may affect his work and the Principal will not accept any responsibility for loss of, or damage to the structures, the Contractors plant or materials, due to flooding.

The Contractor shall be fully responsible and reinstate at his own cost any drain or structure which has been installed and subsequently damaged or adversely affected due to storm water, flooding or from any other cause during the currency of the Contract.

The Contractor shall be responsible for protecting all excavations from the entry of surface runoff produced by rainfall and shall make good damage caused by such runoff.

Should the Contractor interfere with or divert the natural flow of any watercourse, surface or stormwater such interference or diversion shall be approved by the Superintendent.

The Principal shall be fully indemnified by the Contractor against flood damage to the works to the date of the expiry of the maintenance period.

B3.3.9 Trenches Open Exceeding 48 Hours

If the Superintendent deems it necessary, he may order the Contractor to backfill any trench or excavation or part thereof where no work has been carried out over a period exceeding 48 hours. Should the Contractor fail to backfill such trench or excavation as directed the Principal may carry out the work and recover the cost by deduction from payments to the Contractor. The Contractor shall have no claim for any loss suffered by him in consequence of such direction.

B3.3.10 Excavation – Bituminised Roads

Where any excavation is to be carried out along or across any bituminised or sealed roads, the Contractor shall cut the sealed or bituminised surface with a carborundum or other approved type of mechanical saw or equipment. The saw cut shall be made to the full depth of the bitumen surface.

The Contractor shall allow, in his tender, to make two parallel cuts at a width 500mm wider than the intended trench excavation. The trench shall be excavated centrally within the saw cuts. In the case of a spray seal, the Contractor shall be permitted to make the cuts after the trench has been excavated. This will be done at the Contractor's discretion and any tearouts resulting from not pre-cutting the seal shall be reinstated at the Contractor's expense.

The width between the saw cuts shall allow for additional excavation width necessary to provide for shoring.

The Contractor shall carry out the excavation, placement and removal of shoring, dewatering equipment, pipe bedding and installation, backfill, compaction and reinstatement with all due care and in such away so as to prevent damage to the sealed surface outside the saw cuts.

Should any damage occur outside the area contained by the saw cuts, a new saw cut shall be made by the Contractor as directed by the Superintendent to provide a neat clean edge to match to when reinstating the seal.

The Contractor shall be responsible for all costs associated with such additional reinstatement, unless in the opinion of the Superintendent, that although the Contractor had taken due care, the damage/overbreak outside the saw cuts was unavoidable due to ground conditions or the nature or condition of the road base materials and/or surface, in which case the Contractor shall be paid for additional saw cutting, reinstatement of the road base and sealed surface at the rates provided in the Schedules submitted with the tender.

The Contractor should note that the rates submitted in the tender shall be examined against a predetermined quantity for the purpose of tender assessment.

B3.4 DEWATERING

B3.4.1 By Sump Pump

Where groundwater is encountered, the Contractor shall be responsible for dewatering the excavation in a safe and efficient manner.

Where possible, a sump pump shall be used, in association with aggregate pipe bedding and initial backfill, to maintain groundwater at 50mm below the invert level of the excavation.

The Contractor shall make due allowance in his Tender for all dewatering where ground water is encountered using sump pump techniques.

B3.4.2 Well Point Dewatering – Not Applicable

B3.4.3 Pipe Bedding in Ground Water

The Contractor shall allow in his tender for bedding and initial backfill in trench excavations requiring dewatering as follows:

Where the trench excavation requires dewatering, geotextile fabric shall be placed over the floor of the trench, extending up the sides of the trench to at least the mid height of the pipe before placement of the bedding material.

Bedding material shall be 10mm single aggregate bedding. Initial backfill over the pipe to a level of 200mm above the top of the pipe shall be as for bedding material, this shall be covered with geotextile fabric before placing any excavated and/or imported trench backfill material.

B3.5 ROCK EXCAVATION – PROVISIONAL SUM

The construction of the works may require the excavation of rock. The Contractor shall allow in his Tender a Provisional Sum for the excavation of rock. This sum could either increase or decrease according to field findings and measurement certified by the Superintendent and adjustment shall be made, in accordance with the General Conditions of Contract, at the rate provided by the Contractor with his Tender.

Providing levels etc. permit, a drain located in rock may be raised or relocated subject to the approval of the Superintendent.

B3.5.1 Use of Explosives

Under no circumstances shall explosives be brought to the site or used in connection with any part of the Contract, unless directed by the Principal in writing.

B3.5.2 Definition of Rock

For the purposes of interpretation, measurement and/or payment relevant to the term "rock" as mentioned throughout this Specification, rock shall be defined as only that material found in ledges, masses, bedded deposits and/or conglomerate deposits so firmly cemented and presenting the characteristics of rock which in the opinion of the Superintendent cannot be removed by using an excavator rated at 90kW (120HP) and would normally be removed by blasting, pneumatic tools or mechanical impactor.

Where due to limited access the use of a machine as above is impracticable, a side shift excavator rated at 56kW (75HP) will be approved.

Floater in trenches, foundations or similar excavations shall be classified as rock only when their least dimension exceeds 0.6m or where their volume exceeds 0.25m³.

Materials which, in the opinion of the Superintendent, could be excavated by the above rated plant such as broken shale, coastal limestone, weak conglomerates, etc. shall not be classified as rock for purpose of payment.

B3.5.3 Measurement and Payment of Rock Excavation

Note that this clause refers only to rock excavation for the drainage works (i.e. gravity mains, maintenance holes, flushing points, pump stations and pressure mains). If rock excavation is required for the treatment lagoons, storage pond and/or treatment plant, the Contractor shall inform the Superintendent prior to commencing rock excavation. An agreement shall then be negotiated between the Principal, Superintendent and the Contractor as to the payment structure.

Actual payment for rock excavation in drainage works shall be made on the following basis:

- The Contractor shall include in his tender a unit rate per cubic metre of rock excavation as set out in the Schedules submitted with the Tender.
- The unit rate shall be deemed to provide for all plant, equipment, labour and all additional costs to the Contractor, such as overhead and profit, associated with the existence of rock including all consequential costs such as decreased rates of production.

- The schedule rates shall apply to rock as measured jointly by representatives of the Contractor and the Principal.
- The rock shall be measured in the solid form, within the limits of the trench excavation, before any backfilling is placed, or new work commenced.
- The limits of the trench excavation shall be determined at 450mm maximum trench width. Where it is necessary to provide shoring within the excavation a maximum trench width of 600mm shall be allowed, or as approved by the Superintendent. Where common service trenching is provided the trench width, for the purpose of measurement of rock, shall be approved by the Superintendent.
- No payment shall be made for overbreak beyond the limits of the required excavation.
- The Contractor shall keep a daily record of the agreed volume of rock excavated, detailing:
 - the drain line no;
 - the chainage at which the rock was encountered;
 - the agreed volume of rock excavated; and
 - the rate applicable to the rock excavated.

These details shall be verified and certified by the Superintendent daily.

- The Contractor shall provide two copies of the verified certificate to the Superintendent for his records.
- Payment for rock shall be made only when the Superintendent deems the material to comply with the definition for rock.

B3.6 SHORING

B3.6.1 General

The Contractor shall allow in his Tender for all provisions for shoring. No additional payments will be made by the Principal for shoring of trenches or excavations.

The Contractor shall put in place and maintain such sheeting, bracing, timbering or a patent shoring system to prevent collapse of earth adjoining the excavation.

The system used shall be installed to protect the safety of workers in conformity with the provisions of the regulations under the Work Health and Safety Act and facilitate efficient construction practices.

If approval is given to batter or shelve the sides of trenches, no additional payment will be made. The Contractor shall meet the full costs of extra excavation and restoration and for any required increase in pipe strength. The responsibility for stability of any such battering or shelving shall remain with the Contractor.

For the purpose of preventing injury to persons or damage to property, the Superintendent may direct that any shoring more than 1.5m deep be left in place and the shoring above that level cut off and removed from the site.

The Superintendent may order the provision of shoring at any location deemed necessary to protect the stability of the excavation and the safety of workman and property. Any direction or lack of direction given by the Superintendent shall not relieve the Contractor of any responsibility regarding the provisions of shoring.

B3.7 BACKFILL**B3.7.1 Initial Backfill, Drains, Pressure Mains**

After the line and level of the drain has been approved by the Superintendent, the Contractor shall cover the drain with sand if the bedding is sand and 10mm screenings if the bedding is of screenings, to at least 200mm above the top of the drain. Such cover shall be spread uniformly over the full length and width of the trench and shall be compacted using hand compaction tools or by flooding to the satisfaction of the Superintendent.

The Contractor shall place the initial and subsequent backfill carefully and in such a way that the drain and appurtenances are neither damaged nor disturbed.

If conditions are such as to require screenings as bedding material and cover over the drain, the screenings shall be covered with a geotextile fabric for the full width of the trench prior to placing the backfill material (Refer also Clause B3.4.3).

B3.7.2 Backfill Generally

Following placement of the initial backfill and on receipt of approval by the Superintendent, final backfill shall be placed, spread and compacted as follows:

Within DPTI roads

Refer to DPTI "Specification for Works on Roads – Carried out for organisations other than the Commissioner of Highways."

