

Summary File ONLY

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**IT IS BROWSABLE ON-SCREEN ONLY AND IS PROVIDED
FOR YOUR INFORMATION TO DECIDE WHETHER TO
BECOME A PROSPECTIVE TENDERER ONLY**

Note: This file may contain a brief scope statement, or an extract from the RFT documents, or a full exhibited copy – depending on the specific circumstances.

To participate in this tender process you **MUST** first download or order a full copy of the Request for Tender (RFT) documents, including the responsible components, and any addenda issued to date.

To do this return to the RFT web page on this web site and copy the RFT documents to your own computer or network – the blue “**DOWNLOAD A SOFT COPY**” link at the bottom provides access to the page from which you can do this.



Specification

Lake Cargelligo Water Supply

**The Design and Construction of
a Dissolved Air Flotation (DAF)
Raw Water Pre-Treatment
System for the Lake Cargelligo
Water Treatment Plant**

Tender No. 0900677

Contract 02/2009



Funding Partner:

NSW Department of Water and Energy

Document Prepared by:



NSW Water Solutions

APRIL 2009

Tender Documents
For
**The Design and Construction of a Dissolved Air
Flotation (DAF) Raw Water Pre-Treatment System
for the Lake Cargelligo Water Treatment Plant**

Contract No. 02/2009

APRIL 2009

Lachlan Shire Council

Consultants:
NSW Department of Commerce
NSW Water Solutions

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TENDERING

CONDITIONS OF TENDERING

THERE ARE 8 PAGES IN THIS SECTION

This section includes notices to tenderers.

The Conditions of Tendering section does not form part of the Contract.

1 GENERAL

1.1 CONTACT PERSON

Refer requests for information about the Tender to:

Name:	Kamal Fernando
Telephone number:	02 9372 7869
Facsimile Number:	02 9372 7877
e-mail address:	kamal.fernando@commerce.nsw.gov.au

All communication with the Principal in respect of the Tender must be through the Contact Person named above. Tenderers must not approach other Council officers or elected members. Any Tenderer who contacts an elected member will be automatically excluded from the tender process forthwith.

1.2 NSW GOVERNMENT CODE OF PRACTICE FOR PROCUREMENT

Tenderers must comply with the NSW Government *Code of Practice for Procurement*, which is available at:

www.treasury.nsw.gov.au/procurement/cfpf_ig

2 TENDERER ELIGIBILITY

2.1 ACCEPTABLE LEGAL ENTITIES

The Principal contracts only with recognised and acceptable legal entities. The Principal does not contract with firms under any form of external administration. Any tender submitted by an unincorporated business such as a sole trader, partnership, or business name must identify the legal entity that proposes to enter the contract.

The Principal will not award this Contract to a tenderer that is a trustee.

2.2 QUALITY MANAGEMENT

The Principal may elect to pass over a tender from a tenderer that does not demonstrate the capacity to systematically plan and manage the quality of its work in accordance with the NSW Government *Quality Management Systems Guidelines*, which are available at:

www.managingprocurement.commerce.nsw.gov.au/system/index_procurement_guideline_documents.doc

Submit with the Tender the information identified in Tender Schedules - **Schedule of Quality Management Information.**

2.3 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

Tenderers must demonstrate their capacity to manage occupational health and safety in accordance with the NSW Government *Occupational Health and Safety Management Systems Guidelines 4th Edition (OHSM Guidelines)*. The *OHSM Guidelines* are available at:

www.managingprocurement.commerce.nsw.gov.au/system/index_procurement_guideline_documents.doc

Submit with the Tender the information identified in Tender Schedules - **Schedule of Occupational Health and Safety Management Information.**

2.4 FINANCIAL ASSESSMENT CRITERIA

The main criteria considered in financial assessment of tenderers are:

- Net Worth (total assets, excluding any assets of company directors, less total liabilities less intangible assets);

- Current Ratio (ratio of current assets to current liabilities); and
- Working Capital (current assets less current liabilities).

The Principal considers tenders with the following financial capacity, and no other significant detrimental financial characteristics to be financially satisfactory in respect of tenders:

- Net Worth exceeds 5% of the Contract Sum or initial Contract Price;
- Current Ratio exceeds 1; and
- Working Capital exceeds 10% of the Contract Sum or initial Contract Price.

Deviations below these indicative criteria will not necessarily prevent the Principal from considering any tender.

3 CONTRACT DETAILS

3.1 SITE

The Principal may provide geotechnical or other information concerning the Site. Refer to Preliminaries Clause – **Site Information**.

The tenderer may apply to the Contact Person for approval to carry out further site investigation. The tenderer must bear the cost of any such further site investigation.

Reports and other Site Information are available as follows:

- Lagoon Sedimentation Pre-treatment System Concept Design (NSW Department of Commerce Report No. DC05203 dated March 2006).

Investigations Carried Out

Investigations carried out on this site include:

- Geotechnical Investigations,
- Review of Environmental Factors (REF)

Other Site Activities

Other site activities which may affect this site are:

- Nil.

Other Contracts

A construction contract for construction of the civil/structural works associated with the DAF pre-treatment system.

3.2 GENERAL CONDITIONS OF CONTRACT

The tender documents include a copy of the General Conditions of Contract.

3.3 INSURANCE

Works and public liability insurance

The Contractor must arrange insurance of the Works (and any temporary works) and public liability and pay all premiums.

Other Insurance

The Contractor must arrange and pay all premiums for all other insurance required.

For professional indemnity insurance, a Certificate of Currency or evidence of the ability to obtain the required insurance, such as a letter from a broker or insurer, may be required as a condition of acceptance of tender.

3.4 PROPOSED SUBCONTRACTORS AND CONSULTANTS

For any individual Subcontract or consultancy agreement valued at more than \$100,000 or 2% of the Contract Sum, whichever is the greater, complete Tender Schedules - **Schedule of Proposed Subcontractors and Consultants**, providing the names of the Subcontractors and Consultants and descriptions of the type of work they will be carrying out. Include confirmation that the recent OHS, environmental and industrial relations management performance of the proposed Subcontractors and Consultants has been reviewed by the Tenderer and found to be satisfactory. Submit the schedule when requested.

This information will be taken into account in assessing the tenders. Identification of Subcontractors and Consultants before the award of the Contract will be taken as an indication of the team approach to be used by the Contractor and a demonstration that the Contractor will not trade off different subcontractors' prices to obtain a lower price (a practice that is unacceptable under the NSW Government *Code of Practice for Procurement*).

3.5 DESIGN DEVELOPMENT AND DOCUMENTATION RESOURCES

Where the Tenderer proposes to use internal resources for design development and documentation in any discipline not subject to Preferred Subcontractors, when requested, provide full details to establish that each of the key staff have the proven competence, qualifications and experience on similar tasks to satisfactorily perform the proposed functions in accordance with Tender Schedules - **Schedule of Internal Designers**.

Where the Tenderer proposes to use other than internal resources for design development and documentation, when requested, for such work which is not subject to Preferred Subcontractors, provide full details and references to show their proven competence, qualifications and experience on similar tasks to satisfactorily perform the proposed functions in accordance with Tender Schedules - **Schedule of External Designers**.

4 CURRENT POLICIES

4.1 DISCLOSURE OF TENDER AND CONTRACT INFORMATION

Details of this tender and contract awarded as a result of this tender process will be disclosed in accordance with section 179 of the *Local Government (General) Regulation 2005*.

4.2 EXCHANGE OF INFORMATION BETWEEN GOVERNMENT AGENCIES

By submitting a tender, the Tenderer authorises the Principal to gather, monitor, assess, and communicate to NSW Government agencies or local government authorities information about the Tenderer's financial position and its performance in respect of any contract awarded as a result of the tender process. Such information may be used by those agencies or authorities in considering whether to offer the Tenderer future opportunities for work.

4.3 FINANCIAL ASSESSMENT

By tendering for this Contract, the Tenderer agrees that the Principal may engage private sector consultants to financially assess tenderers. Financial details of tenderers may be obtained by an external Financial Assessor for assessment. The Financial Assessor may be Kingsway Financial Assessment Pty Ltd. or Corporate Scorecard Pty Ltd. Financial Assessors have an obligation to safeguard the financial details obtained.

Submit, when requested by the Financial Assessor or Principal, the Financial Assessment information shown in Tender Schedules - **Schedule of Financial Assessment Information**.

4.4 UNCONDITIONAL UNDERTAKINGS - APPROVED INSTITUTIONS

For the purpose of giving unconditional undertakings, banks, building societies, credit unions and insurance companies listed by the Australian Prudential Regulation Authority (APRA) as being regulated by the APRA are acceptable. Lists appear at the APRA website at:

www.apra.gov.au/

5 FURTHER INFORMATION

5.1 ADDENDA TO TENDER DOCUMENTS

If, as a result of a request for clarification from a tenderer or for any other reason, the Principal issues an instruction amending the tender documents, the instruction will be issued in writing to all tenderers in the form of an Addendum, which becomes part of the tender documents. Written Addenda issued by the Principal are the only recognised explanations of, or amendments to, the tender documents.

5.2 NOT USED

5.3 SITE ACCESS RESTRICTIONS

Tenderers and their agents or representatives must:

- obtain permission to inspect the Site from the Client's Representative at least 48 hours before access to the Site is required;
- upon arrival, at the pre-arranged time, introduce themselves at the Client Representative's office prior to undertaking their inspection of the Site.

The Client's Representative's: Phil Newham, Director Technical Services (Ph 02 6895 4444)

The Client's Representative may be contacted:

on the following days: Monday to Friday
between the hours of: 9 am-5 pm

5.4 PRE-TENDER MEETING

A pre-tender meeting will be held on the date, at the time and at the place nominated in the advertisement or invitation.

The Contact Person will be available at that time to answer any tenderer's queries regarding the tender.

6 PREPARATION OF TENDERS

6.1 ALTERNATIVE TENDERS

Alternatives will not be considered for the Dissolved Air Flotation Process.

Tenderers may provide an optional price to undertake all the civil work as specified, in addition to the process, electrical and mechanical work.

Mandatory Alternative Tenders

Provide a price for standby equipment that the Tenderer believes is necessary for the plant.

Alternative (Optional) Tenders

Tenderers may submit an alternative (optional) Tender to include the civil work as specified in Sub Section 5 – Civil as well.

6.2 NOT USED

6.3 PROGRAM

Submit when requested by the Principal, a program in accordance with the Clause GENERAL CONDITIONS OF CONTRACT – CONSTRUCTION PROGRAM, in the form of a bar chart and network diagram, showing the following: -

- Sequence of work.
- Periods within which various stages or parts of the work are to be executed.
- Critical paths of activities related to the work.
- Allowance for holidays.
- Restraints/constraints imposed by the proposed Contract documents.
- Significant milestones, including Separable Portions, if any.
- Activity inter-relationships, including those activities to be undertaken by subcontractors, including consultants and suppliers, both on and off site.
- External dependencies, including provision of access, document approvals and work by others.
- The estimated value of work completed for each month.

- This program will be provided for the Principal's better understanding of the planning of the Works by the Tenderer and may form part of any Contract.

6.4 PROPOSED CONTRACTOR'S PERSONNEL

Submit, when requested, the details referred to in TENDER SCHEDULES - SCHEDULE OF PROPOSED CONTRACTOR'S PERSONNEL.

7 SUBMISSION OF TENDERS

7.1 DOCUMENTS TO BE SUBMITTED

A) The following documents must be completed and submitted by the Tenderer:

- Tender Form
- Schedule of Tender Program
- Schedule of Brief Description of the Offer
- Schedule of Quality Assurance Information
- Schedule of Recent Experience Completion of Similar Projects
- Schedule of Performance Guarantees
- Schedule of Prices
- Schedule of Prices for Optional Tender - Civil Works
- Schedule of Mandatory Alternative Tenders
- Schedule of Technical Data
- Schedule of Departures

B) The following documents must be completed and submitted when requested:

- Schedule of Proposed Sub-Contractors and Consultants
- Schedule of Proposed Contractor's Personnel
- Schedule of Internal Designers
- Schedule of External Designers
- Schedule of Financial Assessment Information

Where applicable, refer to each Addendum and state that the Tender allows for the instructions given in the Addendum.

7.2 SUBMISSION PROCEDURE

Submit the Tender Form, Tender Schedules marked 'Submit with the Tender Form' and other required documents or information by the date and time given in the advertisement or invitation.

If more than one tender is submitted or an alternative tender is lodged, mark each tender clearly as to whether it is a copy, an alternative tender, or whether the tender supersedes another submission.

Submit when requested, by the date, time and method stipulated in the request, Tender Schedules marked 'Submit when requested' and any other information required to allow

further consideration of the Tender. Failure to meet this requirement may result in the Tender being passed over.

7.3 TENDER BOX

The Tender may be submitted in the Tender Box at:

Lachlan Shire Council
58-64 Molong Street,
Condobolin NSW 2877

Submit the Tender, original plus two (2) copies, in a sealed envelope addressed to the Secretary of the Tender Opening Committee and marked with "Tender for the Design and Construction of the Dissolved Air Flotation Pre-Treatment System for Lake Cargelligo Water Treatment Plant" and the closing date and time.

7.4 FACSIMILE

The Tender may be submitted to the following facsimile number:

02 6895 3478.

Address the Tender to the Secretary of the Tender Opening Committee and mark the first page of the facsimile with "Tender for the Design and Construction of the Dissolved Air Flotation Pre-Treatment System for Lake Cargelligo Water Treatment Plant" and the closing date and time.

Tenders sent by facsimile and not completely received by the close of tenders may be excluded from consideration for acceptance even if transmission or receipt is delayed due to the receiving facsimile machine being engaged, faulty or otherwise inoperative.

7.5 LATE TENDERS

In accordance with the *Local Government (General) Regulation 2005*, a late tender will not be considered unless the Tenderer satisfies the Principal that the Tender was posted or lodged at a Post Office or other recognised delivery agency in sufficient time for the Tender to have been received by the closing date and time.

8 PROCEDURES AFTER CLOSING OF TENDERS

8.1 EVALUATION OF TENDERS

Tenders will be evaluated in accordance with the *Local Government (General) Regulation 2005*.

In evaluating tenders, the Principal may take into consideration factors including, but not limited to: whole of life costs; ability to meet requirements of the NSW Government *Code of Practice for Procurement*; innovation; delivery time; quality offered; previous performance; experience; capability; occupational health and safety performance; industrial relations performance; environmental management performance; community relations; value adding including economic, social and environmental initiatives; and conformity.

Tenders will be assessed using a weighted scoring process based on information provided with the Tender. The ratio of price to non-price criteria will be: 60-40%.

The price criteria will include:

- Capital cost of the mandatory work.

The non-price criteria will be:

- Tenderers Experience – similar plants constructed in Australia (20%)
- Personnel proposed including subcontractors (10%)
- Back up parts and long term service support (10%)

The Principal may treat any detail required by the tender documents which is omitted, illegible or unintelligible as failing to fulfil the relevant requirement.

8.2 ACCEPTANCE OF TENDER

The Principal may accept tenders that do not conform strictly to all requirements of the tender documents.

The Principal is not bound to accept the lowest or any tender. Tenders which do not comply with any requirement of, or which contain conditions or qualifications not required or allowed by, the tender document may be passed over.

No tender, or qualification or departure from a contract condition or specification, is accepted unless the Principal gives an acceptance or formal agreement in writing.

Tenders may be accepted for the whole of the work or specific sections as follows:

- Design, installation, testing and commissioning of process, mechanical, and electrical works.
- Design and construction of civil work.

8.3 PROTECTION OF PRIVACY

The Tenderer warrants, in respect of any personal information provided in this Tender or any contract arising from this Tender, that the information is accurate, up to date and complete, and that nominated individuals authorise its collection and are aware:

- that the information is being collected for the purpose of evaluating tenders and administering any contracts arising from those tenders and may be made available to other NSW government agencies or local government authorities for those purposes;
- whether the supply of the information by the individual is required by law or is voluntary, and any consequences for the individual if the information (or any part of it) is not provided; and
- of the existence of any right of access to, and correction of, the information.

END OF SECTION – CONDITIONS OF TENDERING

TENDER SCHEDULES

THERE ARE 26 PAGES IN THIS SECTION

TENDER FORM

(SUBMIT WITH TENDER)

Tender Closing Office: The Tender may be submitted in the Tender Box at:

Lachlan Shire Council
58-64 Molong Street,
Condobolin NSW 2877
Fax No. 02 6895 3478

Name of Tenderer
(in block letters):

A.B.N.
(if applicable):

Address:
.....

Telephone number:

Facsimile number:

e-mail address:

hereby tender(s) to perform the work for

The Design and Construction of a Dissolved Air Flotation (DAF) Raw
Water Pre-treatment system for Lake Cargelligo WTP, at Lake
Cargelligo NSW

(Contract No. 02/2009)

in accordance with the following documents:

TENDER DOCUMENT Volumes 1 and 2

and Addenda Numbers:

For the lump sum of:

.....

(\$.....) including GST

1 SCHEDULE OF TENDER PROGRAM

(SUBMIT WITH TENDER FORM)

Submit a Tender Program to the requirements of Clause CONDITIONS OF TENDERING - PROGRAM. State proposed working hours and working days if different to those in the General Conditions of Contract.

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

2 SCHEDULE OF DESCRIPTION OF THE OFFER

(SUBMIT WITH TENDER FORM)

Provide a description of the offer, including the process technology and the equipment provided, and how the offer meets the requirements of the Specification.

Signed for the Tenderer by: Date:

Name (in block letters) (Authorised Officer)

In the Office Bearer capacity of:

3 SCHEDULE OF QUALITY ASSURANCE INFORMATION

(SUBMIT WITH TENDER FORM)

Submit the information required in Clause CONDITIONS OF TENDERING - QUALITY ASSURANCE.

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

4 SCHEDULE OF RECENT EXPERIENCE IN COMPLETION OF SIMILAR PROJECTS IN AUSTRALIA

(SUBMIT WITH TENDER FORM)

List below details of similar projects completed within the last 5 years together with names, phone numbers and addresses of referees from satisfied customers who can be contacted by the Principal. Please note that these details will be use in the Tender Evaluation procedure.

Refer to Conditions of Tendering Clause “Procedures after Closing of Tenders”

Plant Capacity (ML/d) and year of Completion	Value (A\$)	Customer	Referees name, phone no & address & responsibility for the Project
DAF Process			
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

5 SCHEDULE OF PROPOSED SUB-CONTRACTORS AND CONSULTANTS

(SUBMIT WHEN REQUESTED BY PRINCIPAL)

The Contractor's, sub-Contractors' or Consultants' experience on the design, manufacture, construction and commissioning of the following treatment processes will be taken into account in Tender Assessment.

CIVIL WORKS

Name of Contractor, sub-Contractors' or Consultants'	Projects completed in the last 5 years (Name/Capacity in ML/d)	Referee & Organisation Name	Telephone
	1.....	.....	.....

	2.....	.....	.....

	3.....	.....	.....

	4.....	.....	.....

	5.....	.....	.....

SWITCHBOARDS

Name of Contractor, sub-Contractors' or Consultants'	Projects completed in the last 5 years (Name/Capacity in ML/d)	Referee & Organisation Name	Telephone
	1.....	.....	.....

	2.....	.....	.....

	3.....	.....	.....

	4.....	.....	.....

	5.....	.....	.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

6 SCHEDULE OF PROPOSED CONTRACTOR'S PERSONNEL

(SUBMIT WHEN REQUESTED BY PRINCIPAL)

Nominate below the names of the proposed Contractor's Representative and Quality Assurance Manager and list their qualifications, level of expertise and experience relevant to the work under the Contract.

Contractor's Representative

.....
.....
.....
.....

Quality Assurance Manager

.....
.....
.....
.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

7 SCHEDULE OF INTERNAL DESIGNERS

(SUBMIT WHEN REQUESTED BY PRINCIPAL)

If the Tenderer proposes to use internal resources for design development and documentation in any discipline not subject to Selected Subcontracts, then provide full details to establish that each of the key staff have the proven competence, qualifications and experience on similar tasks to satisfactorily perform the proposed functions.

Refer to Clause ANNEXURE PART B - DESIGN, DOCUMENTATION AND CONSTRUCTION OBLIGATIONS.

Details are to include the following for individual key staff:

Person 1:

NAME:

ROLE:

BRIEF CV:

Person 2:

NAME:

ROLE:

BRIEF CV:

Person 3:

NAME:

ROLE:

BRIEF CV:

Person 4:

NAME:

ROLE:

BRIEF CV:

Person 5:

NAME:

ROLE:

BRIEF CV:

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

8 SCHEDULE OF EXTERNAL DESIGNERS

(SUBMIT WHEN REQUESTED BY PRINCIPAL)

If the Tenderer proposes to use subcontractors for design development and documentation for such work which is not subject to Selected Subcontracts, provide full details and references to show their proven competence, qualifications and experience on similar tasks to satisfactorily perform the proposed functions.

Refer to Clause ANNEXURE PART B - DESIGN, DOCUMENTATION AND CONSTRUCTION OBLIGATIONS

NAME OF PROPOSED SUBCONTRACTOR:

ADDRESS:

PHONE:

FAX:

OTHER OFFICES:

PROPOSED DISCIPLINES UNDER THE CONTRACT, INCLUDING ESTIMATED VALUE OF ENGAGEMENT

.....
.....

The following details are not required where such proposed subcontractors are registered as Consultants for the relevant discipline with the Department of Commerce.

TYPE OF ORGANISATION

Sole Trader () *(Tick where applicable)*

Company ()

Partnership ()

Other *(Describe)*

Date Established

A.B.N.

Business Name No. *(If any)*

CURRENT INSURANCE

Professional Indemnity

Public Liability

Insurer

Sum Insured

Date of Expiry

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

TENDER SCHEDULES

STAFF NUMBERS

Number of full-time employees (*exclude contract staff or associated firms*)

	Main Office	Other Offices
Office Location		
Principals
Qualified Architects
Professional Engineers
Other Professionals
Technical Support Staff
Admin./Secretarial
Others
Total Staff		

PRINCIPALS AND KEY PERSONNEL

Name	Discipline	Qualifications, Affiliation and Date of Professional Registration
------	------------	---

Principals:

**Key Personnel proposed
for Contract:**

OFFICE FACILITIES:

Describe the relevant support facilities available in your various offices (eg. Type and Capacity of C.A.D.D. System, subscription to NATSPEC, including update service).

Note that where an engagement includes preparation of specifications for building works, subscription to NATSPEC will be a mandatory requirement.

RELEVANT RECENT AND CURRENT ENGAGEMENTS

Greatest consideration will be given to engagements completed in the last two years and substantially completed current engagements.

Where a consultancy has completed engagements more than two years prior to the date of application, those engagements will only be considered where supporting evidence is provided that the consultancy has retained expertise.

Project
Overall value \$
Client,

TENDER SCHEDULES

Contact Person and Phone No.

Engagement Details

Primary or secondary consultant

Actual or Anticipated Completion
Date

Value of work constructed
resulting from engagement \$

Fee \$ or % or range

Key Personnel Details

Person 1:

NAME:

ROLE:

BRIEF CV:

Person 2:

NAME:

ROLE:

BRIEF CV:

Person 3:

NAME:

ROLE:

BRIEF CV:

Person 4:

NAME:

ROLE:

BRIEF CV:

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

9 SCHEDULE OF FINANCIAL ASSESSMENT INFORMATION

(SUBMIT WHEN REQUESTED BY PRINCIPAL)

Provide documents and information listed below in accordance with Clause CONDITIONS OF TENDERING - FINANCIAL ASSESSMENT.

- 1) Financial Statements for last three years for the entity under consideration, including:
 - i) Balance Sheets;
 - ii) Profit and Loss Statement;
 - iii) detailed Profit and Loss Statement;
 - iv) statement of Cash Flows;
 - v) notes to and Forming Part of the Accounts;
 - vi) an Accountant's Report;
 - vii) where existing, Auditor's Reports.

Consolidated accounts of a parent organisation or group to which the entity belongs are not acceptable.
- 2) Where latest financial statement is more than 6 months old, the latest management report showing:
 - i) a trading statement;
 - ii) a profit and loss statement;
 - iii) a trial balance.
- 3) Where the company is required to lodge audited financial statements with ASIC, copies of these statements for the last three years.
- 4) Where any financial statement supplied is not audited, copies of the entity's tax returns for last three years.
- 5) A letter from the Tenderer's banker providing details of overdraft and guarantee facilities including:
 - i) Bank, Branch, and Account Names,
 - ii) type and limit of bank overdraft facility,
 - iii) type and limit of bank guarantee facility,
 - iv) current bank overdraft balance,
 - v) number and amount of bank guarantees outstanding
 - vi) details of other bank funding facilities available to the Tenderer, such as term loans, lines of credit, commercial bills and other debt instruments.
- 6) Current and projected cash flows for all work on hand.
- 7) Forecast budget for forthcoming financial year including Revenue and Profit and Loss.
- 8) Names and contact numbers of:
 - i) major suppliers
 - ii) major subcontractors.
- 9) Details relating to the Tenderer's history and Directors Profiles.

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

10 SCHEDULE OF PERFORMANCE GUARANTEES

(SUBMIT WITH TENDER FORM)

The successful Tenderer shall provide Performance Guarantees for the following items:

1 Pre-treated Water Quality

The DAF plant shall be required to produce pre-treated water to the water quality requirements listed in Table 2 at the plant throughput as stated in Table 1 when supplied with raw water with maximum quality as specified in Clause 8 of Sub-Section 1; General . The specified sampling point shall be at the outlet of the DAF pre-treated water storage tank.