(http://www.dpti.sa.gov.au/contractor_documents/works_on_roads_by_other_organisations)

Within Council roadways and other trafficable areas as defined herein

Class "B" backfill

Within footways

Class "C" backfill

Within private property

Class "D" backfill

B3.7.3 Backfill Class "A"

Shall be in accordance with;

- DPTI "Specification: Part 208 Reinstatement of Existing Pavements, Edition: Jan 2013"
- DPTI "Pavement Reinstatement Configurations, Edition: December 2012"

(http://www.dpti.sa.gov.au/contractor_documents/works_on_roads_by_other_organisations)

B3.7.4 Backfill Class "B"

Backfill Class "B" shall be of sand as specified in Clause B1.5.1 uniformly compacted in horizontal layers of 300mm loose thickness to not less than 95% of the maximum dry density (Standard) in accordance with AS 1289, to within 600mm of the finished level, and to not less than 98% (Standard) in accordance with AS 1289 at all levels above 600mm below finished surface to 200mm below the road pavement or finished surface level.

The top 200mm shall be backfilled with 20mm quarry waste as specified in Clause B1.6.1. and uniformly compacted to not less than 96% of the maximum dry density (Modified) in accordance with AS 1289.

B3.7.5 Backfill Class "C"

Backfill Class "C" shall be "ordinary fill", as specified in Clause B1.5.2., uniformly compacted in horizontal layers of 300mm loose thickness to not less than 95% of the maximum dry density (Standard) in accordance with AS 1289 to 100mm below the finished surface level. The top 100mm of the trench shall be backfilled with 20mm quarry waste compacted to 95% (Standard) in accordance with AS 1289.

B3.7.6 Backfill Class "D"

Backfill Class "D" shall be "ordinary fill" as specified in Clause B1.5.2 uniformly compacted in horizontal layers of 300mm loose thickness to not less than 90% of the maximum dry density (Standard) in accordance with AS 1289 to natural surface.

B3.7.7 Definitions

Roadway shall be all of the formed or unformed, sealed or unsealed portion of the road reserve not allocated as footpath.

Footpath shall be the formed or unformed, sealed or unsealed portion of the road reserve not allocated as roadway. Where the footpath is not clearly defined by kerbing or other means the width of the footpath area shall be three (3) metres from the boundary of the road reserve.

Private Property shall be all property not classified as road reserve.

For the purpose of the Tender, the following roads shall be classified as DPTI roads:

- Lincoln Hwy.

B3.8 REINSTATEMENT OF PROPERTY, PAVEMENTS AND FOOTWAYS

B3.8.1 Making Good

The Contractor shall make good without compensation, unless a specific Provisional Sum is provided, all damage caused to the existing buildings, ground, gates, fences, etc., and shall reinstate damaged paving in private premises to the same condition as they were before the work commenced.

Making good shall include making good settlement, soil subsidence and any damage or defect caused by settlement.

Any works or structure passed as satisfactory pursuant to the provisions of this Clause shall not release the Contractor from his obligations under the maintenance provisions of the Contract to make good or maintain any settlement or damage caused by the settlement to the date at which the maintenance period expires.

If after 48 hours of the completion of any drain or appurtenance in any area the Superintendent considers the cleaning up, making good or reinstatement to be unsatisfactory he will visit the area with the Contractor and issue such necessary directions to have the area brought to the same conditions as existed prior to the commencement of work. Should the Contractor fail to complete this work within the time specified by the Superintendent, the Principal may carry out the work and deduct the costs incurred from payments made to the Contractor under the conditions of the contract.

B3.8.2 Reinstatement of Roads & Footways

General

Any damage to any roadway or footpath during the carrying out of the Contract shall be made good, at the Contractor's own expense, to the satisfaction of the appropriate authority and the Superintendent.

Any paved surfaces, whether concrete or bitumen, that have been destroyed, damaged or removed by trenching operations or plant shall be reinstated by the Contractor to the satisfaction of the Superintendent (Refer also to Clause B3.3.10).

Roads Under Control of DPTI

- DPTI "Specification: Part 208 Reinstatement of Existing Pavements, Edition: Jan 2013"
- DPTI "Pavement Reinstatement Configurations, Edition: December 2012" and
- DPTI "Specification: Part 215 Appendix , Edition: April 2014."

(http://www.dpti.sa.gov.au/contractor_documents/works_on_roads_by_other_organisations)

Council Roads

Council roads shall be reinstated to match the existing pavement shape as follows:

Hotmix Asphalt Pavements

Where the existing surface is hotmix asphalt, the Contractor shall:

- a. Excavate to 30mm below the final level to allow for new asphalt.
- b. Trim and compact the crushed rock to not less than 98% of the maximum dry density (Modified) in accordance with AS 1289.
- c. Apply an emulsion prime CRS60 to the crushed rock at a uniform application rate of 0.55 L/m².
- d. Place and compact the Bituminous Hotmix by an approved method. The amount of Hotmix shall be sufficient to level out under the effects of compaction to result in a minimum compacted thickness of 30mm and to provide a smooth ride for passing traffic.

On completion of compaction, the Hotmix shall be dusted with fine aggregate to prevent "pick-up".

The Contractor shall schedule the Hotmix surfacing so that trenches are not left unsealed for an unreasonable length of time, as determined by the Superintendent, while avoiding working in excessively small sections.

Where reinstatement of the sealed surface is not to be carried out immediately after backfilling and compaction, the Contractor shall place the base course material up to the adjacent road surface level and open the road to traffic. The Contractor shall maintain the temporary road surface in a trafficable condition up until placement of the Hotmix.

Spray Seal Pavements

Where the existing surface is a spray seal, the Contractor shall use a 14mm/7mm double coat seal. The residual cold bitumen application rates shall be 1.3 L/m² and 1.1 L/m² and the spread rate shall be 90 m² per cubic metre and 130 m² per cubic metre respectively.

- a. Where the existing seal has been damaged beyond the initial saw cuts (refer Clause B3.3.10), the Superintendent and the Contractor shall agree on a seal width to best suit the section of road requiring reseal.
- b. The Contractor shall then box out the trench ensuring that a clean cut edge is obtained on the damaged section of road. This can be achieved with a mechanical saw or grader blade or other method approved by the Superintendent.
- c. The top 200mm of the trench shall be filled with crushed rubble (PM 2/20QG). The trench shall be left proud to enable trimming to be done prior to the application of the seal.
- d. The final surface of the basecourse is to be inspected by the Superintendent prior to applying the first coat of seal. The surface shall be a trimmed, uniform, tight matrix and shall be swept prior to seal application.
- e. The first seal coat shall be placed flush with the existing surface and be rolled with a pneumatic roller prior to the application of the second coat.
- f. The second coat shall overlap the first coat by 100mm and be rolled with a pneumatic roller to the satisfaction of the Superintendent.

Settlement

Trenches in Council roads shall be maintained in a safe trafficable condition throughout the duration of the Contract.

Reinstatement of Defective Roadways

Where the pavements of existing roads which are cut by excavations under the Contract are defective, the Contractor shall notify the Superintendent prior to the commencement of works so that the extent and standard of reinstatement can be agreed with the Superintendent prior to excavation commencing.

B3.8.3 Reinstatement of Footways

Footways shall be reinstated as for Council roads using the following pavement standards:

Earth Footways - reinstate with 100mm of compacted topsoil (refer to Clause B3.2.2) to match existing formation.

Gravel Footways - reinstate with 100mm of compacted quarry waste to match existing formation.

Paved Footways - pavement to match existing materials, shape and finish.

B3.8.4 Reinstatement of Defective Footways

As for Defective Road Pavements (refer to Clause B3.8.2).

B3.8.5 Compaction Testing – Provisional Sum

The Contractor shall include in his Tender a Provisional Sum for testing of compaction as judged necessary by the Superintendent.

Where compaction test results do not meet the required compaction standards, the Contractor shall be responsible for all re-work and testing associated with bringing the section of trench up to the required standard.

Testing shall be carried out by such persons as shall be approved by the Superintendent.

Testing shall only be paid for as a Provisional Cost when the testing is requested by the Superintendent. Any testing completed by the Contractor for his own records or quality system or any re-testing following a failure shall be at the Contractor's expense.

B4. GRAVITY DRAINS, PRESSURE MAINS & MAINTENANCE HOLES**B4.1 INSTALLATION OF GRAVITY DRAINS AND PRESSURE MAINS****B4.1.1 Storage and Handling of PVC & Polyethylene Pipes**

All pipes and fittings shall be handled in accordance with AS 2032 or AS 2033 as appropriate. Any pipe which, in the opinion of the Superintendent, is excessively bowed or distorted, shall not be used, and shall be replaced by the Contractor at his expense.

B4.1.2 Cooling of PVC Drains before Backfilling

Backfilling of the pipe should not proceed if the temperature of the pipe is likely to be significantly greater than the surrounding earth and the joints have not been given the time specified by the solvent manufacturer for curing. In these conditions, backfilling should be delayed until cooler conditions prevail (e.g. early morning) or the pipes should be cooled by filling the line with cold water, or as directed by the Superintendent.

B4.1.3 Excavation

As specified in Clause B3.3.

B4.1.4 Pipe Bedding

Where naturally occurring dry conditions are found to exist in the trench, drains and pressure mains shall be laid on a sand bedding.

Where the ground watertable, prior to the commencement of excavation and installation of the drain or pressure main, is above the base of the trench, the drain or pressure main shall be laid on a bed of 10mm aggregate except as provided for in Clause B3.4.3.

Prior to placement of the bedding, the Contractor shall obtain the Superintendent's approval to ensure that the base of the trench is free from uncompacted material and is sound and does not require any form of "stabilising treatment" to ensure adequate support of the drain or pressure main.

The bedding shall be spread, compacted and evenly graded over the full width of the trench to a uniform depth of not greater than 75mm below the underside of the drain or pressure main so as to provide uniform support for the drain or pressure main over its full length.

B4.1.5 Trench Base Stabilisation

If, in the opinion of the Superintendent, the condition of the trench is such as to indicate that stabilisation of the base is necessary to provide adequate support for the drain, the trench shall be over-excavated to 450mm below the normal bed level. A layer of geotextile fabric shall then be placed on the base of the trench extending 450mm up the sides of the trench. This shall be followed by a layer of cement treated quarry rubble which shall be tamped with the excavator bucket or similar and levelled to provide a uniformly graded sub-base 450mm thick, on which the bedding of screenings shall be placed as specified above.

The Contractor shall provide a unit rate in his Tender which shall be used as the basis of payment for this item. The unit rate shall be deemed to provide for all materials, plant, equipment, labour necessary to stabilise the trench as provided above and all additional costs to the Contractor, such as overhead and profit, associated with the necessity to stabilise the trench base, including all consequential costs such as decreased rates of production.

B4.1.6 Pipe Laying

a. Line and Level

The Contractor shall install all drains and pressure mains in accordance with alignments, levels and gradients shown on the Drawings and/or the Schedule of Levels provided in the Contract Documents. The work shall be carried out by a competent drain layer in accordance with the requirements of AS 2032 or AS 2033 as appropriate, together with AS 3500.2, and shall be to the satisfaction of the Superintendent.

b. Sequence and Tolerances for Pipe Laying

The laying of drains and pressure mains shall be commenced at the lower or outlet level and proceed to the higher level with pipe faucets, when laid, facing upstream. The pipes when laid to line and level shall be within the following tolerances.

Alignment $\pm 25\text{mm}$ and not more than 5mm deviation in any 3m length.

Level $\pm 10\text{mm}$ from design invert and not more than 5mm deviation in grade in any 3m length.

B4.1.7 Solvent Welded Joints – PVC

Solvent welded joints shall be formed in the following manner:

- a. The pipe end to be jointed shall be cut in a mitre box. All such cuts to be made square with the axis of the pipe being cut.

or

Cut the pipe end to be jointed using an approved pipe cutter.

- b. Remove all burs from the inside edge of the pipe and file the outer half of the spigot end to an angle of approximately 45° to the pipe axis.

- c. Clean both surfaces to be jointed with an approved dye impregnated cleaning fluid (Primer).

The depth of the socket shall be marked on the spigot end of the pipe. Another measured mark (not by means of scratching pipe) shall be placed outside the depth of the socket mark. An even thin layer of solvent cement shall be applied to both surfaces to be jointed so as to minimise excess solvent accumulating in the pipe after jointing.

Enter the spigot end into the socket and push home as quickly as possible to the full depth of the socket. Clean off surplus solvent cement. The joint should not be disturbed for ten minutes and not stressed for twenty four hours beyond that involved in testing as outlined in this Section. Jointing shall not be carried out in a damp atmosphere or in wet conditions.

The surfaces of the joint shall be dry during forming and made in accordance with the manufacturer's directions.

B4.1.8 Solvent Cement

The instructions of the solvent cement manufacturer shall be adhered to in every detail. The lid shall be kept on the container and lumpy or stringy cement shall not be used. Brushes shall be kept clean and soft.

B4.1.9 Expansion Joints and Fittings

Expansion joints and fittings shall be provided at the ingress side of each pumping sump.

Expansion joints shall be wrapped with "Denso" tape to seal against entry of tree roots. Each turn of the Denso tape shall overlap by half the width of the tape and shall extend 100mm beyond each end of the expansion joint.

B4.1.10 Rubber Ring Joints

Clean rings where necessary with soapy water only.

Wipe and clean out spigots, sockets and jointing collars before placing rings in position. Use jointing lubricant as recommended by the manufacturer.

Push spigots into sockets and collars to the manufacturer's witness mark on the pipe or fitting.

Do not use rings which have been stored on site for longer than 2 months.

All jointing is to comply with the manufacturer's recommendations.

B4.1.11 Backfill

Backfill shall be as specified in Clause B3.7.

B4.2 FLUSHING POINTS

The Contractor shall construct and install flushing points on main drainlines as shown on the ground and the Drawings and as otherwise specified.

When constructed the precast concrete base and cover shall be installed so that no weight is transmitted to the PVC-U riser (refer Drawings and Clause B4.1.6.).

There shall be a minimum of 75mm clear space between either side of the PVC-U riser and the precast concrete base and access cover.

The PVC-U risers shall be of the same diameter as the drain (100mm for 100mm drain and 150mm for 150mm drain and all main drains of diameters greater than 150mm shall have 150mm flushing point risers installed), and be sealed with a screw threaded access cap. The top of the access cap shall not extend above the level of the precast concrete base slab.

The Contractor shall allow in his tender to provide flushing points at locations as shown on the ground and in the Drawings or the schedule of levels.

B4.3 PROPERTY CONNECTIONS

The Contractor shall allow to install a 100mm diameter connection drain to each allotment as detailed and in the position and to the depth shown on the Drawings or as nominated by the Superintendent.

Allotment connection drains shall be installed before the drain into which they discharge is tested passed and backfilled.

Each property connection shall include an inspection opening, with 100mm diameter PVC-U riser, screwed access cap, precast concrete cover and timber bearers as shown on the Drawings.

When constructed the precast concrete cover shall be installed so that no weight is transmitted to the PVC-U riser (refer Drawings and Clause B4.1.6).

Where a drain does not pass through an allotment, the property connection shall be extended from the main drain junction to 300mm inside the allotment boundary.

Where a drain is located within the allotment served, the property connection shall extend not less than 1000mm from the main drain.

Each property connection drain shall be sealed as shown on the Drawings.

The trench for each property connection shall extend at least 150mm past the sealed end of the property connection and be filled with sand to the depth of the initial sand backfill.

B4.4 MAINTENANCE HOLES

The Contractor shall construct and install maintenance holes as provided for in this specification and in the Drawings.

B4.4.1 Excavation and Preparation of Sub-grade

The excavation for maintenance holes shall be the minimum uniform shaped excavation necessary to permit the installation of the maintenance hole and to allow external sealing of joints, pipe entries, etc.

The floor of the excavation shall be level and free from loose or soft material prior to placing the bedding material. The Contractor shall have the Superintendent inspect the excavation to determine whether additional treatment is required.

B4.4.2 Maintenance Hole Construction

Maintenance holes shall be as shown on the Drawings and may be of pre-cast concrete products manufactured in accordance with Clause B1.7.8.

The Contractor shall be responsible for checking ground or pavement surface levels prior to ordering materials to ensure that the manhole cover finishes flush with the surrounding ground or pavement surface.

All maintenance holes shall be constructed so as to prevent the ingress of any ground or surface water and egress of effluent.

The drainage channel in the floor of the manhole shall be formed to the shapes and dimensions shown on the Drawings using the PVC-U pipe to form the liner of the channel. The remainder of the manhole floor shall be concrete, finished to a steel trowelled finish as shown on the Drawings.

B4.4.3 Sealing of Maintenance Holes

Circumferential Joints

All maintenance hole circumferential joints on the interlocking pipes and the maintenance hole top slab (where made of precast components) shall be sealed with approve caulking sealant (butyl rubber based) "Everlevel" or similar, 25 x 15mm continuous strip installed in the compression mode, as required by the manufacturers instruction and as shown on the Drawings.

The joint shall be clean, dry and free from loose mortar or laitance.

The resultant void created on the internal face of the circumferential joint shall be filled with an approved sealant as provided for in Clause B1.2.11 to finish flush with the internal wall surface. The sealant shall be forced into the joint in such a way that the cavity is completely filled with the sealant to avoid air entrapment.

The joint between the cover slab and the maintenance hole walls shall be sealed as for circumferential joints.

Openings Through Maintenance Hole Walls

Holes cut in walls of maintenance holes to take inlet and outlet drains shall be neatly cast or machine cut to provide a uniform 15mm cavity around the pipes. The cavities shall be filled and sealed with an approved sealant as provided for in Clause B1.2.11.

The sealant shall be forced into the joint, working from the bottom upwards, such that the cavity surrounding the pipe is completely filled with the sealant to avoid air entrapment. A fillet of sealant shall be splayed off at 45 degrees on the internal and external surfaces of the maintenance hole.

B4.4.4 Backfill Around and Testing of Maintenance Holes

Backfill

The excavation around maintenance holes shall be backfilled in accordance with Backfill Class "A", Clause B3.7.3 of this specification.

Testing

Same as for testing of pump sumps (refer Clause B5.3).

B4.5 TESTING OF GRAVITY DRAINS

Maximum length of gravity drain for testing shall not exceed 300 metres without the approval of the Superintendent.

The Contractor shall supply all equipment and labour necessary for the pneumatic testing of drains.

The Contractor shall apply the test and maintain the drain under test during the backfilling procedures, or alternatively, the Contractor will be permitted to apply a test to the drain after backfilling is completed. Any defects to the drain are to be rectified at the Contractor's expense.