Table 1 – Net Pre-Treated Water Quantity Requirements

Parameter	Winter or Summer
Maximum net treated water throughput	64.4 L/s

Table 2 – Pre-Treated Water Quality Requirements

Parameter	Requirement	Test Method
True Colour	≤ 10 Hazen Units	AWWA Standard Methods
Turbidity	≤ 5 NTU 95% of the time ≤ 10 NTU 100% of the time	AWWA Standard Methods
pH	7.2 – 8.0	AWWA Standard Methods

Signed for the Tenderer by: Date:

Name (in block letters) (Authorised Officer)

In the Office Bearer capacity of:

11 SCHEDULE OF PRICES

(SUBMIT WITH TENDER FORM)

This Schedule is for information only and does not form part of the Contract. Its purpose is to assist in making valuations of works carried out but the Principal is not bound to use it.

Insert the amount allowed for each of the following items.

If any item is not applicable, insert "nil". Insert any item not included.

All prices are to be GST exclusive.

Item No.	Description	Amount
A.	Preliminary Design and Documentation	
	A.1 Process, Mechanical, and Electrical	\$
	A.2 Civil Works	\$
B.	Detailed Design /Supply /Installation /Construction	
	<i>Tenderer to cross out items not offered in this Contract</i>	
B.1	Flash mixing arrangement	\$
B.2	Flocculation Equipment	
	Process	\$
	Mechanical	\$
	Electrical	\$
B.3	DAF Equipment	
	Process	\$
	Mechanical	\$
	Electrical	\$
B.4	Coagulant Dosing Equipment	
	Process	\$
	Mechanical	\$
	Electrical	\$
B.5	pH Correction Dosing Equipment	
	Process	\$
	Mechanical	\$
	Electrical	\$
B.6	Plant Wastewater Transfer Equipment	
	Mechanical	\$
	Electrical	\$
B.7	Main switchboard and all other electrical, instrumentation, control and monitoring equipment, including cabling, earthing, PLC & SCADA etc).	\$
B.8	Variable speed drives with associated equipment for raw water pumps	\$
B.9	Any Item not listed above	
	Sub-total for Item B:	\$
C.	TESTING/DEMONSTRATION/COMMISSIONING:	
C.1	Testing	\$
C.2	Demonstration	\$

TENDER SCHEDULES

Item No.	Description	Amount
C.3	Commissioning	\$
C.4	Water Quality Compliance Tests (if required)	\$
C.5	Training of Operators	\$
C.6	Supply of Operation and Maintenance Manuals	\$
C.7	Supply of Work-As-Executed Drawings. Supply of Tool, Spare Parts and Lubricants	\$
C.8	Any items not listed above	\$
Sub-total for Item C:		\$
 D. POST COMMISSIONING		
D.1	Plant inspection in the 11 th month after Date of Practical Completion of Separable Portion 3	\$
D.2	Any items not listed above	\$
Sub-total for Item D:		\$
 TOTAL OF TENDER (Total of Items A to D): (excluding GST)		\$
GST		\$
TOTAL OF TENDER (including GST): (to equal amount on Tender Form)		\$

Signed for the Tenderer by: Date:

Name (in block letters) (Authorised Officer)

In the Office Bearer capacity of:

12 SCHEDULE OF PRICES FOR OPTIONAL TENDER – CIVIL WORKS

(SUBMIT WITH TENDER FORM IF OFFERED)

Insert the amount allowed for each of the following items.

If any item is not applicable, insert “nil”. Insert any item not included.

All prices are to be GST exclusive.

Item No.	Description	Quantity	Unit	Amount \$
1	All work and obligations under the Contract NOT INCLUDED ELSEWHERE in this Schedule		Item Lump Sum	.....
2	Site establishment and disestablishment (Max. \$10,000)		Item Lump Sum	.....
3	PIPELINES AND FITTINGS Design pipelines listed below, produce construction drawings and construct pipelines including locating services, setting out of pipelines, excavate in all classes of materials, supply of all pipes and fittings (excluding valves, in-line mixer and magflow meter), labour and plants including bedding material if required. Lay, joint, test and backfill the pipelines including construction of thrust and anchor blocks, installing marker tapes, indicator posts and restoration of surfaces. Refer drawing No. 02/2009 - 02			
(a)	Pipeline including connection from existing raw water rising main to the new DAF Plant up to the limit of contract.		Item Lump Sum	.....
(b)	Pre-treated pipeline from the limit of contract near the new DAF Plant to the existing raw water rising main's spare tee including connection located upstream of the existing magflow meter.		Item Lump Sum	.....

Signed for the Tenderer by: Date:

Name (in block letters) (Authorised Officer)

In the Office Bearer capacity of:

Item No.	Description	Quantity	Unit	Amount \$
(c)	Pipelines (scum and sludge discharge lines) from the new DAF Plant to the new distribution pit as shown on the drawing.		Item Lump Sum	.....
(d)	Inlet pipelines from distribution pit to lagoons 1 and 2 inlet pits including concrete surrounds of the pipes laid across the lagoon embankments.		Item Lump Sum	.....
(e)	Outlet pipelines from outlet pits in lagoons 1 and 2 to collection pit including concrete surrounds of the pipes laid across the lagoon embankments.		Item Lump Sum	.....
(f)	Pipeline from new collection pit to the existing supernatant inlet pipeline including connection detail Refer work as executed drawing No. 0202417 – 40 for existing pipe details.		Item Lump Sum	.....
(g)	Pipeline starting from the existing waste water tank including connection detail up to the limit of contract to the inlet of the new DAF Plant.		Item Lump Sum	.....
4	CIVIL WORKS FOR INSTALLATION OF NEW DAF PLANT			
(a)	Design, supply all materials and labour to construct reinforced concrete slab platform to the requirements of new DAF Plant Supplier's specification and requirements.		Item Lump Sum	.....
(b)	Provide a suitable roof cladding supported on a steel portal frame to cover the plant including guttering and plant access from the natural ground. Standard design pre-fabricated industrial shed structures, compliant with Australian Standards & fit for proposed use, will be considered.		Item Lump Sum	.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

Item No.	Description	Quantity	Unit	Amount
				\$

5 DISTRIBUTION PIT

- (a) Design, supply all materials and labour, excavate in all materials including rock and construct a suitable reinforced concrete distribution pit or supply, lay and joint suitable precast reinforced concrete pipe/s from Hume's Pipes or equivalent.
The distribution pit shall be founded on a firm stratum.
- (b) Supply and install two suitable gate valves with spindles and associated fittings on the inlet pipelines inside the distribution pit for lagoon operational purposes.

Item Lump Sum

Item Lump Sum

6 INLET PITS

Design, supply all materials and labour, excavate in all materials including rock, timbering, dewatering if required and construct a suitable reinforced concrete inlet pit in lagoons or supply, lay and joint suitable precast reinforced concrete pipe/s from Humes Pipes Ltd. or equivalent.
The inlet pit shall be founded on a firm stratum and shall have a notch opening on each pit.

Item Lump Sum

7 OUTLET PITS

- (a) Design, supply all materials and labour, excavate in all materials including rock, timbering, dewatering if required and construct a suitable reinforced concrete outlet pit in both lagoons.
Outlet pits shall have a square cross sectional pit area with provision for stop boards for controlling sludge levels and the stop boards shall be of tallow wood or similar.

Item Lump Sum

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

TENDER SCHEDULES

Item No.	Description	Quantity	Unit	Amount \$
(b)	Design and Construct walkways and davits including supply of materials, labour and plant.		Item Lump Sum	.....
8	COLLECTION PIT			
(a)	Design, supply all materials and labour, excavate in all materials including rock and construct a suitable reinforced concrete collection pit or supply, lay and joint suitable precast reinforced concrete pipe/s from Hume's Pipes or equivalent. The collection pit shall be founded on a firm stratum.		Item Lump Sum	.....
(b)	Supply and install two suitable gate valves with spindles and associated fittings on the inlet pipelines inside the collection pit for lagoon operational purposes.		Item Lump Sum	.....
9	INSTALLATION OF IN-LINE MIXER, MAGFLOW METER, VALVES AND FITTINGS			
	Design, supply and install all stop valves excluding control valves inside distribution and collection pits, relocate existing magflow meter to new raw water line above ground, in-line mixer (if provided), tapplings for acid/coagulant dosing and fittings identified within the limit of contract. Excavate in all classes materials, backfilling and compaction. Construct pits with covers, including concrete supports and marker posts.			
(a)	Stop valves on the new pipelines including valve pit with covers.		Item Lump Sum	.....
(b)	Acid/coagulant dosing points including pipes and fittings from storage.		Item Lump sum	.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

TENDER SCHEDULES

Item No.	Description	Quantity	Unit	Amount \$
10	LAGOONS REMEDIAL WORKS			
(a)	Clear vegetation and reinstate embankments profile by filling the areas affected by erosion.		Item. Lump sum	.....
(b)	Stabilise the existing lagoon internal batter slopes and floor with 5% w/w lime.		Item. Lump sum	.....
11	Prepare and implement OHS&R Management Plan, Environmental Management Plan and Quality Assurance Plan.		Item. Lump sum	.....
12	Relocate, if required, the existing septic tank & transpiration pit to a location conducive to draining existing wastewater.		Item. Lump sum	.....
13	Hydrostatic testing of pipelines.		Item. Lump sum	.....
14	Prepare Work As Executed Drawings.		Item. Lump sum	.....
TOTAL (Total of Items 1 to 15): (excluding GST)				.....
GST				
TOTAL (including GST):				

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

13 SCHEDULE OF MANDATORY ALTERNATIVE TENDERS

(SUBMIT WITH TENDER FORM)

Insert the amount to be added or subtracted from the Tender Sum in respect of each of the following items in accordance with Clause CONDITIONS OF TENDERING – ALTERNATIVE TENDERS. The Principal may accept none or any of these alternatives.

Item No.	Description	Amount (GST Exclusive)	GST	Amount (GST Inclusive)
1.	Price deduction to provide a DAF unit with a rise rate of 15m/hr instead of 10m/hr.	\$	\$	\$
2.	Price increase to provide suitable netting around the roof over the DAF unit to prevent entry of birds to the DAF Plant area.	\$	\$	\$
3.	Price reduction for providing the DAF unit without bottom scraper.	\$	\$	\$
4.	Price reduction to carry out the design, supply, installation, testing, demonstration and commissioning of all the electrical, instrumentation, control and automation works required for the DAF Pre-Treatment System as per the tenderer's standard design but complying with all the relevant Australian Standards and local Supply Authority requirements. List all the departures to the Specification in the SCHEDULE OF DEPARTURES.	\$	\$	\$
5.	Price increase to Supply Standby Equipment Where Such Equipment Can Increase The Reliability of The Plant.	\$	\$	\$
6.	Purchase of existing backwash water DAF treatment unit (Yes/No). If yes price reduction.	\$	\$	\$
7.	Price increase for design, supply & installation of surge suppressors for the existing main switchboard as per Clause 2.5.9 of Section 3 Sub-section Electrical.	\$	\$	\$

Signed for the Tenderer by: Date:

Name (in block letters) (Authorised Officer)

In the Office Bearer capacity of:

14 SCHEDULE OF TECHNICAL DATA

(SUBMIT WITH TENDER FORM)

List all information required by this Schedule, and attach details of manufactures product data together with illustrations as are necessary to fully describe the Tenderer's offer.

Item	Description	Tenderer's Offer
1	DAF Pre-treatment System	
	Describe the overall pre-treatment system process, including submission of drawings in A3 size of:	
	(i) Site Layout	Attach separate sheets
	(ii) Simplified Hydraulic Profile	
	(iii) Simplified Process and Instrumentation Diagram	
	(iv) Schematic flow diagram including wastewater treatment, all major pipe sizes.	
2	Flash Mixing Arrangement	
	In-line Static mixer (if provided)	.....
	Dimensions	.....
	Material of construction of static mixer	.....
3	Flocculation Tank	
	Number of chambers	.....
	Detention time (at design flow)	.....
	Dimensions	.....
	Material of construction	.....
4	DAF Unit	
	Number of units	.....
	Material of Construction	.....
	Surface loading rate	.....
	Detention time	.....
	Recycle rate	.....
	Air compressor	.....
	Number of units and capacity	.....
	Manufacturer	.....
	Recycle pump	.....
	Number of units and capacity	.....
	Manufacturer	.....
	Saturator	.....
	Detention time	.....
	Number of units and capacity	.....
	Material of construction	.....
	Mechanical sludge skimming equipment (De-float)	.....
	Bottom sludge scraper	.....