Property connections shall be installed before the drains into which they discharge are tested.

b. Testing of PVC-U Drains with Air

The Contractor shall provide airtight seals to all openings in the drain to be tested. Air shall be slowly introduced through a specially prepared stopper until a pressure of 50 kilopascals is obtained.

The air supply shall be cut off, and providing the pressure in the drain being tested does not fall below 35 kilopascals within 15 minutes the drain or section being tested will be considered satisfactory.

If the pressure is not maintained within the specified limits the Contractor shall determine the source of leak/s.

Any damaged and/or defective joint/s, fitting/s or pipe shall be made good or replaced to the satisfaction of and as specified by the Superintendent.

Following replacement of the damaged and/or defective joint/s, fitting/s or pipe the drain shall be retested and provided the specified pressures are maintained will be passed as satisfactory.

Testing equipment shall include a glass faced clock type pressure gauge at least 75mm in diameter calibrated 0 to 100 kilopascals.

c. Damage after Testing

The passing of the installation/s as acceptable on completion of testing shall not negate the Contractor's obligations to repair any faulty section of the work discovered after testing or where any section of the work is damaged during backfilling and/or reinstatement activities. Where defective, damaged and/or faulty sections of the work are so discovered or suspected, the Superintendent retains the right to direct further testing at the Contractor's expense.

B4.6 TESTING OF PRESSURE MAINS

The Contractor shall test all pressure mains for leaks after backfilling is carried out by the application of a pressure test of 1.5 times the maximum working pressure of the main under full pumping load or 300 kilopascals whichever is the greater. The main shall be deemed to be satisfactory when there is no evidence of leakage and the pressure is maintained for a period of not less than 30 minutes. The test shall be hydrostatic and the Superintendent shall be present when testing is carried out. Any defects or leaks discovered during testing shall be rectified by the Contractor and the main retested at his own expense.

The Superintendent reserves the right to require the Contractor to test the pressure main to a pressure not exceeding 75% of the manufacturer's recommended maximum working pressure.

B4.7 DRAINS OR PRESSURE MAINS UNDER CREEK BED – NOT APPLICABLE

B4.8 THRUST BLOCKS ON PRESSURE MAINS

B4.8.1 General

The Contractor shall construct concrete thrust blocks at all changes of direction and junctions of pressure mains, with the exception stated in Clause B4.8.2, in accordance with the Drawings. Concrete material properties shall comply with Clause B1.7.

B4.8.2 Electro Fusion Fittings

Where horizontal changes in direction or horizontal junctions are constructed using electro fusion fittings, the use of thrust blocks is not required. However, vertical changes in direction or vertical junctions constructed using electro fusion fittings still require the use of thrust blocks as per Clause B4.8.1.

B4.9 LOCATION MARKER POSTS FOR PRESSURE MAINS

The Contractor shall install location marker posts along the length of each pressure main.

Location marker posts shall be installed at all changes in direction and at intervals not exceeding 200 metres. The marker post shall be installed against a boundary line if possible, or

otherwise at a suitable offset to the pressure main, and located at 90 degrees to the bend or line of the pressure main. The marker post shall be fitted with a Photo Anodised 1mm aluminium plate having silver lettering on a black background. The distance from the marker post to the pressure main shall be stamped on the plate after installation (Refer to LGA Standard Drawing SD-18A).

B4.10 VALVES ON PRESSURE MAINS

All air bleeding, scour, non return and gate valves shall be installed in the direction and position shown on the Drawings and tested to ensure correct operation.

B4.11 GALVANISED STEEL PIPE BELOW GROUND

All galvanised steel pipe and fittings installed below ground surface shall be protected from corrosion by wrapping with "Denso" tape. Each turn of the Denso tape shall overlap by half the width of the tape.

B4.12 FLUSHING OF GRAVITY DRAINS

On completion of a pumping area, or the whole of the works, the Contractor shall flush all drains with clean, clear water to the satisfaction of the Superintendent.

The sequence of gravity drain flushing shall commence at the top end of the drain, following downstream. All property connections shall be flushed prior to flushing any drain. All branch drains shall be flushed in sequence with the main drain flushed after all branch drains.

Flushing shall be accomplished with sufficient flow through the drain to remove all sand, screenings, soil etc. that may have entered the drain during construction. The flow at the outlet end of the drains being flushed shall have a free fall into a pump sump at all times during the flushing process.

All drains, pump sump and maintenance holes are to be flushed clear and cleansed before any pump is operated.

On completion of drain line flushing there shall be no accumulation of water in the base of the drains except that which may result from the application of the tolerances provided for in Clause B4.1.6 of this Specification or as may be determined acceptable by the Superintendent.

Where the accumulation of water in the base of the drain is determined unacceptable the Contractor shall, at his own expense, determine the cause of the accumulation and take all necessary action to rectify the situation.

Where the Contractor's proposed method of flushing fails to clean the drains to the satisfaction of the Superintendent, the Contractor shall use the following method:

High Pressure Drain Line Flushing

Line flushing shall be conducted using a high pressure, high volume jet system. With a minimum flow of 200 l/min and a minimum pressure of 10,000kpa. Other methods of line flushing can be proposed by the Contractor but these must be outlined in their submission.

Where the allowance in the Tender for Drain Line Flushing does not include High Pressure Flushing the Contractor shall submit a price in the schedule of rates to complete all line flushing using the above method.

The Superintendent reserves the right to instruct the Contractor to use the above method at the rate stated in the schedule, should the Contractor's method of flushing prove unsatisfactory.

B4.13 FLUSHING OF PRESSURE MAINS

On completion of a pumping station and pressure main the Contractor shall flush the pressure main by operating the pumps using clean, clear water until the mains have a clean, clear flow to the satisfaction of the Superintendent.

B5. PUMP STATIONS**B5.1 EXCAVATION FOR AND CONSTRUCTION OF PUMP STATION**

The Contractor shall construct and install a pump sump, pump, electrical connections, control switch gear, connecting pipework, valves, electrical control cabinets, pump housing, etc. as provided for in this Specification and as shown on the Drawings.

B5.1.1 Excavation and Preparation of Sub-Grade for Pump Sump

The Contractor shall be responsible for checking ground or pavement surface levels prior to ordering materials to ensure that the pump sump cover finishes above the surrounding ground or pavement surface as shown on the Drawings.

The excavation for pump sump/s shall be the minimum uniform shaped excavation necessary to permit the installation of the pump sump and to allow external sealing of joints, pipe entries etc.

The floor of the excavation shall be level and free from loose or soft material prior to placing the bedding material. The bedding shall be a uniform compacted layer of 10mm screening of at least 100mm thickness placed over the whole of the excavation floor and shall be placed to the level of the underside of the pump sump base.

The Contractor shall have the Superintendent inspect the excavation prior to placing the bedding to determine whether additional treatment is required.

B5.1.2 Pump Sump Construction

Pump sumps shall be sealed to prevent the ingress of ground or storm water and the egress of collected effluent.

Holes cut in walls of existing pump sumps to take inlet drain/s, transfer pipes, vents etc. shall be neatly machine cut to provide a uniform 15mm cavity around the pipes.

B5.2 SEALING OF PUMP SUMPS**B5.2.1 Circumferential Joints**

The circumferential joints on interlocking pipes and all openings through pump sump walls shall be sealed as specified in Clause B4.4.3 of this Specification.

The joint between the cover slab and the pump sump walls shall be sealed as for circumferential joints.

B5.2.2 Openings Through Pump Station Walls

All penetrations through pump station walls shall be sealed in accordance with Clause B4.4.3.

B5.3 TESTING OF PUMP SUMPS

The pipes to the pump sump shall be sealed with stoppers and the pump sump filled to the top with water and allowed to stand for 24 hours. It shall then be topped up with water again and the drop in water level shall then not exceed 20mm in 24 hours. Water tests shall be witnessed by the Superintendent.

Where water loss exceeds this rate, the pump sump shall be emptied and the seals on all joints and entries resealed and cracked or defective sections of the pump sump repaired in a manner approved by the Superintendent and the chamber retested.

At the completion of the test the water shall be pumped from the sump.

The Contractor shall not backfill around the pump sump until the water test is complete unless otherwise approved by the Superintendent.

B5.4 BACKFILL AROUND PUMP SUMPS

The excavation around pump chambers shall be backfilled with sand complying with Clause B3.7.4 (i.e. Backfill Class "B").

B5.5 VALVE INSPECTION BOXES

All gate valves not in pump stations shall be placed in valve chambers with removable covers, "Everlevel", as shown on the Drawings.

The valve box may be located adjacent the pump sump as a separate chamber or may be constructed as a chamber within the pump sump, cast as an integral part of the pump sump, and be sealed from the main pump chamber.

The valve inspection box shall be constructed to the details and dimensions as shown on the Drawings or as approved by the Superintendent. The Contractor shall provide sleeves in the walls to allow for the entry and exit of any pipes through the walls. Such openings shall be no larger than 15mm greater than the size required, and shall be sealed as detailed in Clause B4.4.3. Backfill around valve inspection boxes shall be as for pump sumps.

B5.6 PUMP HOUSING (ABOVE GROUND PUMPS) – NOT APPLICABLE

B5.7 VENTING OF PUMP SUMPS

The Contractor shall supply and install, at each pumping sump, a 200mm internal diameter (unless otherwise shown on the Drawings) educt vent, prefabricated from heavy gauge steel pipe (5.4mm wall thickness), as shown on the Drawings, and hot dipped galvanised after manufacture.