TENDER SCHEDULES

Item	Description	Tenderer's Offer	
5	Chemicals		
	Chemical	Min. Dosage (mg/L)	Max. Dosage (mg/L)
	Hardman Alchor Premium (23% Al ₂ O ₃)	.....	.....
	pH correction (Orica HCl Acid (33% solution))	.....	.....
7	Coagulant Dosing		
	Metering Pumps	Manufacturer	.....
		Model No.	.....
		Capacity	.....
8	pH Correction Dosing		
	Metering Pumps	Manufacturer	.....
		Model No.	.....
		Capacity	.....
9	Wastewater Transfer Pump & Pipework		
	No. of pumps		.....
	Use Existing pump		.....
	Capacity		.....
	Manufacturer		.....
	Model No.		.....
	Transfer pipe (size/length)		.....
10	Plant Switchboard		
	Manufacturer		.....
	Fault rating		.....
11	PLC		
	Manufacturer		.....
12	Magflow Meter (Relocate existing)		.....

Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

15 SCHEDULE OF DEPARTURES

(SUBMIT WITH TENDER FORM)

The Tenderer has examined the Tender Document and agrees that the Tender offered complies with the contractual and technical requirements of the Tender Document except as stated below. If the Tenderer does not complete this Schedule it shall be taken that the Tender complies in all respects with the Tender Document.

In the event of a Contract being awarded, all work included in the Contract shall be fully in accordance with all aspects of the Tender Document unless listed below and accepted by the Principal in the Letter of Acceptance.

Items in this Schedule as accepted by the Principal take precedence over all other tender information, including comments in any letter accompanying the Tender, Tender Drawings, and Schedules of Technical Data.

The Tender offered does not comply with the Tender Document in the following technical respects:

Clause No.	Description	Alternative and \$ value for complying with the Contract
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Signed for the Tenderer by: Date:

Name (in block letters)(Authorised Officer)

In the Office Bearer capacity of:

END OF SECTION –TENDER SCHEDULES

END OF SECTION – TENDERING

SPECIFICATION

1. GENERAL CONDITIONS OF CONTRACT AND ANNEXURE:

THERE ARE 51 PAGES IN THIS SECTION

The General Conditions of Contract AS 2124-1986 as amended below, together with the Annexures, shall form part of this Contract.

AUSTRALIAN STANDARD AS 2124-1986 GENERAL CONDITIONS OF CONTRACT (AS AMENDED) NOTE: Clauses prefixed by an asterisk can be omitted without making consequential amendments.

1 CONSTRUCTION OF CONTRACT.

The Contract shall be governed by and construed with reference to the laws for the time being in force in the State or Territory named in the Annexure.

Unless otherwise provided, prices are in Australian currency and payments shall be made in Australian currency at the place named in the Annexure.

Communications between the Principal, the Superintendent and the Contractor shall be in the English language.

Measurements of physical quantities shall be in Australian legal units of measurement within the meaning of the Weights and Measures (National Standards) Act 1960 as amended from time to time.

Where provisions in the General Conditions of Contract are expressed to be alternatives and the Contract fails to state which alternative applies, the first alternative shall apply.

2 INTERPRETATION.

In the Contract, except where the context otherwise requires—

'Bill of Quantities' means a document named therein as a Bill of Quantities issued to tenderers by or on behalf of the Principal, stating estimated quantities of work to be carried out;

'Business Day' means any day other than:

(a) *a Saturday, Sunday or public holiday, or*

(b) *27, 28, 29, 30 or 31 December.*

'Constructional Plant' means appliances and things used in the execution of the work under the Contract but not forming part of the Works;

'Contract Price' at any particular date means the Contract Sum [excluding any provisional sums] increased or decreased by:

(a) *if the Principal and the Contractor agree in writing on a specific amount to be added to or deducted from the Contract Price, the agreed amount; or*

(b) *if by a final decision under Clause 46, it is decided that a specific amount is to be added to or deducted from the Contract Price, the amount decided.*

'Contract Sum' means—

(a) where the Principal accepted a lump sum, the lump sum;

(b) where the Principal accepted rates, the sum ascertained by calculating the products of the rates and the corresponding quantities in the Bill of Quantities or Schedule of Rates;

(c) where the Principal accepted a lump sum and rates, the aggregate of the sums referred to in paragraphs (a) and (b),

including provisional sums but excluding any additions or deductions which may be required to be made under the Contract;

'Contractor' means the person bound to execute the work under the Contract;

'Date of Acceptance of Tender' means the date which appears on the notice in writing of acceptance of the tender;

'Date for Practical Completion' means:

- where the Annexure provides a date for Practical Completion, the date;

- where the Annexure provides a period of time for Practical Completion, the last day of the period;

but if an extension of time for Practical Completion is granted by the Superintendent, it means the date resulting from the extension of time.

'Date of Practical Completion' means the date certified by the Superintendent in a Certificate of Practical Completion under Clause ~~42.5~~35.2 to be the date upon which the Works reached Practical Completion;

'day' means calendar day;

'Drawings' means the drawings referred to in the Contract and any modification of such drawings notified to the Contractor by the Superintendent and includes such other drawings as may from time to time be supplied to the Contractor by the Superintendent, or the use of which has been permitted by the Superintendent, for the purposes of the Contract;

'month' means calendar month;

'person' includes a firm or body corporate or unincorporate as well as an individual;

'Practical Completion' is that stage in the execution of the work under the Contract when–

- (a) the Works are complete except for minor omissions and minor defects–
 - (i) which do not prevent the Works from being reasonably capable of being used for their intended purpose, and
 - (ii) in relation to which the Superintendent determines that the Contractor has reasonable grounds for not promptly rectifying them, and
 - (iii) rectification of which will not prejudice the convenient use of the Works, and
- (b) those tests which are required by the Contract to be carried out and passed before the Works reach Practical Completion have been carried out and passed, and
- (c) documents and other information required under the Contract which, in the opinion of the Superintendent, are essential for the use, operation and maintenance of the Works have been supplied;

'Priced Bill of Quantities' means the Bill of Quantities priced and lodged by the Contractor with the Superintendent and corrected where necessary under Clause 4.3;

'Principal' means the Principal stated in the Annexure;

'provisional sum' includes monetary sum, contingency sum and prime cost item;

'Schedule of Rates' means any schedule included in the Contract which, in respect of any section or item of work to be carried out, shows the rate or respective rates of payment for the execution of that work and which may also include lump sums, provisional sums, other sums, quantities and prices;

'Separable Portion' means a portion of the work under the Contract described in the Contract as a Separable Portion or made a Separable Portion under Clause 35.4;

'Site' means the lands and other places to be made available and any other lands and places made available to the Contractor by the Principal for the purpose of the Contract;

'Specification' means the Specification for work to be carried out as existing at the Date of Acceptance of Tender and any modification of such Specification thereafter directed or the use of which has been permitted by the Superintendent pursuant to powers contained in the Contract;

'Superintendent' means the person named in the Annexure as the Superintendent or other person from time to time appointed in writing by the Principal to be the Superintendent and notified as such in writing to the Contractor by the Principal and, so far as concerns the functions exercisable by a Superintendent's Representative, includes a Superintendent's Representative;

'Superintendent's Representative' means a person appointed in writing by the Superintendent under Clause 24;

'Temporary Works' means works used in the execution of the work under the Contract but not forming part of the Works;

'work under the Contract' means the work which the Contractor is or may be required to execute under the Contract and includes variations, remedial work, Constructional Plant and Temporary Works;

'Works' means the whole of the work to be executed in accordance with the Contract, including variations provided for by the Contract, which by the Contract is to be handed over to the Principal;

The clause headings and sub-clause headings in the General Conditions of Contract shall not form part of the General Conditions of Contract and shall not be used in the interpretation of the Contract.

Words in the singular include the plural and words in the plural include the singular, according to the requirements of the context.

Words importing a gender include every gender.

3 NATURE OF CONTRACT.

3.1 Performance and Payment.

The Contractor shall execute and complete the work under the Contract.

The Principal shall pay the Contractor:

- for work for which the Principal accepted a lump sum, the lump sum;
- for work for which the Principal accepted rates, the sum ascertained by multiplying the measured quantity of each section or item of work actually carried out under the Contract by the rate accepted by the Principal for the section or item;

adjusted by any additions or deductions pursuant to the Contract.

3.2 Quantities.

Quantities in a ~~Bill of Quantities or~~ Schedule of Rates are estimated quantities only.

An order shall not be required to be given by the Superintendent by reason of the actual quantity of an item required to perform the Contract being greater or less than the quantity shown in the ~~Bill of Quantities or~~ Schedule of Rates.

Where otherwise than by reason of a direction of the Superintendent under Clause 40.1, the actual quantity of an item required to perform the Contract is greater or less than the quantity shown in the ~~Bill of Quantities or~~ Schedule of Rates—

- (a) where the Principal accepted a lump sum for the item, the difference shall be valued under Clause 40.2;
- (b) where the Principal accepted a rate for the item, the rate shall apply to greater or lesser quantities within the limits of accuracy stated in the Annexure and quantities outside the limits shall be valued under Clause 40.2.

4 BILL OF QUANTITIES. (NOT USED)

5 SECURITY, RETENTION MONEYS AND PERFORMANCE UNDERTAKINGS.

5.1 Purpose.

Security, retention moneys and performance undertakings are for the purpose of ensuring the due and proper performance of the Contract.

5.2 Provision of Security.

If it is provided in the Annexure that a party shall provide security then the party shall provide security in the amount stated in the Annexure and in accordance with this clause.

5.3 Form of Security.

The security shall be in the form of cash or an approved unconditional undertaking given *in the form attached to these General Conditions at Schedule 1. All undertakings must be provided by a financial institution acceptable to the Principal.* ~~by an approved financial institution or insurance company or other form approved by the party having the benefit of the security.~~

The party having the benefit of the security shall have a discretion to approve or disapprove of the form of an unconditional undertaking and the financial institution or insurance company giving it or other form of security offered. The form of unconditional undertaking attached to these General Conditions is approved.

If the security is not transferable by delivery it shall be accompanied by an executed transfer. The costs (including all stamp duty or other taxes) of and incidental to the transfer and retransfer shall be borne by the party providing the security.

5.4 Time for Lodgement of Security.

Security shall be lodged within 28 days of the Date of Acceptance of Tender. Failure to lodge security within that period shall be a substantial breach of Contract within the meaning of Clause 44.

5.5 Conversion of Security.

A party shall not convert into money security that does not consist of money until the party becomes entitled to exercise a right under the Contract in respect of the security. The party shall not be liable for any loss occasioned by conversion pursuant to the Contract.

5.6 Substitution of Security for Retention Moneys.

The Contractor shall be at liberty at any time to provide in lieu of retention moneys additional security in any of the forms permitted by Clause 5.3. To the extent that additional security is provided, the Principal shall not deduct retention moneys and shall forthwith release retention moneys.

5.7 Reduction of Security and Retention Moneys.

Upon issue of the Certificate of Practical Completion, the Principal's entitlement to security and retention moneys shall be reduced to the percentage thereof stated in the Annexure or, if no percentage is stated, by one-half.

If in the opinion of the Superintendent it is reasonable to further reduce retention moneys or security, the Principal's entitlement shall be reduced to the amount which the Superintendent determines to be reasonable.

The Principal shall release security and retention moneys in excess of the entitlement *within 14 days of the entitlement being so reduced.*

5.8 Release of Security.

If the Contractor has provided additional security pursuant to Clause 42.4, the Principal shall release that additional security upon incorporation into the Works of the unfixed plant or materials in respect of which the additional security was furnished.

If the Principal has provided security, then when the Contractor has been paid all moneys due to the Contractor under the Contract or a Separable Portion the Contractor shall account to the Principal for security lodged by the Principal in respect of the Contract or the Separable Portion, as the case may be.

If the Contractor has provided security then the Principal shall release it when required by Clause 42.8.

If the Contractor has provided additional security in order to have the value of certain unfixed plant or materials included in a progress payment, the Principal will release the additional security upon incorporation into the Works of the unfixed plant or materials.

Within 28 days after receipt of the Contractor's Statement of Outstanding Claims under Clause 42.6, the Principal will release to the Contractor any retention moneys or security then held by the Principal.

5.9 Interest on Security and Retention Moneys.

Alternative 1.

The party holding retention moneys or cash security shall own any interest earned on the retention moneys or security.

Alternative 2. (NOT USED)

6 EVIDENCE OF CONTRACT.

6.1 Contract in Absence of Formal Instrument of Agreement.

~~Until~~ Unless a Formal Instrument of Agreement is executed by the parties, the agreement in writing between the parties for the execution of the work under the Contract, including documents or parts of documents to which reference may properly be made to ascertain the rights and obligations of the parties, shall evidence the Contract.

The Contract is the entire agreement between the parties, and supersedes finally and conclusively all tender documentation, tender negotiations, discussions and correspondence and all other pre-contract material not expressly referenced or included in the written agreement, ('pre-contract matters').

Except where not permitted by law, by entering into the Contract the parties acknowledge they have no claims or actions whatsoever arising out of pre-contract matters other than under the terms of the Contract.

7 SERVICE OF NOTICES.

A notice shall be deemed to have been given when it is received by the person to whom it is addressed or is delivered to the address of the person last communicated by the person to the person giving the notice, whichever is the earlier.