The vent shall be located as shown on the plans, but not less than 3 metres from the pump sump and shall extend 12 metres in height above the top surface of the pump sump cover slab or as otherwise shown on the Drawings.

The vertical stack shall connect to the pump sump with 150mm diameter uPVC pipe surrounded with cement concrete as shown on the Drawings.

B5.8 INSTALLATION AND OPERATION OF PUMPS AND EQUIPMENT

The Contractor shall allow to install pumps, pumping equipment, pump housing, switchgear, control equipment, electrical wiring, pipework, etc. as shown on the Drawings, in accordance with the manufacturer's requirements and conforming to this Specification.

For the purpose of the Tender, the Contractor shall allow to provide the brand of pumps specified on the Drawings. Alternatives may be offered with full details of cost adjustment and material specification etc.

B5.9 PUMPS AND EQUIPMENT

B5.9.1 General

Materials and equipment used must be able to give a long operating life with a minimum of maintenance under the prevailing conditions. Sewerage effluent presents a highly corrosive environment.

Any pumping facilities that are "time critical" for processing of wastewater shall be equipped with two (2) pumps, each capable of full independent duty at the design flow and head.

B5.9.2 Submersible Pumps and Motors

a. General

Submersible pumps shall be of the sump base mounted type, with slide and lock system for connection to the delivery mains, and be provided with stainless steel guide rails for raising and lowering the pumps.

The pumps shall conform with the following performance requirements:

- The unit shall be able to operate over the full head range from full flow to no flow duties in either wet or dry well installation without overloading the motor. The cooling system shall be integral and adequate for all operating conditions.
- The unit shall operate in the vertical position.
- The pumps shall be suitable for the pumping of sewerage effluent without undue wear or corrosion to the casing, shaft, impeller or seals.
- The unit shall be resistant to the severe corrosion associated with sewerage effluent pumping stations and shall be lubricated sufficiently to allow long periods of operation without attention.
- Wear rings and seals should be constructed in such a manner as to preclude excessive wear from intrusive silt or grit.
- The pump shall be capable of passing a sphere not less than 38mm diameter or be of the cutter or shredder design.
- Pump installation shall be in accordance with the manufacturer's recommendations and specifications and any deviation from the Drawings and this Specification must be approved by the Superintendent.
- The pump shall be fitted with a moisture monitoring probe.

b. Pump Motor

The motor shall be:

- designed for 415 Volt 3 phase 50 Hertz electrical supply. Starting current shall not exceed six times the normal operating current. The motor shall be capable of not less than fifteen starts per hour without overheating.

- rated for non-overloading horsepower.
- totally enclosed oil immersed squirrel cage 50 Hz with dimensions and performance in accordance with AS 1359.
- water tight and of cast iron construction. Entry of water at the shaft shall be prevented by use of mechanical face seals installed in an oil filled chamber incorporating adequate pressure relief.
- fitted with an adequate length of cable and be completely sealed.
- fitted with 1000 Ohm PTC thermistors.

B5.9.3 Positive Displacement Pumps – Not Applicable

B5.9.4 Pump Bases and Beds (Above Ground Pumps) – Not Applicable

B5.10 CONTROL SWITCHBOARD AND SWITCHGEAR

B5.10.1 General

The Contractor shall supply and install the switchboard and switchgear and all associated wiring complying with this Specification, together with Australian Standard Wiring Rules AS 3000. The switchboard and switchgear shall be suitable for connection to a 415 Volts, 50 Hz, 3 phase 4 wire system, unless connection to a 240 volts, 50 Hz single phase supply is shown on the Drawings.

The switchboard shall be an enclosed type, front connected, dust proof and moisture proof, minimum IP54, constructed as detailed in the Drawings or as detailed in the Contractor's treatment plant design.

All push button selector switches, etc. which are to be normally operated shall be accessible from the front. Covers shall be removable without disturbing wiring to equipment. Hinged control panels may be used.

It shall be possible to operate all control gear selector switches, etc. and to read all meters, etc. without the removal of covers, or exposure to live parts within the switchboard.

Power circuit breakers shall be arranged for operation without the removal of covers, etc.

Switchboard construction and schematic wiring diagrams shall be submitted for approval before manufacture is commenced. Approval of the wiring diagrams by the Superintendent does not release the Contractor from his obligations under the Contract to ensure that the pumps operate in accordance with the requirements of this Specification.

B5.10.2 Control Equipment

Where the functions of the pump system as described in this Specification are controlled by Programmable Logic Control (PLC), the Contractor shall allow in the tender price to provide the Superintendent with a copy of the control function program for inclusion in the Operation Manual. The control function program shall be written to allow access by other than the control equipment manufacturer and be capable of function adjustment.

The Controls shall comprise some or all of the following equipment, as appropriate to the particular pump station being upgraded:

- Three phase isolator switch.

- Direct on-line contactors fitted with suitably rated three pole ambient temperature compensated thermal overload relays having positive single phasing protection characteristics.
- 240/24 Volt control transformer.
- Hour run indicators.
- Pump control "Manual - Off - Auto" single pole rotary switches.
- Duty Time Delay Relay.
- Alternate Duty step relay.
- Alarm cancel push button.
- Reset push button.
- Active alarms and alarm history..
- Lamp test switch to test external alarm warning light.
- Terminal strip to be provided for the termination of level regulator cables and wiring to all external equipment.

Control and fault condition inputs for:

- (a) High level
- (b) Thermal/current overload
- (c) High pressure (positive displacement pump only)
- (d) Low level (float controls only and storage pond pump)
- (e) Thermistor (motor winding temperature)
- (f) No flow (positive displacement pump only)
- (g) Moisture probe (submersible pump only)
- (h) Cyclic fault

The fault condition inputs are required to perform the functions outlined in Clauses B5.10.4 and B5.10.5.

Each alarm output shall have an associated pair of potentially free normally open contacts for connection to the remote alarm monitoring system.

Controls to be accessible from front cover:

- (a) Reset push button
- (b) Control switch (Man-Off-Auto)
- (c) Alarm cancel button
- (d) Hour run meter (reading 10,000 hours with 1/10 hour increments) – for each pump
- (e) Lamp test switch for external alarm warning light

B5.10.3 Level Control Switches

Level control switches shall be "mercury float" type of the fully sealed bulb style, or "Multi-Trode" 2.0/10 multi sensed probe or individual 0.2/1 probes for each sensor setting or equal approved control switching mechanisms, installed in accordance with the Drawings.

Where individual float or probe level controllers are used provision shall be made in the level control cables for alteration of the operating levels by plus or minus 1800mm.

B5.10.4 Control and Alarm Systems

The control and alarm system shall have the following protection measures:

a. High Level

High level indication at the holding tank shall be provided via telemetry to the control system.

The high level switch, if operated, shall energise a relay and activate the alarm. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required. The high level alarm shall shut down the pump.

b. Thermal Current Overload

Thermal current overload protection shall be provided.

Each thermal current overload relay, on over current, shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

The thermal current overload relay shall be set to suit the running current of the motor but in no circumstances shall it be greater than the full load current of the motor.

Warning: Over current protection shall not be omitted when over-temperature protection is provided.

c. Over Temperature Protection

Motor over temperature control (thermistor) shall be provided.

Over temperature shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

d. No Flow Protection

Where it is required that no flow protection be provided (refer to Clause B5.10.5), a limit switch and time delay relay shall be installed for the pump. The time delay relay shall override no flow during start up.

No flow shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

e. Seal Check Protection

Where it is required that seal check protection be provided (refer to Clause B5.10.5), a liquid detection relay shall be installed for the pump.

Seal failure shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

f. High Pressure Protection

Where it is required that high pressure protection be provided (refer to Clause B5.10.5), a pressure switch shall be installed for the pump.

High pressure shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

g. Low Level Protection (for float type level controllers only)

Where it is required that low level protection be provided (refer to Clause B5.10.5), a low level control switch shall be installed.

Low level shall energise a fault relay, activate the alarm and shut down the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

h. Cyclic Fault Protection

Cyclic fault protection shall be provided to ensure that the number of pump starts per hour does not exceed the pump manufacturer's recommendations.

A cyclic fault shall energise a fault relay, activate the alarm and stop the pump. The alarm shall remain active until cancelled manually by the alarm cancel function. System reset will be required.

i. Remote Alarm Monitoring System

The Contractor shall supply, install, program and commission a solid state automatic alarm dialler capable of monitoring and reporting alarm conditions at the pump station/s. The system shall also enable a pump station to be shut down remotely.

The remote monitoring system shall comprise:

One (1) EDAC Model 400, Automatic Alarm Dialler, with user recordable voice message facility and phone list, back up battery power supply, and FAX GUARD Transient Protection unit, or alternative brand with at least equivalent functionality.

A user programmable seven day 24 hour time clock, with battery backup, shall be incorporated into the auto-dialler non critical alarm input to allow for delay of alarm reporting to times allocated and determined by the Principal.

The alarm dialler and timer shall enable the following operations to occur:

- i. The immediate reporting of all Critical Alarm conditions.
- ii. Non Critical Alarm conditions to be reported either immediately or delayed to times predetermined by the Principal. Initially this function shall be set to report non critical alarms during normal business hours five days a week pending further instruction from the Principal.
- iii. The phone number list shall dial sequentially until answered and cancelled. Cancellation shall be by operation of tone key on phone.

- iv. All voice messages, phone number lists, dialler operations and time clock shall be fully programmable by the Principal.
- v. The control system shall enable the pump station to be shut down remotely using a facility on the auto-dialler using a predetermined code.

All alarms from each system shall be configured into up to four (4) auto dialler inputs as required by this Specification and in accordance with the following:

Critical Alarms (individual inputs)

- High level in the pump sump
- Mains power failure - if still present after adjustable delay (0 to 30 minutes)
- Low level in pump station (if applicable)

Non Critical Alarms (single grouped input)

- Thermal/current overload – all pumps
- Thermistor over load – all pumps
- Low Voltage backup battery
- Cyclic fault
- Seal probe – all pumps (if applicable)
- High pressure – all pumps (if applicable)
- No flow – all pumps (if applicable)

All alarm conditions shall be automatically dialled to a group of at least four (4) pre-defined telephone numbers. Numbers shall be dialled sequentially in order until answered and cancelled using telephone tone keys.

A pre-recorded voice message shall be provided for critical or non-critical alarm conditions and shall include the following:

- pump station site identification,
- nature of alarm (i.e. critical type or non-critical), and
- for critical alarms, advice that urgent attention is required.

The auto dialler shall be compatible with both DTMF and Decadic telephone systems.

Battery backup shall maintain full system operation for at least four hours without mains power and retain programming and voice recordings for at least 48 hours without mains power.

All components associated with the Automatic Alarm Dialer shall be installed with-in the main control cabinet.

Three (3) copies of all manuals for the Remote Alarm Monitoring System shall be provided to the Superintendent. Documentation shall include full workshop manuals and user handbooks for each component, as installed wiring and interconnection diagrams, full details of programming and alarm messages and recommended maintenance procedures.

- j. Identification

Engraved labels shall be provided to identify all equipment, switches, etc.

All terminals and wiring shall be identified and conform to the wiring diagram.

- k. Direct On-Line Starting

Where the rating of the pump motor exceeds that allowed for direct-on-line starting by the supply authority, reduced voltage starting shall be provided.

It is the responsibility of the Contractor to ensure that the starting torque on reduced voltage starting is adequate to start and accelerate the pump.

l. Provision for Manual Control

Provision shall be made to run the pumps under manual control.

WARNING: The manual control shall only override the pump start function, all other control and fault systems shall continue to operate. Alternatively, manual operation shall be controlled by a timing device to limit operation of the pump in conditions of low sump level beyond the recommendations of the pump manufacturer.

m. Alarm System Reset

The alarm cancel function shall be wired so that when the alarms are isolated, the defaulting pump cannot be started until a manual system reset is performed.

n. External Alarm Warning Light

In addition to any requirements for remote alarm monitoring, the alarm system, in the event of a fault, is required to activate a 240 Volt 40 Watt weatherproof light, fitted with a red (impact resistant) polycarbonate well-glass, located as indicated on the Drawings or as otherwise directed by the Superintendent.

B5.10.5 Summary of Equipment Schedule

The Contractor shall include the following protection equipment in accordance with this Specification, as detailed and as follows:

a. No Flow

This shall be installed at the following pump stations:

- Existing pump stations 1 and 2

b. Seal Check

This shall be installed at the following pump stations:

- Existing pump stations 1 and 2

c. High Pressure

This shall be installed at the following pump stations:

- Existing pump stations 1 and 2

d. Low Level

This shall be installed at the following pump stations:

- Existing pump stations 1 and 2

All associated wiring and equipment shall be integrated with the basic control and alarm system.

B5.11 PUMP OPERATION

The performance of the completed pumping system may be managed using a programmable logic controller having sufficient input and output modes to allow the pumping system to operate in accordance with this Specification and as follows:

- a. Automatic **start** of each pump alternately shall occur on each consecutive call by the level control regulator, and be capable of individual automatic operation exclusively when desired by the Principal. The start controller shall be set at the level indicated on the Drawings.
- b. Automatic **stop** of the operating pump shall occur on call from the level control regulator. The stop controller shall be set at the level indicated on the Drawings.
- c. The **high level** control regulator shall activate the alarm when the liquid level is above the limit shown on the Drawings.
- d. The **thermal overload** relay shall detect the running current of the motor and ensure that the operating pump does not operate when over-current is detected.
- e. The **thermistor** relay shall detect over-temperature within the motor casing and ensure that the operating pump does not operate when over-temperature is detected.
- f.
 - (i) Where required, a **no flow switch** activated by the non-return valve shall ensure that the operating pump does not operate for a duration greater than that recommended by the pump manufacturer when there is no flow.
 - (ii) Where required, a **seal check** relay shall detect the ingress of water within the lower motor casing and ensure that the operating pump does not operate when moisture is detected.
 - (iii) Where required, a **high pressure** switch in the pump discharge main shall ensure that the operating pump does not operate above a pressure set by the Superintendent.
 - (iv) Where required, a **low level** float switch shall ensure that both pumps are shut down and do not operate when the liquid level falls below the limit shown on the Drawings.
- g. In the event of a fault, the operating pump shall automatically cease operation and the alarm shall be activated. The respective fault indicator shall be illuminated. The standby pump shall assume normal duty, excepting in the case of low level shutdown. (Refer also to Clause B5.10.4).
- h. A **time delay** relay shall ensure that the on/off operation of either pump cannot be more frequent than 15 starts per hour. (Refer also to Clause B5.10.4).
- i. Controls shall be provided for isolation, automatic or manual stop/start operation for commissioning, inspection and maintenance purposes. (Refer Clause B5.10.4(k) for conditions for manual control).

WARNING: The pumps shall be wired in such a manner that at no time shall both pumps operate together under automatic or manual operation.

B5.12 METER CABINET, SWITCHBOARD AND PUMP CONTROL BOARD

B5.12.1 General

The Contractor shall supply and install a free standing meter and control switchgear cabinet for existing pump stations 1 and 2, located as shown on the Drawings.

The cabinet shall be a two (2) section unit, the top section (the main switchboard) shall contain the Supply Authority meters, the main supply switch and circuit protection, the lower section the pump control board and switchgear.

B5.12.2 Construction

The cabinet shall be weather proof, IP56D fabricated from 1.6mm galvanised sheet steel fully folded and welded and constructed in accordance with the Drawings. The Contractor shall provide a hot dipped galvanised, steel angle iron base bolted to the underside of the cabinet, to form a solid fixing to the concrete plinth as shown on the Drawings.

The doors shall be of the hinged lift off type and provided with lockable "Tee" handles. Two keys shall be provided for each lock. The locks for all cabinets shall be keyed alike. Metering sections shall be keyed as approved by the supply authority (ETSA Utilities Key Code ES) and control board sections shall have key code 604.

Each door shall be restrained from fully opening using a removable chain or other approved device.

A sun shield, together with ventilation louvres with replaceable filters and insect screens, shall be provided. Dust-proofing seals shall be of a neoprene air cushion type, cemented to the cabinet return.

The entire unit shall be degreased before multi etch primer is applied. This shall be followed by one coat of undercoat and two coats of high gloss finish paint. The paint colour shall be "Rivergum" unless otherwise selected by the Superintendent.

The cabinet shall be of sufficient dimensions to house the supply meter and all the control equipment.

B5.12.3 Metering Section

The Contractor shall supply and fit a double hinged insulation panel within the top section to the supply authority's requirements, including suitably rated main switch, sub-circuit breakers and neutral and earth links.

B5.12.4 Pump Control Section

The Contractor shall supply and fit an internally hinged panel to the lower section for switchgear and control equipment, indicated for the operation of the pumps. A removable equipment plate shall be provided behind the panel to accept switchgear.

The Contractor shall supply and fit all switchgear and control equipment for the operation of the pumps in accordance with this Specification.

B5.12.5 Meter and Control Cabinet in Pump Shed – Not Applicable**B5.13 SUPPLY OF ELECTRICITY AND TELECOMMUNICATIONS EXCHANGE LINE**

For each pump station, and for the irrigation pump station, the Contractor shall make all applications and arrangements with the appropriate power service provider for the supply of electricity from the main network to a suitable service supply point; and

The Contractor shall make all applications and arrangements with the appropriate telecommunications provider for the supply of a telecommunication exchange line from the main network to the remote alarm monitoring facility in the control cabinet. The telecommunications line should be DTMF ("tone dialling") if available. Alternatively, the Contractor shall provide a mobile telephone connection and modem if a suitable network is available and is sufficiently reliable.

Both applications (i.e. for the supply of electricity and for the telecommunications line) shall be made in the name of the Principal.

The Principal will pay each service provider directly for all fees and costs associated with the provision of electricity and telecommunications to the respective service supply points.

B5.14 SERVICE WIRING

The Contractor shall install service wiring from the power service provider's service supply point to the meter provided by the power service provider.

For the purpose of tendering, the Contractor shall allow a maximum length of 20m of service wiring for each pump station or treatment plant site.

B5.15 ELECTRIC WIRING

The Contractor shall supply and install all electric wiring necessary for the proper operation of the complete pumping systems, switchgear and controls. The switchgear and controls shall be mounted as indicated on the Drawings and/or as directed by the Superintendent.

All wiring, electrical equipment and installation shall be in accordance with Australian Standard AS 3000 and the Supply Authority service rules.

B5.16 SWITCH BOARD CIRCUIT PROTECTION

A main switch, motor, control, general power outlet and light sub circuit protection shall be provided. Neutral and earth links of suitable capacity are required.