The Principal, the Contractor and the Superintendent shall each notify the others of a change of address.

Notices signed by an officer of the Department of Commerce on behalf of the Principal, Superintendent or Superintendent's Representative shall be as effective as if signed by the Principal, Superintendent or Superintendent's Representative personally.

Without limiting the generality of 'notice', it includes a document.

8 CONTRACT DOCUMENTS.

8.1 Discrepancies. (NOT USED)

8.2 Dimensions.

Where any discrepancy exists between figured and scaled dimensions, the figured dimensions shall prevail.

8.3 Supply of Documents by Principal.

The Principal shall supply to the Contractor the number of copies stated in the Annexure, or if no number is stated then 5 copies of the Drawings, Specification, Bill of Quantities (if any) and other documents required by the Contract to be supplied to the Contractor by the Principal.

Documents supplied to the Contractor shall remain the property of the Principal and shall be returned by the Contractor to the Principal on demand in writing. The documents shall not, without the prior written approval of the Principal, be used, copied or reproduced for any purpose other than the execution of the work under the Contract.

8.4 Supply of Documents by Contractor.

If the Contract requires the Contractor to supply documents, the Contractor shall supply the number of copies stated in the Annexure, or if no number is stated then 3 hard copies and an electronic copy.

The Superintendent and/or the Principal shall not be bound to check the documents for errors, omissions or compliance with the requirements of the Contract. The Contractor shall have no claim whatsoever due to the Superintendent and/or Principal not detecting and notifying the Contractor of any errors, omissions or non-compliance with the requirements of the Contract in the documents submitted.

If the Contract provides that the Contractor must obtain the Superintendent's approval to the use of documents supplied by the Contractor then *in addition*:

- (a) ~~The Superintendent shall not be bound to check the documents for errors, omissions or compliance with the requirements of the Contract.~~
- (b) Notwithstanding the provisions of Clause 23, the Superintendent's approval shall not relieve the Contractor from responsibility for the Contractor's errors or omissions or compliance with the requirements of the Contract. *If the Superintendent approves documents which contain one or more of errors, omissions or non-compliance with the requirements of the Contract, then such approval shall not be a direction or approval to vary the work pursuant to Clause 40 unless the approval to use the documents includes such a direction or approval and describes the nature of the variation.*
- (c) Within the time stated in the Annexure (or if no time is stated then within 14 days) after receipt of the documents the Superintendent shall advise the Contractor that the documents are suitable or are not suitable.
- (d) If the Superintendent advises the Contractor that the documents are not suitable, the Contractor shall submit new or amended documents.

- (e) The Superintendent shall not reject documents which are in accordance with the requirements of the Contract.

Copies of documents supplied by the Contractor shall be the property of the Principal but shall not be used or copied otherwise than for the use, maintenance or alteration of the Works.

8.5 Availability of Documents.

During the execution of the work under the Contract one complete set of Drawings, Specification and other written information supplied by the Principal, the Superintendent and the Contractor shall be kept by the Contractor at the Site or other location approved in writing by the Principal and shall be available at all times for reference by the Principal, the Superintendent and any persons nominated in writing by either of them.

During the manufacture or assembly of any significant part of the work under the Contract away from the part of the Site where the Works are to be constructed a set of the drawings and written information relevant to that part of the work shall be kept by the Contractor at the place of manufacture or assembly and shall be available for reference by the Principal, the Superintendent and any person nominated in writing by either of them.

8.6 Confidential Information.

Drawings, specifications and other information, samples, models, patterns and the like, supplied by either the Contractor or the Principal and marked or otherwise identified as confidential shall be regarded as confidential and shall not be disclosed to a third party except with the prior agreement of the other party to the Contract.

If required in writing by a party the other party shall enter into a separate agreement not to disclose to anyone else any confidential matter even after the expiry of the Contract.

8.7 Media Releases.

The Contractor shall not issue any information, publication, document or article for publication concerning the project in any media without prior approval of the Principal, which approval shall not be unreasonably withheld. The Contractor shall refer to the Principal any enquiries concerning the project from any media.

9 ASSIGNMENT AND SUBCONTRACTING.

9.1 Assignment.

Neither party shall, without the prior written approval of the other and except on such terms and conditions as are determined in writing by the other, assign the Contract or any payment thereunder.

9.2 Subcontracting.

The Contractor shall not without the written approval of the Superintendent, which approval shall not be unreasonably withheld, subcontract or allow a subcontractor to assign or subcontract work described in the Annexure.

With a request for approval the Contractor shall provide to the Superintendent particulars in writing of the work to be subcontracted and the name and the address of the proposed subcontractor.

The Contractor shall provide to the Superintendent other information which the Superintendent reasonably requests, including the proposed subcontract documents without prices.

Within 14 days after a request by the Contractor for approval the Superintendent shall advise the Contractor of approval or the reasons why approval is not given.

Approval may be conditional upon the subcontract including:

- provision that the subcontractor shall not assign or subcontract without the consent in writing of the Contractor;
- provisions which may be reasonably necessary to enable the Contractor to fulfil the Contractor's obligations to the Principal.

9.3 Contractor's Responsibility.

Approval to subcontract shall not relieve the Contractor from any liability or obligation under the Contract. Except where the Contract otherwise provides, the Contractor shall be liable to

the Principal for the acts and omissions of subcontractors and employees and agents of subcontractors as if they were acts or omissions of the Contractor.

10 ~~DESIGNATED, SELECTED AND NOMINATED SUBCONTRACTORS.~~

10.1 Definitions.

If the Contract provides that certain work or the supply of certain items shall be subcontracted to a ~~Designated, Selected or Nominated~~ Subcontractor, the work or the supply of the items is ~~'Designated Subcontract Work', 'Selected Subcontract Work' or 'Nominated Subcontract Work'~~, and:

'Nominated Subcontractor' means a subcontractor to whom the Contractor is directed by the Superintendent to subcontract Nominated Subcontract Work.

10.2 Designated Subcontractors. (NOT USED)

10.3 Selected Subcontractors.

If the Contract includes Selected Subcontract Work the Contractor shall subcontract the Selected Subcontract Work to a Selected Subcontractor.

If the Contract does not include a list of approved subcontractors, the Contractor shall provide a list for the approval of the Superintendent. The Superintendent shall not unreasonably refuse to approve of any subcontractor on the list.

If the Superintendent does not approve of any subcontractor on the list provided by the Contractor or if no subcontractor on the list included in the Contract or provided by the Contractor will subcontract to perform the Selected Subcontract Work, ~~the Selected Subcontract Work shall be regarded as Nominated Subcontract Work and the Superintendent shall nominate a Nominated Subcontractor.~~ *the Contractor shall provide an additional list for the approval of the Superintendent.*

10.4 Nominated Subcontract. (NOT USED)

10.5 Provisions Applying Generally to ~~Designated, Selected and Nominated~~ Subcontract Work.

If the Contractor is required by Clause 10 to enter a subcontract, the Contractor shall proceed promptly to do so and shall notify the Superintendent in writing as soon as the subcontract has been entered.

With the consent of the Contractor, the Superintendent may direct the Contractor to perform ~~Designated, Selected or Nominated~~ Subcontract Work.

Notwithstanding Clause 16.2, if the Contractor is to be responsible to the Principal for the design or suitability of Designated, Selected or Nominated Subcontract Work, as distinct from the quality or workmanship, the responsibility shall be expressly stated in the Contract and the Contractor's liability for the design or suitability of the Designated, Selected or Nominated Subcontract Work shall only be that which is expressly stated in the Contract.

11 PROVISIONAL SUMS.

A provisional sum included in the Contract shall not itself be payable by the Principal but–

- (a) where at the direction of the Superintendent the work or item to which the provisional sum relates is performed or supplied by the Contractor, the work or item shall be valued under Clause 40.2;
- (b) where at the direction of the Superintendent the work or item to which the provisional sum relates is performed or supplied by a subcontractor to the Contractor the Principal shall pay the Contractor the amount payable to the subcontractor for the work or item, disregarding any damages payable by the Contractor to the subcontractor or vice versa, plus the amount or percentage thereon for profit and attendance stated in the Annexure or elsewhere in the Contract.

The amount payable to a subcontractor for materials or goods is to be taken to be the nett cost to the Contractor (disregarding any deduction of cash discount for prompt payment).

12 LATENT CONDITIONS.

12.1 Definition.

Latent Conditions are–

- (a) physical conditions on the Site or its surroundings, including artificial things but excluding weather conditions *or physical conditions which are a consequence of weather conditions at the Site*, which differ materially from the physical conditions which should reasonably have been anticipated by the Contractor at the time of the Contractor's tender if the Contractor had–
 - (i) examined all information made available in writing by the Principal to the Contractor for the purpose of tendering; and
 - (ii) examined all information relevant to the risks, contingencies and other circumstances having an effect on the tender and obtainable by the making of reasonable enquiries; and
 - (iii) inspected the Site and its surroundings; and
- (b) any other conditions which the Contract specifies to be Latent Conditions.

12.2 Notification.

If during the execution of the work under the Contract, the Contractor becomes aware of a Latent Condition the Contractor shall forthwith and where possible before the physical conditions are disturbed, give written notice thereof to the Superintendent.

~~If required by the Superintendent,~~ The Contractor shall provide *in that notice* to the Superintendent a statement ~~in writing~~ specifying–

- (a) the physical conditions encountered and in what respects they differ materially;
- (b) the additional work and additional resources which the Contractor estimates to be necessary to deal with the physical conditions;
- (c) the time the Contractor anticipates will be required to deal with the physical conditions and the expected delay in achieving Practical Completion;
- (d) the Contractor's estimate of the cost of the measures necessary to deal with the physical conditions; and
- (e) other details reasonably required by the Superintendent.

12.3 Extension of Time and Costs.

Delay caused by a Latent Condition may justify an extension of time under Clause 35.5.

If a Latent Condition causes the Contractor to–

- (a) carry out additional work;
- (b) use additional Constructional Plant; or
- (c) incur extra cost (including but not limited to the cost of delay or disruption);

which the Contractor could not reasonably have anticipated at the time of tendering, a valuation shall be made under Clause 40.2.

12.4 Time Bar.

In making a valuation pursuant to Clause 12.3 regard shall not be had to the value of additional work carried out, additional Constructional Plant used or extra cost incurred more than 28 days before the date on which the Contractor gives the written notice required by the first paragraph of Clause 12.2.

13 PATENTS, COPYRIGHT AND INTELLECTUAL PROPERTY.

13.1 Warranties.

The Principal warrants that unless otherwise provided in the Contract–

design;
materials;
documents; and
methods of working

specified in the Contract or provided or directed by the Principal or the Superintendent will not infringe any patent, registered design, trademark or name, copyright or other protected right.

The Contractor warrants that any other design, materials, documents and methods of working provided by the Contractor will not infringe any patent, registered design, trademark or name, copyright or other protected right.

13.2 **Vesting and Indemnity.**

In this clause:

(a) Data means Drawings, sketches, specifications, digital records and computer software and all other data and information relating to the *Contract*, and

(b) *Intellectual Property Rights* includes copyright, patent right, registered design and other protected rights.

The *Contractor* assigns copyright in all Data created specifically for the *Contract*, upon its creation, to the *Principal*.

The *Contractor* must include provisions in all Subcontracts and agreements with *Consultants* to ensure that copyright in all Data created specifically for the *Contract* is assigned to the *Principal* upon its creation. The *Contractor*, *Subcontractors* and *Consultants* are granted licences to use the Data for the purposes of the *Contract*.

For Data provided by or for the *Contractor*, but not created specifically for the *Contract*, the *Contractor* must obtain irrevocable licences to allow the *Principal* to use, operate, maintain, modify and decommission the *Works*.

Licences must apply from the *Date of Acceptance of Tender* or (if the Data has not then been created or is not then available) from the date the Data is created or becomes available (as applicable).

The *Contractor* indemnifies the *Principal* against any claims, actions, and loss or damage arising out of any infringement of Intellectual Property Rights in relation to the Data provided by or for the Contractor and used under the Contract or required to use, operate, maintain, modify or decommission the *Works*.

The Contractor must ensure that Data created specifically for the Contract by or for the Contractor is only used for the purposes of the Contract.

14 **STATUTORY REQUIREMENTS. (NOT USED)**

15 **PROTECTION OF PEOPLE AND PROPERTY.**

In so far as compliance with the requirements of the Contract permits, the Contractor shall–

- (a) provide all things and take all measures necessary to protect people and property, *including but not limited to the environment*;
- (b) avoid unnecessary interference with the passage of people and vehicles;
- (c) prevent nuisance and unreasonable noise and disturbance.

Without limiting the generality of the Contractor's obligations, they include the provision of barricades, guards, fencing, temporary roads, footpaths, warning signs, lighting, watching, traffic flagging, safety helmets and clothing, removal of obstructions and protection of services.

If the Contractor or the employees or agents of the Contractor damage property, including but not limited to public utilities and services and property on or adjacent to the Site, the Contractor shall promptly make good the damage and pay any compensation which the law requires the Contractor to pay.

If the Contractor fails to comply with an obligation under Clause 15 the Principal may, in addition to any other remedy, perform the obligation on the Contractor's behalf and the cost incurred by the Principal shall be a debt due from the Contractor to the Principal.

16 CARE OF THE WORK AND REINSTATEMENT OF DAMAGE.

16.1 Care of the Work Under the Contract.

From and including the earlier of the date of commencement of work and the date on which the Contractor is given possession of the Site to 4 p.m. on the Date of Practical Completion of the Works the Contractor shall be responsible for the care of the work under the Contract.

Without limiting the generality of the Contractor's obligations, the Contractor shall be responsible for the care of unfixed items the value of which has been included in a payment certificate schedule under Clause 42.1, things entrusted to the Contractor by the Principal for the purpose of carrying out the work under the Contract, things brought on the Site by subcontractors for that purpose, the Works, the Temporary Works and Constructional Plant and the Contractor shall provide the storage and protection necessary to preserve these things.

After 4 p.m. on the Date of Practical Completion the Contractor shall remain responsible for the care of outstanding work and items to be removed from the Site by the Contractor and shall be liable for damage occasioned by the Contractor in the course of completing outstanding work or complying with obligations under Clauses 31.1 and 37.

16.2 Reinstatement.

If loss or damage (except loss or damage which is the direct consequence, without fault or omission on the part of the Contractor, of an Excepted Risk defined in Clause 16.3) occurs to anything while the Contractor is responsible for its care, the Contractor shall at the Contractor's own cost promptly make good the loss or damage.

16.3 Excepted Risks.

The Excepted Risks are–

- (a) Any negligent act or omission of the Principal, the Superintendent or the employees, consultants or agents of the Principal.
- (b) Any risk specifically excepted in the Contract.
- (c) War, invasion, act of foreign enemies, hostilities, (whether war be declared or not), civil war, rebellion, revolution, insurrection or military or usurped power, martial law or confiscation by order of any Government or public authority.
- (d) Ionising radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel not caused by the Contractor or the Contractor's employees or agents.
- (e) Use or occupation by the Principal or the employees or agents of the Principal or other Contractors to the Principal (not being employed by the Contractor) of any part of the Works or the Temporary Works.
- (f) Defects in the design of the work under the Contract other than a design provided by the Contractor.

17 DAMAGE TO PERSONS AND PROPERTY OTHER THAN THE WORKS.

17.1 Indemnity by Contractor.

The Contractor shall indemnify the Principal against–

- (i) loss of or damage to property of the Principal, including existing property in or upon which the work under the Contract is being carried out;
- (ii) claims by any person against the Principal in respect of personal injury or death or loss of or damage to any property,

arising out of or as a consequence of the carrying out by the Contractor of the work under the Contract but the Contractor's liability to indemnify the Principal shall be reduced

proportionally to the extent that the act or omission of the Principal or employees or agents of the Principal may have contributed to the loss, damage, death or injury.

Clause 17.1 shall not apply to—

- (a) the extent that the liability of the Contractor is limited by another provision of the Contract;
- (b) exclude any other right of the Principal to be indemnified by the Contractor;
- (c) things for the care of which the Contractor is responsible under Clause 16.1;
- (d) damage which is the unavoidable result of the construction of the Works in accordance with the Contract; and
- (e) claims in respect of the right of the Principal to construct the work under the Contract on the Site.

17.2 Indemnity by the Principal.

The Principal shall indemnify the Contractor in respect of damage referred to in Clause 17.1(d) and claims referred to in Clause 17.1(e).

18 INSURANCE

18.1 Insurance of the Works

Alternative 1

Before the Contractor commences work, the Contractor shall take out an insurance policy covering all the things referred to in Clause 16.1 against loss or damage resulting from any cause whatsoever until the Contractor ceases to be responsible for their care. Without limiting the generality of the obligation to insure, the policy shall cover the Contractor's liabilities under Clause 16.2 and things in storage off Site and in transit to the Site.

The insurance cover may exclude—

- (a) the cost of making good fair wear and tear or gradual deterioration but shall not exclude the loss or damage resulting therefrom;
- (b) the cost of making good faulty design, workmanship and materials but shall not exclude the loss or damage resulting therefrom;
- (c) consequential loss of any kind, but shall not exclude loss of or damage to the Works;
- (d) damages for delay in completing or for the failure to complete the Works;
- (e) loss or damage resulting from ionising radiations or contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel resulting from any cause;
- (f) loss or damage resulting from the Excepted Risks (b) and (c) in Clause 16.3. The insurance cover shall be for an amount not less than the sum of—
 - (i) the Contract Sum;
 - (ii) the amount stated in the Annexure to provide for costs of demolition and removal of debris;
 - (iii) the amount stated in the Annexure to cover fees of consultants;
 - (iv) the value stated in the Annexure of any materials or things to be supplied by the Principal for the purposes of the work under the Contract; and
 - (v) the additional amount or percentage stated in the Annexure of the total of the items referred to in sub-paragraphs (i) to (iv) of this paragraph.

The insurance policy shall be in the joint names of the Principal and the Contractor, and shall cover the Principal, the Contractor and all subcontractors employed from time to time in relation to the work under the Contract for their respective rights, interests and liabilities and, unless otherwise specified elsewhere in the Contract, shall be effected with an insurer and in terms both approved in writing by the Principal which approvals shall not be unreasonably withheld. The policy shall be maintained until the Contractor ceases to be responsible under Clause 16.1 for the care of anything. 35

Alternative 2

On or before the Date of Acceptance of Tender, the Principal shall effect a policy of insurance in relation to the work under the Contract in the terms of the policy or proposed policy included in the documents on which the Contractor tendered. The policy or proposed policy shall include the name of the insurer. The Principal shall maintain the policy while ever the Contractor has an interest therein and the Principal shall pay all premiums.

18.2 Asbestos Liability Insurance

If work under the Contract includes asbestos decontamination, including stripping, encapsulation or removal, the Contractor must take out, and pay all premiums for any asbestos related insurance required by law.

18.3 Marine Liability Insurance

If work under the Contract includes the use of water-borne craft 8 metres or more in length, the Contractor must take out, and pay all premiums for, Marine Liability Insurance to cover the use of such craft.

The policy shall be in the name of the Contractor and shall cover the Contractor, the Principal, the Superintendent and all subcontractors employed from time to time in relation to the work under the Contract for their respective rights and interests and cover their liabilities to third parties. The policy shall be for an amount not less than \$5 Million for any one occurrence, and shall include a cross-liability clause in which the insurer agrees to waive all rights of subrogation or action against any of the persons covered and for the purpose of which the insurer accepts the term 'insured' as applying to each of the persons covered as if a separate policy of insurance had been issued to each of them (subject always to the overall sum insured not being increased thereby).

The policy shall be effected with an insurer and in terms both approved in writing by the Principal which approvals shall not be unreasonably withheld. The policy shall be effected before commencing work covered by the policy and be maintained until the payment schedule issued in response to the Final Payment Claim is provided under Clause 42.4

18.4 Professional Indemnity Insurance

If work under the Contract includes carrying out design or documentation of the Works by the Contractor or any subcontractor, the Contractor must take out Professional Indemnity Insurance.

The policy shall cover the Contractor for liability to the Principal for the amount described in the Annexure for loss (whether economic loss only or other loss) in a single occurrence arising from errors or omissions in design or documentation of the Works carried out by the Contractor or any subcontractor. The policy is to include at least one automatic reinstatement after claims have been paid where this is required in the Annexure.

The policy shall be effected with an insurer and in terms both approved in writing by the Principal which approvals shall not be unreasonably withheld. The policy shall be effected before commencing work covered by the policy and be maintained until the period described in the Annexure after the Payment Schedule issued in response to the Final Payment Claim is provided under Clause 42.4.

19 PUBLIC LIABILITY INSURANCE.

Before the Contractor commences work, the Contractor shall take out a Public Liability Policy of insurance in the joint names of the Principal and the Contractor which covers the Principal, the Contractor, the Superintendent and all subcontractors employed from time to time in relation to the work under the Contract for their respective rights and interests and covers their liabilities to third parties. The policy shall also cover the Contractor's liability to the Principal and Principal's liability to the Contractor for loss of or damage to property (other than property required to be insured by Clause 18) and the death of or injury to any person (other than liability which is required by law to be insured under a Workers Compensation Policy of insurance).

The Public Liability Policy of insurance shall be for an amount in respect of any one occurrence not less than the sum stated in the Annexure and, unless otherwise specified elsewhere in the Contract, shall be effected with an insurer and in terms both approved in writing by the Principal which approvals shall not be unreasonably withheld. The policy shall be maintained until the Final Certificate is issued under Clause 42.8.

20 INSURANCE OF EMPLOYEES.

Before commencing work the Contractor shall insure against liability for death of or injury to persons employed by the Contractor including liability by statute and common law. The insurance cover shall be unlimited in amount and shall be maintained until all work including remedial work is completed.

The insurance shall be extended to indemnify the Principal for the Principal's statutory liability to persons employed by the Contractor.

The Contractor shall ensure that every subcontractor is similarly insured.

21 INSPECTION AND PROVISIONS OF INSURANCE POLICIES.

21.1 Proof of Insurance.

Before the Contractor commences work and whenever requested in writing by the other party, a party liable to effect or maintain insurance shall produce evidence to the satisfaction and approval of the other party of the insurance effected and maintained.

When submitting proof of insurance cover, provide a photocopy of the insurer's Certificate of Currency or a licence as a self-insurer or other proof of being a self-insurer under the Workers Compensation Act 1987.

The effecting of insurance shall not limit the liabilities or obligations of a party under other provisions of the Contract.

21.2 Failure to Produce Proof of Insurance.

If, after being requested in writing by the other party so to do, a party fails to produce evidence of compliance with insurance obligations under Clauses 18, 19 or 20 which is to the satisfaction and approval of the other party, the other party may effect and maintain the insurance and pay the premiums. The amount paid shall be a debt due from the party in default to the other party. *If the Contractor fails to effect any insurance obligation under the Contract, and the Principal effects or maintains the insurances, an additional amount to cover the Principal's other reasonable costs shall also be a debt due from the Contractor.* Where the defaulting party is the Contractor, the Principal may refuse payment until evidence of compliance with insurance obligations under Clauses 18, 19 and 20 is produced by the Contractor to the satisfaction and approval of the Principal. The rights given by Clause 21.2 are in addition to any other right.

21.3 Notices from or to the Insurer.

The party effecting insurance under Clauses 18 or 19 shall ensure that each policy of insurance contains provisions acceptable to the other party that will–

- (a) require the insurer (*other than in relation to Workers Compensation and Professional Indemnity Insurance*), whenever the insurer gives the Principal the Contractor or a subcontractor a notice of cancellation or other notice, *or receives a notice*, concerning the policy, at the same time, *and at least 7 days before any proposed cancellation of a policy*, to inform the other party in writing that the notice has been given; and
- (b) provide that a notice of claim given to the insurer by the Principal, the Superintendent, the Contractor or a subcontractor shall be accepted by the insurer as a notice of claim given by the Principal, the Superintendent, the Contractor and the subcontractor.

21.4 Notices of Potential Claims.

The Contractor shall, as soon as practicable, inform the Principal in writing of any occurrence that may give rise to a claim under a policy of insurance required by Clauses 18 or 19 and shall keep the Principal informed of subsequent developments concerning the claim. The Contractor shall ensure that subcontractors in respect of their operations similarly inform the Principal.

Where a policy of insurance has been effected by the Principal, the Principal shall similarly inform the Contractor.

21.5 Settlement of Claims.

Upon settlement of a claim under the insurance specified by Clause 18 if the Contractor has not completed reinstatement of the loss or damage, moneys received shall if requested by either party be paid into a bank agreed upon by the parties in an account in the joint names of the Contractor and the Principal. As the Contractor proceeds to reinstate the loss or damage, the Superintendent shall certify against the joint account for the cost of reinstatement.

21.6 Maintenance of Insurance.

The Contractor must ensure that in respect of each insurance required to be effected or taken out by the Contractor or any subcontractor, it:

ensures that any non-disclosure by one insured does not prejudice the right of any other insured to claim on the policy;

does not do anything which prejudices any insurance;

if necessary, rectifies anything which might prejudice any insurance;

reinstates an insurance policy if it lapses;

does not cancel, vary or allow an insurance policy to lapse without the prior written consent of the Principal;

immediately notifies the Principal of any event which may result in an insurance policy lapsing or being cancelled; and

gives full, true and particular information to the insurer of all matters and things the non-disclosure of which might in any way prejudice or affect any such policy or the payment of all or any benefits under the insurance.