Sub circuit protection shall be via suitably rated miniature circuit breakers. It is the responsibility of the Contractor to determine the rating of the circuit breakers to suit the installation and motor starting capacity.

B5.17 POWER OUTLETS

The Contractor shall install a double 240 Volt 10 Amp, RCD protected, power outlet within each metering and control switchgear cabinet or pump shed as applicable.

B5.18 TESTING

The Contractor shall be responsible for all testing necessary to establish with the Superintendent that the pumping installation performs as required by this Specification in all possible operating modes and sequences.

Testing shall include the provision of fresh water for the filling of pressure mains and the pump chambers, the measurement of operating pressure at the pump outlet and the recording of draw down rates in the pump sump to establish pump performance.

If the test operation does not meet the specified performance for the installation as a whole or any part, the installation shall be rectified and further tests shall be carried out to the satisfaction of the Superintendent at no extra cost to the Principal.

On the successful completion of the testing at the installation, the Contractor shall provide the Superintendent with a certification by a Qualified Electrician confirming that the installation conforms with the requirements of the electricity supply authority.

B5.19 INSTRUCTION OF THE PRINCIPAL'S REPRESENTATIVE

Following acceptance of the tested pump stations, the Contractor shall provide instruction to the Principal's Representative in the use and operation of the pumping system.

B5.20 CIRCUIT DIAGRAMS

An approved circuit diagram in a waterproof clean plastic envelope shall be attached to the inside of the switch cabinet.

B5.21 OPERATING MANUAL

The Contractor shall provide, to the Superintendent, three (3) copies of an operating manual, which shall provide details relevant to each pump station. The information to be provided in full detail is to be categorised as follows:

- (a) Introduction
- (b) Start up procedures
- (c) Alarm conditions
- (d) Components
- (e) Installation, dismantling and re-assembly procedures
- (f) Testing
- (g) Operation
- (h) Maintenance instructions
- (i) Fault list (symptom, cause and action)
- (j) Wiring diagrams (in addition to the requirements of Clause B5.20)

B6. TREATMENT LAGOONS AND STORAGE POND**B6.1 SITE CLEARING**

Trees and other vegetation shall only be removed from the area upon which the storage pond is to be constructed, together with a buffer zone for use by construction equipment of up to 3m (unless additional area is approved by the Contract Administrator).

Topsoil shall be stripped (nominally the top 100 mm to 200 mm) and stockpiled separately for replacement or re-use.

B6.2 FLOOR AND EMBANKMENT CONSTRUCTION

The site shall be levelled to 400 mm below the required finished floor level.

The area forming the base of the embankments shall be ripped to a depth of 100 mm to 150 mm before placement of materials to form the embankment.

The Contractor shall allow in his tender to construct the storage pond to the dimensions and levels shown on the Drawings and as detailed in the Geotechnical Investigation report.

Initially the embankments shall be formed from material won from excavating the site, to the shape and dimensions shown on the Drawings. All materials used for the embankment construction shall be approved by the Contract Administrator. Approved materials shall be placed to form the embankments and compacted in accordance with this Specification. Unsuitable material shall be stockpiled on site. Such material may be used in the construction of the storage pond following further treatment as may be determined by the Contract Administrator.

If the Contractor determines that the on-site materials resulting from excavation are insufficient to complete the works, he shall allow in his tender to import sufficient materials to complete the embankment formation and to use as bedding material for the liner as required by this Specification and the Drawings.

The embankments shall be constructed in 200 mm layers with each layer compacted to achieve a dry density of 95% modified.

The top 500 mm of each embankment crest shall be compacted to 98% modified.

The top 150 mm of the crest of the embankment shall be compacted quarry waste (PM11).

The embankments shall be deliberately over filled to allow for final trimming.

The embankment walls shall be constructed with a 1:3 incline.

Where vehicle access up the wall is required, as defined on the Drawings, the embankment slope shall be 1:6.

B6.3 CONSTRUCTION TOLERANCES

The final floor level shall be within +/- 25 mm from design.

The horizontal alignment shall be within +/- 300 mm.

Inlet and outlet structures shall be within +/- 25 mm.

Outlet of the treatment lagoon shall be within +/- 10 mm.

B6.4 SOURCES OF MATERIALS

The embankment material for the winter storage pond site shall be obtained from the initial levelling of the site and from stockpiles or borrow pits located as advised by the Superintendent.

Additional material may be obtained from the excess material excavated from the reticulation system construction or other source determined by the Contractor.

Where excess soil from trench excavation is used, it shall be approved by the Contract Administrator prior to use. It shall not contain asphalt and or road base materials.

Approved materials may be placed directly on the embankments for compaction or stockpiled on the site for further treatment prior to placement and compaction.

B6.5 COMPACTION TESTING

Compaction testing at the evaporation pond site shall be conducted on every 200 mm layer as directed by the Contract Administrator. The compaction tests conducted at the site shall be claimed as part of the PC Item for Compaction Testing referred to in Clause B3.8.5. Any retesting or re-work required as a result of substandard test results shall be completed at the Contractor's expense.

B6.6 EMBANKMENT COMPACTION REQUIREMENTS

Compaction requirements of the embankment walls shall be as follows:

Each 200 mm layer	95% modified
Top 500 mm of wall	98% modified
150 mm of quarry rubble	98% modified

B6.7 EMBANKMENT PREPARATION FOR PLACEMENT OF THE LINER

A 100mm bed shall be provided for the synthetic liner. This bed shall consist of either the existing material ripped, mixed with sand and rolled or 100mm of clean sand complying with the last paragraph of Clause B1.4.1.

The bed shall be free of all protrusions such as sharp objects, rocks and vegetation. The layer shall then be rolled by a steel drum roller to ensure the integrity of the bedded surface. The bedded surface shall be inspected by the Superintendent prior to laying the liner.

B6.8 DEWATERING

The Contractor shall make all provisions and allowances in his tender for dewatering at the storage pond site.

B6.9 SUPPLY AND PLACEMENT OF THE LINER

Refer to Clause B1.10 for details on the material requirements for the storage pond liners.

The liners shall be installed in accordance with the manufacturer's recommendations. They shall be anchored at the top of the embankment with an anchor trench 600mm deep and 300mm wide. The backfill in the anchor trench shall be compacted to 95% modified.

The Contractor shall supply the Superintendent with all integrity test results performed on the liner (e.g. break strain, weld checks, overlap, etc.).

Leak Detection: – The leak detection system comprises, strips of M5 Geonet, a catchment sump, observation sump and connection pipework. The 1m wide strips of Geonet provide a path for leaked water to the 500mm x 500mm x 500mm catchment sump which is to be lined with Geotextile and backfilled with 10 – 15 mm aggregate stone and covered with 100mm layer of sand. A 100mm gravity pipe with a Geotextile wrapped around the inlet to act as filter, will connect the catchment sump to the observation sump as shown on the Drawings.

Egress Ladder: - A HDPE Egress ladder must be installed at the location shown on the drawings as soon as possible after the lining in the storage pond has been installed in that location.

B6.10 EMBANKMENT TREATMENTS

B6.10.1 Internal Embankment Walls and Floor

Once the liner is in place, car tyres at a density of one tyre per 3m in each direction, shall be placed over the liner. The tyres shall be laid on the base of the storage pond. All tyres shall have holes cut into the sidewalls to prevent them from floating. Alternate methods of securing and protecting the liner during construction maybe considered in consultation with the Superintendent and the liner supplier

Care should be taken to ensure that the liner is not damaged during placement of the tyres. There shall be no construction traffic applied directly to the liner.

B6.10.2 External Walls

A 100mm layer of topsoil shall be placed on outside walls of the embankments for the storage pond. The topsoil is to be lightly compacted to at least 90% standard.

B6.10.3 Spillways – NOT APPLICABLE

B6.11 SURPLUS SOIL/MATERIAL

All surplus material from the evaporation pond site or material not suitable for embankment construction shall be carted and dumped at the location specified in Clause B3.3.6.

B6.12 INLET AND OUTLET STRUCTURES

All inlet and outlet structures shall be constructed in accordance with the Drawings and to the satisfaction of the Superintendent.

B6.13 LAGOON DIVERSION FENCE – NOT APPLICABLE

B6.14 PERIMETER FENCING

The Contractor shall provide and erect a 1.83 metre high galvanised chain wire mesh fence with galvanised posts around the storage pond site as shown on the Drawings.

All posts shall be fitted with a suitable cap.

Gate posts shall be 63mm internal diameter medium duty galvanised water pipe.

Corner and end posts shall be 50mm internal diameter medium duty galvanised water pipe.

Posts shall be at a maximum 3m spacing and consist of 40mm internal diameter medium duty galvanised water pipe.

Chain wire mesh shall be 1.83m high 10 gauge x 50mm galvanised mesh.

Posts and gate frames shall extend above the chain wire mesh to support 2 rows of galvanised barbed wire at 150mm spacing.

Gates shall comprise 1 pair of 1.83m x 1.83m to form a 3.66m opening and fitted with one way gate catch and lock. A padlock shall be supplied with the gates, comprising Lockwood 234 or similar with a solid brass body.

B7. TREATMENT PLANT AND TERTIARY TREATMENT SYSTEM – NOT APPLICABLE

B8. IRRIGATION SYSTEM**B8.1 GENERAL**

The Contractor shall install three new irrigations system at the locations shown on drawing No. IR-37-001, ensure that sprinkler heads and junction box covers are lilac coloured, as shown on the Drawings. The new irrigation pump at the oval is to be connected to the existing oval irrigation system as shown on the drawings.