22 CLERK OF WORKS AND INSPECTORS. (NOT USED)

23 SUPERINTENDENT

The Principal shall ensure that at all times there is a Superintendent and that in the exercise of the functions of the Superintendent under the Contract, the Superintendent–

- (a) acts honestly and fairly;
- (b) acts within the time prescribed under the Contract or where no time is prescribed, within a reasonable time;
- (c) arrives at a reasonable measure or value of work, quantities or time.

If, pursuant to a provision of the Contract enabling the Superintendent to give directions, the Superintendent gives a direction, the Contractor shall comply with the direction.

In Clause 23 'direction' includes agreement, approval, authorisation, certificate, decision, demand, determination, explanation, instruction, notice, order, permission, rejection, request or requirement.

Except where the Contract otherwise provides, a direction may be given orally but the Superintendent shall as soon as practicable confirm it in writing.

If the Contractor in writing requests the Superintendent to confirm an oral direction, the Contractor shall not be bound to comply with the direction until the Superintendent confirms it in writing.

24 SUPERINTENDENT'S REPRESENTATIVE.

The Superintendent may from time to time appoint individuals to exercise any functions of the Superintendent under the Contract but not more than one Superintendent's Representative shall be delegated the same function at the same time. The appointment of a Superintendent's Representative shall not prevent the Superintendent from exercising any function.

The Superintendent shall forthwith notify the Contractor in writing of:

- the appointment and the name of any Superintendent's Representative and the functions delegated to the Superintendent's Representative;
- the termination of the appointment of a Superintendent's Representative.

If the Contractor makes a reasonable objection to the appointment, the Superintendent shall terminate the appointment.

25 CONTRACTOR'S REPRESENTATIVE.

The Contractor shall personally superintend the execution of the work under the Contract or, at all times during which any activities relating to the execution of the work under the Contract are taking place, have a competent representative present on the Site and, if required by the Superintendent, at other places at which activities relating to the execution of the work under the Contract are taking place.

The Contractor shall notify the Superintendent in writing of the name of the representative and of any subsequent changes. Any direction defined in Clause 23 shall–

- ~~(a) if it relates to the execution of work on the Site and is if given to the any Contractor's representative, on the Site; or~~
- ~~(b) if it relates to the execution of work at any other place and is given to the representative at the other place;~~

be deemed to have been given to the Contractor.

Matters within the knowledge of a representative of the Contractor shall be deemed to be within the knowledge of the Contractor.

If the Superintendent makes a reasonable objection to the appointment of a representative, the Contractor shall terminate the appointment and appoint another representative.

26 CONTROL OF CONTRACTOR'S EMPLOYEES AND SUBCONTRACTORS.

The Superintendent may direct the Contractor to have removed from the Site or from any activity connected with the work under the Contract, within such time as the Superintendent directs, any person employed in connection with the work under the Contract who, in the opinion of the Superintendent, is guilty of misconduct or is incompetent or negligent. The person shall not be employed on the Site or on activities connected with the work under the Contract without the prior approval of the Superintendent.

27 SITE.

27.1 Possession of Site.

The Principal shall on or before the expiration of the time stated in the Annexure give the Contractor possession of the Site or sufficient of the Site to enable the Contractor to commence work. If the Principal has not given the Contractor possession of the whole Site, the Principal shall from time to time give the Contractor possession of such further parts of the Site as may be necessary to enable the Contractor to execute the work under the Contract in accordance with the requirements of the Contract. The Principal shall advise the Contractor in writing of the date upon which the Site or any part will be available.

Notwithstanding the provisions of Clause 27.1, if the Contractor is in breach of Clause 21.1, the Principal may refuse to give the Contractor possession of the Site or any part of the Site until the Contractor has complied with the requirements of Clause 21.1.

Possession of the Site shall confer on the Contractor a right to only such use and control as is necessary to enable the Contractor to execute the work under the Contract.

27.2 Access for the Principal and Others.

The Principal and the Principal's employees and agents may at any time after reasonable notice to the Contractor have access to any part of the Site for any purpose.

The Contractor shall permit the execution of work on the Site by persons engaged by the Principal and shall cooperate with them and coordinate the Contractor's work with their work.

If requested by the Contractor, the Principal shall provide to the Contractor the names of the persons.

The Contractor shall at all reasonable times give the Principal, the Superintendent, ~~the Clerk of Works and inspectors appointed under Clause 22,~~ and other persons authorised in writing by the Principal or by the Superintendent access to the work under the Contract at any place where the work is being carried out or materials are being prepared or stored.

The Principal shall ensure that the Contractor is not impeded in the execution of the Contractor's work by any persons referred to in Clause 27.2, whilst exercising the right of access given by Clause 27.2.

27.3 Delivery of Materials to and Work on Site Before Possession.

Until possession of the Site or part of the Site is given to the Contractor under Clause 27.1, the Contractor shall not deliver materials to or perform work on the Site or part of the Site, as the case may be, unless approval is given by the Superintendent.

27.4 Use of Site by Contractor.

Unless the Contract otherwise provides or the Superintendent gives prior written approval, the Contractor shall not use the Site or allow it to be used for:

- camping;
- residential purposes; or
- any purpose not connected with the work under the Contract.

27.5 Finding of Minerals, Fossils and Relics.

Valuable minerals, fossils, articles or objects of antiquity or of anthropological or archaeological interest, treasure trove, coins and articles of value found on the Site shall as between the parties be and remain the property of the Principal. Immediately upon the discovery of these things the Contractor shall take precautions to prevent their loss or removal or damage and shall notify the Superintendent of the discovery.

If compliance with obligations under Clause 27.5 causes the Contractor to incur more or less cost than the Contractor could reasonably have anticipated at the time of tendering, the difference shall be valued under Clause 40.2.

28 SETTING OUT THE WORKS.

28.1 Setting Out.

The Superintendent shall supply to the Contractor the information and survey marks necessary to enable the Contractor to set out the Works and the survey marks specified in the Contract. Upon receipt of any necessary information and survey marks, the Contractor shall set out the Works in accordance with the Contract and shall provide all instruments and things necessary for that purpose.

28.2 Care of Survey Marks.

The Contractor shall keep in their true positions all survey marks supplied by the Superintendent.

If a survey mark is disturbed or obliterated, the Contractor shall immediately notify the Superintendent and, unless the Superintendent otherwise directs, the Contractor shall reinstate the survey mark.

If the disturbance or obliteration is caused by a person referred to in Clause 27.2, other than the Contractor, the cost incurred by the Contractor in reinstating the survey mark shall be valued under Clause 40.2.

28.3 Errors in Setting Out.

If the Contractor discovers an error in the position, level, dimensions or alignment of any work under the Contract, the Contractor shall immediately notify the Superintendent and, unless the Superintendent otherwise directs, the Contractor shall rectify the error.

If the error has been caused by incorrect data supplied by the Superintendent, the cost incurred by the Contractor in rectifying the error shall be valued under Clause 40.2.

28.4 Survey Mark Defined.

'Survey mark' in Clause 28 means a survey peg, bench mark, reference mark, signal, alignment, level mark or any other mark for the purpose of setting out, checking or measuring work under the Contract.

29 MATERIALS, LABOUR AND CONSTRUCTIONAL PLANT.

29.1 Provision of Materials, Labour and Constructional Plant.

Except to the extent that the Contract otherwise provides the Contractor shall supply everything necessary for the execution and completion of the Contractor's obligations under the Contract.

29.2 Removal of Materials and Constructional Plant.

From time to time the Superintendent may by written notice to the Contractor direct the Contractor not to remove from the Site Constructional Plant or materials. Thereafter, the Contractor shall not remove the materials or the Constructional Plant without the prior written approval of the Superintendent, which approval shall not be unreasonably withheld.

29.3 Manufacture and Supply of Materials.

The Superintendent may direct the Contractor to supply particulars of:

- the mode and place of manufacture;
- the source of supply;
- the performance capacities; and
- other information,

in respect of any materials, machinery or equipment to be supplied under or used in connection with the Contract.

30 MATERIALS AND WORK.

30.1 Quality of Materials and Work.

The Contractor shall use the materials and standards of workmanship required by the Contract. In the absence of any other requirement, the Contractor shall use suitable new materials.

30.2 Defective Materials or Work.

If the Superintendent discovers material or work which is not in accordance with the Contract, the Superintendent may direct the Contractor to—

- (a) remove the material from the Site;
- (b) demolish the work;
- (c) reconstruct, replace or correct the material or work; or
- (d) not to deliver the material or work to the Site.

The Superintendent may direct the times within which the Contractor must commence and complete the removal, demolition, replacement or correction.

30.3 Variations Due to Defective Materials or Work.

Instead of a direction under Clause 30.2, the Superintendent may direct a variation of the kind referred to in Clause 40.1. The variation shall be valued under Clause 40.2 and—

- (a) if the variation causes an increase or decrease in the value to the Principal of the Works, regard shall also be had to the increase or decrease; and
- (b) if the variation results in the Contractor incurring more or less cost than would reasonably have been incurred had the Contractor been given a direction under Clause 30.2, regard shall also be had to the difference.

30.4 Acceptance of Defective Material or Work.

Instead of a direction under Clause 30.2 or 30.3, the Superintendent may notify the Contractor that the Principal elects to accept the material or work notwithstanding that it is not in accordance with the Contract. In that event the resulting increase or decrease in the value to the Principal of the Works and any other loss suffered by the Principal shall be valued under Clause 40.2.

30.5 Generally.

The Superintendent shall give either a direction under Clause 30.2 or 30.3 or a notice under Clause 30.4 as soon as practicable after the Superintendent becomes aware that material or work is not in accordance with the Contract. The Superintendent may give the direction or notice at any time before the provision of the ~~Final Payment Certificate~~ *payment schedule issued in response to the Final Payment Claim* under Clause ~~42.8~~ *42.4*.

Except to the extent that to do so would be inconsistent with a direction under Clause 30.3 or a notice under Clause 30.4 and notwithstanding that the Superintendent has not given a direction under Clause 30.2, the Contractor shall promptly remove, demolish, replace or correct material or work that is not in accordance with the Contract.

A progress payment, test or failure by the Superintendent or anyone else to disapprove any material or work shall not prejudice the power of the Superintendent to subsequently give a direction under Clause 30.2 or 30.3 or a notice under Clause 30.4.

Nothing in Clause 30 shall prejudice any other right which the Principal may have against the Contractor arising out of the failure of the Contractor to provide material or work in accordance with the Contract.

The Superintendent shall not be obliged to give a direction under Clause 30.3 or a notice under Clause 30.4 to assist the Contractor.

31 EXAMINATION AND TESTING.

31.1 Superintendent May Order Tests.

In Clause 31 'test' includes examine and measure.

At any time prior to the provision of the ~~Final Payment Certificate~~ *payment schedule issued in response to the Final Payment Claim* the Superintendent may direct that any materials or work under the Contract be tested. The Contractor shall provide such assistance and samples and make accessible such parts of the work under the Contract as may be required. On completion of the tests the Contractor shall make good the work under the Contract so that it fully complies with the Contract.

31.2 Covering up of Work.

The Superintendent may direct that any part of the work under the Contract shall not be covered up or made inaccessible without the Superintendent's prior approval.

31.3 Who Conducts Tests.

Tests shall be conducted as provided in the Contract or by the Superintendent or a person (which may include the Contractor) nominated by the Superintendent.

31.4 Notice of Tests.

Before conducting a test under the Contract the Superintendent or the Contractor shall give ~~reasonable~~ notice in writing to the other of the time, date and place of the test *within the time specified in the Contract. If no time is specified, give not less than one working day notice.* If the other does not then attend, the test may nevertheless proceed.

31.5 Procedure if Tests Delayed.

Without prejudice to any other rights or remedies under the Contract, if the Contractor or the Superintendent delays in conducting a test, the other, after giving reasonable notice in writing of intention to do so, may conduct the test.

31.6 Results of Tests.

Results of tests shall be promptly made available by each party to the other and to the Superintendent.

31.7 Costs of Testing.

Costs of and incidental to testing shall be valued under Clause 40.2 and shall be borne by the Principal or paid by the Principal to the Contractor unless—

- (a) the Contract provides that the Contractor shall bear the costs or the test is one which the Contractor was required to conduct other than pursuant to a direction under Clause 31.1;
- (b) the test shows that the material or work is not in accordance with the Contract;
- (c) the test is in respect of work under the Contract covered up or made inaccessible without the Superintendent's prior approval where such was required;
- (d) the test is consequent upon a failure of the Contractor to comply with a requirement of the Contract.

Where the extra costs are not to be borne by the Principal, they shall be borne by the Contractor or paid by the Contractor to the Principal on demand.

32 WORKING HOURS.

Working hours and working days shall be up to 9 hours per day worked between 7.00 a.m. and 5.00 p.m., Monday to Friday inclusive, but excluding public holidays and one day every 4 weeks, usually a Monday which is a rostered day off, unless otherwise stated in the Contract.