B8.2 OPERATION

Refer to Drawing No. IR-37-001 and the Irrigation Management Plan for the irrigation areas and for the irrigation program.

B8.3 CONSTRUCTION CONCEPT

The existing irrigation system at the town oval along with the other three new irrigation areas will be supplied solely with reclaimed water via irrigation mains from the new irrigation pump at the oval. All irrigation of these areas with reclaimed water will take place at night.

B8.4 IRRIGATION PUMP**B8.4.1 General**

The Contractor shall supply and install the irrigation pump, valves and pipework detailed on the Drawings and in accordance with Clause B5.9 as applicable.

The irrigation pumps shall only operate between the hours of 10 pm and 5 am.

B8.4.2 Control Switchboard and Switchgear

The Contractor shall supply and install all switch gear, control equipment and alarm systems as detailed in clause B5.10.

The control switching for the irrigation pumps shall be:

- ON by time switch regulated by the irrigation controller
- OFF by time switch regulated by the irrigation controller
- OFF by low level in treated water storage tanks
- OFF by wind reading on anemometer exceeding 25km/h

Summary of Equipment Schedule

The Contractor shall include the following protection equipment in accordance with this Specification as detailed, and as follows:

- a) Thermistors
 - required
- b) No flow
 - required
- c) Seal Check
 - required

- d) High pressure
 - required
- e) Low Level
 - required

B8.4.3 Pump Operation

Pump operation shall be as detailed in Clause B5.11 except the automatic start and stop shall be controlled by the function of the irrigation controller. Programming of the irrigation controller shall only allow irrigation between the hours of 10.00pm and 5.00am.

Low water level in the storage tank, the anemometer soil moisture probe and rain switch shall override the function of the irrigation controller and stop the irrigation pump.

The Contractor shall be responsible for all testing and the provision of circuit diagrams and operating manuals as per Clauses B5.18, B5.20 and B5.21.

B8.5 CENTRAL IRRIGATION CONTROLLER

If required by the Principal, a "Hunter ACC" irrigation controller or approved alternative with equivalent specifications shall be installed at the existing controller location. The irrigation controller shall be capable of performing all operations stated on Drawing No. IR-37-003 and in the Irrigation Management Plan, as well as possessing sufficient inputs for the following control items to be installed and integrated into the program:

- a. rain sensor, and
- b. soil moisture meter.

Where an equivalent product is proposed, the product specification shall be submitted to the Superintendent for approval as part of the tender.

B8.6 MONITORING OF SOIL AND WEATHER CONDITIONS

B8.6.1 Wind

A "Hunter Wind-Clik" three cup anemometer or an approved equivalent shall be connected to the irrigation controller. The anemometer shall be mounted on a suitable support pole 3m from natural surface level and 1m above the shed roof. The anemometer shall stop irrigation when the wind speed reading exceeds 25km/h.

Where an equivalent product is proposed, the product specification shall be submitted to the Superintendent for approval as part of the tender.

B8.6.2 Rainfall

A "Hunter Rain-Clik" rain sensor or an approved equivalent shall be connected to the irrigation controller at town oval. The rain sensor shall be located such that there are no obstructions adjacent to or above the rain sensor such as buildings, fences and trees. The rain sensor shall stop the irrigation controller when the rainfall reading exceeds 5mm in the previous 24 hour period.

Where an equivalent product is proposed, the product specification shall be submitted to the Superintendent for approval as part of the tender.

B8.6.3 Ground Moisture

A new soil moisture sensor shall be supplied, installed and connected to the town oval irrigation controller as shown on Drawing Number IR-37-003. The moisture meter shall stop irrigation when the ground moisture reading exceeds that recommended by the supplier for saturated soil of the type found on site.

B8.7 CONTROL OF IRRIGATION VALVES

Regulation of lateral line pressure downstream of solenoid valves shall be controlled using a pressure regulation device installed between the solenoid coil and valve body on each and every solenoid valve. The lateral pressure shall be set to give the required operating pressure to each sprinkler. The pressure regulation devices shall be as approved by the Superintendent and shall not affect the design flow.

B8.8 WARNING SIGNS

The Contractor shall supply and install the following warning signs, as listed in the Irrigation Management Plan.

At appropriate locations around the new irrigation areas, the signs shall read **"RECLAIMED WATER BEING USED – NO ACCESS WHEN SPRINKLERS IN OPERATION"**.

All lettering on the signs shall be in block capitals with minimum height of 50mm. The signs shall be steel and mounted on 65mm diameter galvanised steel posts. Colouring shall be black lettering on a yellow background.

B8.9 COMMISSIONING

B8.9.1 General

The Contractor shall allow in his tender sufficient time and monies to supply equipment, materials and labour to programme and test all irrigation equipment to the satisfaction of the Superintendent.

B8.9.2 Equipment Warranties

The Contractor shall supply to the Superintendent the original and two copies of the warranties for the irrigation control system, including but not limited to the irrigation controller, anemometer, rain sensor and soil moisture meter. The warranties shall be for a period of at least one year. Commencement of the warranty period shall be from the Date of Practical Completion.

B8.9.3 Maintenance during the Defects Liability Period

From the Date of Practical Completion, the Contractor shall provide maintenance for the whole of the defects liability period.

Maintenance shall consist of all required servicing of the installation, including attention to emergency calls. All maintenance shall be strictly in accordance with manufacturer's recommendations.

A maintenance schedule setting out the proposed programme of maintenance inspection and servicing, together with advice or arrangement for prompt attention to emergency calls, shall be submitted to the Superintendent for approval.

At the conclusion of the defects liability period, a complete check over and, if necessary, a re-adjustment of the installed equipment shall be made in the presence of the Superintendent.

In the event that any contract or maintenance work is outstanding at the end of the period set down above, the Contractor's maintenance obligations shall continue until this work is completed and the Contractor has been advised, in writing, that it is acceptable to the Superintendent.

B8.9.4 Operation and Maintenance Instructions

The Contractor shall, within four (4) weeks of commissioning the system, supply to the Superintendent, three (3) bound copies of the operating and maintenance manual which shall cover the operating, testing and maintenance procedures for all new components of the irrigation system.

The manual shall also include manufacturers' product data, parts lists and connection diagrams for all sprinklers, control valves and automatic control equipment.

B8.9.5 Training

Immediately after commissioning of the irrigation system, the Contractor shall give a demonstration and provide training to persons nominated by the Superintendent in the operation and maintenance of the equipment installed. The content of the proposed training course shall be submitted to the Superintendent for review and approval at least one week before commissioning.

B9. DOMESTIC PRESSURE RETICULATION SEWER PUMPS

The domestic pressure reticulation sewer pump unit shall be a Mono PSS ECO 1–60 model, unless approved otherwise by the Superintendent.

Pump units shall be purchased for and installed in all properties shown on the Drawings as requiring a sewer boundary kit connection instead of a conventional gravity connection inspection point. Pressure sewer pump units not installed in properties over the course of the contract (e.g. because permission to access the property could not be obtained from the property owner) shall be supplied to the Principal for storage and later installation, in addition to any spare pumps or mechanical and electrical components requested by the Superintendent.

Prior to the Contractor commencing works on site, the Principal will write to the owner of each property on which a domestic pressure reticulation sewer pump is to be installed, advising the owner of the requirement to access their property. The Principal will also provide the Contractor with a standard letter of introduction, together with a form requiring signed approval from each owner for the Contractor to access their property. The Contractor shall obtain written permission from each owner to enter their property for the purpose of installing the domestic pressure reticulation sewer pump and associated pressure main to the property boundary. Should the Contractor be unable to obtain written permission to enter any particular property, the matter shall be referred to the Superintendent for resolution with the Principal.

Once approval to access individual properties has been granted, the Superintendent shall confirm with the Contractor and with the Principal's Representative the exact location for installation of each domestic pressure sewer pump unit and any associated equipment within private properties. The pump unit shall generally be installed within one metre of the household sewerage outlet, or within one metre of the inlet to the septic tank or between these two points once the rate payer has agreed to the location.

The manufacture and installation of pump units shall comply with all requirements of the South Australian Department of Health, including those described in Waste Control Systems –

Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia and all other relevant standards including AS/NZS 3500 Plumbing Code.

An audible and visible alarm with muting facilities shall be provided in a conspicuous position in either the kitchen or laundry area to warn of a pump or power failure and that the sump requires pumping out within 24 hours. The Contractor shall provide details of the proposed design and installation of this alarm panel plus main control panel, pump unit and boundary kit to the Superintendent for approval prior to construction. All products associated with pressure sewer pump units shall be approved as appropriate for installation by the Superintendent prior to construction.

The main control panel for the pump units shall not contain any conspicuous switches or controls external to the enclosed panel. The panel shall not be lockable. A separate appropriate electrical circuit and labelled isolation switch shall be installed for the pump unit from the property's main switchboard. Live connections shall only be made to switchboards which are capable of handling the additional loads. The contractor shall report to the Superintendent any switchboards that require upgrading.

The Contractor shall not connect gravity drainage pipework into the pump unit from upstream of the existing septic tank. The rain water drainage system shall be inspected to ensure no gutter downpipes, tank overflow or ground level sumps drain to the septic tank or the pressure sewer system.