The working hours and working days shall be as stated in the Contract and if not so stated as notified by the Contractor to the Superintendent prior to commencement of work on Site and *Working hours and working days* shall not be varied without the prior approval of the Superintendent except when in the interests of safety of the work under the Contract or to protect life or property the Contractor finds it necessary to carry out work outside the working hours or on other than the working days stated in the Contract. In such cases the Contractor shall notify the Superintendent in writing of the circumstances as early as possible.

All costs attributable to the supervision by or on behalf of the Principal of work during times approved pursuant to the last paragraph shall be borne by the Principal, *except where a variation to the working hours or working days is approved by the Superintendent for the convenience of the Contractor.*

33 PROGRESS AND PROGRAMMING OF THE WORKS.

33.1 Rate of Progress.

The Contractor shall proceed with the work under the Contract with due expedition and without delay.

The Contractor shall not suspend the progress of the whole or any part of the work under the Contract except where the suspension is under Clause 44.9 or is directed or approved by the Superintendent under Clause 34.

The Contractor shall give the Superintendent reasonable advance notice of any information, documents or instructions required by the Contractor.

The Principal and the Superintendent shall not be obliged to furnish information, documents or instructions earlier than the Principal or the Superintendent, as the case may be, should reasonably have anticipated at the Date of Acceptance of Tender.

The Superintendent may direct in what order and at what time the various stages or parts of the work under the Contract shall be performed. If the Contractor can reasonably comply with the direction, the Contractor shall do so. If the Contractor cannot reasonably comply, the Contractor shall notify the Superintendent in writing, giving reasons.

If compliance with the direction causes the Contractor to incur more or less cost than otherwise would have been incurred, the difference shall be valued under Clause 40.2.

33.2 Construction Program.

For the purposes of Clause 33 a 'construction program' is a statement in writing showing the dates by which ~~and~~ the times within which the various stages or parts of the work under the Contract are to be executed or completed.

A construction program shall not affect rights or obligations in Clause 33.1. The Contractor may voluntarily furnish to the Superintendent a construction program.

The Superintendent may direct the Contractor to furnish to the Superintendent a construction program within the time and in the form directed by the Superintendent.

The Contractor shall not, without reasonable cause, depart from—

- (a) a construction program included in the Contract; or
- (b) a construction program furnished to the Superintendent.

The furnishing of a construction program or of a further construction program shall not relieve the Contractor of any obligations under the Contract including the obligation to not, without reasonable cause, depart from an earlier construction program.

34 SUSPENSION OF THE WORKS.

34.1 Suspension by Superintendent.

If the Superintendent considers that the suspension of the whole or part of the work under the Contract is necessary—

- (a) because of an act or omission of—
 - (i) the Principal, the Superintendent or an employee, consultant or agent of the Principal; or
 - (ii) the Contractor, a subcontractor or an employee or agent of either;

- (b) for the protection or safety of any person or property; or
- (c) to comply with an order of a court,

the Superintendent shall direct the Contractor to suspend the progress of the whole or part of the work under the Contract for such time as the Superintendent thinks fit.

34.2 Suspension by Contractor.

If the Contractor wishes to suspend the whole or part of the work under the Contract, otherwise than under Clause 44.9, the Contractor shall obtain the prior approval of the Superintendent. The Superintendent may approve of the suspension and may impose conditions of approval.

34.3 Recommencement of Work.

As soon as the Superintendent becomes aware that the reason for any suspension no longer exists, the Superintendent shall direct the Contractor to recommence work on the whole or on the relevant part of the work under the Contract.

If work is suspended pursuant to Clause 34.2 or 44.9, the Contractor may recommence work at any time after reasonable advance notice to the Superintendent.

34.4 Cost of Suspension.

Any cost incurred by the Contractor by reason of a suspension under Clause 34.1 or Clause 34.2 shall be borne by the Contractor but if the suspension is due to an act or omission of the Principal, the Superintendent or an employee, consultant or agent of the Principal and the suspension causes the Contractor to incur more or less cost than otherwise would have been incurred, the difference shall be valued under Clause 40.2.

34.5 Effect of Suspension.

Suspension shall not affect the Date for Practical Completion but the cause of suspension may be a ground for extension of time under Clause 35.5.

35 TIMES FOR COMMENCEMENT AND PRACTICAL COMPLETION.

35.1 Time for Commencement of Work on the Site.

The Contractor shall give the Superintendent 7 days notice of the date upon which the Contractor proposes to commence work on the Site.

The Superintendent may reduce the period of notice required.

The Contractor shall commence work on the Site within 14 days after the Principal has given the Contractor possession of sufficient of the Site to enable the Contractor to commence work.

The Superintendent may extend the time for commencement of work on the Site.

35.2 Time for Practical Completion.

The Contractor shall execute the work under the Contract to Practical Completion by the Date for Practical Completion.

The Contractor shall give the Superintendent 14 days notice of the date upon which the Contractor anticipates that Practical Completion will be reached.

When the Contractor is of the opinion that Practical Completion has been reached, the Contractor shall in writing request the Superintendent to issue a Certificate of Practical Completion. Within 14 days of the receipt of the request the Superintendent shall give to the Contractor and to the Principal a Certificate of Practical Completion stating the Date of Practical Completion or give the Contractor in writing the reasons for not issuing the Certificate.

The issue of a payment schedule or a Certificate of Practical Completion shall not constitute approval of any work or other matter nor shall it prejudice any claim by the Principal.

Upon the Date of Practical Completion the Contractor shall give possession of the Works to the Principal.

35.3 Separable Portions.

The interpretations of–

Date for Practical Completion;

Date of Practical Completion;

Practical Completion,

and Clauses 5.7, 16, 35, 37, 38; ~~and 42.3 and 42.5~~ shall apply separately to each Separable Portion and references therein to the Works and to work under the Contract shall mean so much of the Works and the work under the Contract as is comprised in the relevant Separable Portion.

If the Contract does not make provision for the amount of security, retention moneys, liquidated damages or bonus applicable to a Separable Portion, the respective amounts applicable shall be such proportion of the security, retention moneys, liquidated damages or bonus applicable to the whole of the work under the Contract as the value of the Separable Portion bears to the value of the whole of the work under the Contract.

35.4 Use of Partly Completed Works.

If a part of the Works has reached Practical Completion but another part of the Works has not reached Practical Completion and the parties cannot agree upon the creation of separable Portions, the Superintendent may determine that the respective parts shall be Separable Portions.

In using the Separable Portion that has reached Practical Completion, the Principal shall not hinder the Contractor in the performance of the work under the Contract.

35.5 Extension of Time for Practical Completion.

When it becomes evident to the Contractor that anything, including an act or omission of the Principal, the Superintendent or the Principal's employees, consultants, other Contractors or agents, may delay the work under the Contract, the Contractor shall promptly notify the Superintendent in writing with details of the possible delay and the cause.

If the Contractor is or will be delayed in reaching Practical Completion by a cause described in the next paragraph and within 28 days after the delay occurs the Contractor gives the Superintendent a written claim for an extension of time for Practical Completion, the Contractor shall be entitled to an extension of time for Practical Completion.

The causes are–

- (a) events occurring on or before the Date for Practical Completion which are beyond the reasonable control of the Contractor including but not limited to:
 - industrial conditions;
 - inclement weather,
- (b) any of the following events whether occurring before, on or after the Date for Practical Completion–
 - (i) delays caused by:
 - the Principal;
 - the Superintendent;
 - the Principal's employees, consultants, other contractors or agents;
 - (ii) actual quantities of work being greater than ~~the quantities in the Bill of Quantities or~~ the quantities which are the upper limit of accuracy in the Schedule of Rates (otherwise than by reason of a variation directed under Clause 40.1);
 - (iii) latent Conditions;
 - (iv) variations directed under Clause 40.1;
 - (v) repudiation or abandonment by a Designated or Nominated Subcontractor;
 - (vi) changes in the law;

- (vii) directions by public authorities but not where the direction arose from the failure of the Contractor to comply with a requirement referred to in Clause 14.1;
- (viii) delays by public authorities not caused by the Contractor;
- (ix) claims referred to in Clause 17.1(e);
- (x) any other cause which is expressly stated in the Contract to be a cause for extension of time for Practical Completion.

When concurrent events cause a delay and one or more of the events is such that the Contractor has no entitlement to an extension of time, then to the extent that the events are concurrent, the Contractor shall not be entitled to an extension of time for Practical Completion notwithstanding that another cause of the delay is such that the Contractor would have had an entitlement to an extension of time.

In determining whether the Contractor is or will be delayed in reaching Practical Completion regard shall not be had to:

- whether the Contractor can reach Practical Completion by the Date for Practical Completion without an extension of time;
- whether the Contractor can, by committing extra resources or incurring extra expenditure, make up the time lost.

If the Contractor desires an extension of time for Practical Completion, the Contractor shall within 28 days after a delay occurs give the Superintendent a written claim setting out the facts on which the claim is based.

With the claim, or as soon as practical after giving the claim, the Contractor shall give the Superintendent written notice of the number of days extension claimed.

If the Contractor is entitled to an extension of time for Practical Completion the Superintendent shall, within 28 days after receipt of the notice of the number of days extension claimed, grant a reasonable extension of time. If within the 28 days the Superintendent does not grant the full extension of time claimed, the Superintendent shall before the expiration of the 28 days give the Contractor notice in writing of the reason.

Notwithstanding that the Contractor is not entitled to an extension of time the Superintendent may at any time before the provision of the ~~Final Payment Certificate~~ *payment schedule issued in response to the Final Payment Claim* by notice in writing to the Contractor extend the time for Practical Completion for any reason.

A delay by the Principal or the failure of the Superintendent to grant a reasonable extension of time or to grant an extension of time within 28 days shall not cause the Date for Practical Completion to be set at large but nothing in this paragraph shall prejudice any right of the Contractor to damages.

35.6 Liquidated Damages for Delay in Reaching Practical Completion.

If the Contractor fails to reach Practical Completion by the Date for Practical Completion, the Contractor shall be indebted to the Principal for liquidated damages at the rate stated in the Annexure for every day after the Date for Practical Completion to and including the Date of Practical Completion or the date that the Contract is terminated under Clause 44, whichever first occurs.

If after the Contractor has paid or the Principal has deducted liquidated damages, the time for Practical Completion is extended, the Principal shall forthwith repay to the Contractor any liquidated damages paid or deducted in respect of the period up to and including the new Date for Practical Completion.

36 DELAY COSTS. (NOT USED)

37 DEFECTS LIABILITY.

The Defects Liability Period stated in the Annexure shall commence on the Date of Practical Completion.

Within sixty (60) days after Practical Completion, or as approved by the Principal's Representative, the Contractor shall rectify any defects or omissions in the work under the Contract existing at Practical Completion.

The Principal shall provide direction on the omission or defect and state a date by which the Contractor shall complete rectification. The direction may provide that in respect of the work of rectification there shall be a separate Defects Liability Period of a stated duration not exceeding the period stated in the Annexure. The separate Defects Liability Period shall commence on the date the Contractor completes the work of rectification. Clause 37 shall apply in respect of the work of rectification and the Defects Liability Period for that work.

If the work of rectification is not completed by the stated date, the Principal may have the work of rectification carried out at the Contractor's expense, but without prejudice to any other rights that the Principal may have against the Contractor with respect to such omission or defect and the cost of the work of rectification incurred by the Principal shall be a debt due from the Contractor.

If it is necessary for the Contractor to carry out rectification, the Contractor shall do so at times and in a manner which cause as little inconvenience to the occupants of the Works as is reasonably possible.

38 CLEANING UP.

The Contractor shall keep the Site and the work clean and tidy.

The Contractor shall regularly remove rubbish and surplus material.

Within 14 days after the Date of Practical Completion the Contractor shall remove Temporary Works and Constructional Plant.

The Superintendent may extend the time for removal of Temporary Works or Constructional Plant necessary to enable the Contractor to perform remaining obligations.

39 URGENT PROTECTION.

If urgent action is necessary to protect the work under the Contract, other property or people and the Contractor fails to take the action, the Principal may take the necessary action. If the action was action which the Contractor should have taken at the Contractor's cost, the cost incurred by the Principal shall be a debt due from the Contractor.

If time permits, the Superintendent shall give the Contractor prior written notice of the Principal's intention to take action under Clause 39.

40 VARIATIONS.

40.1 Variations to the Work.

The Contractor shall not vary the work under the Contract except as directed by the Superintendent under Clause 30.3, 30.4 or 40.1 or approved in writing by the Superintendent under Clause 40.1.

The Superintendent may direct the Contractor to—

- (a) increase, decrease or omit any part of the work under the Contract;
- (b) change the character or quality of any material or work;
- (c) change the levels, lines, positions or dimensions of any part of the work under the Contract;
- (d) execute additional work;
- (e) demolish or remove material or work no longer required by the Principal.

The Superintendent may notify the Contractor in writing of any proposed direction under Clause 40.1. Upon receipt of the notice the Contractor shall advise the Superintendent in writing whether the proposed direction can be effected and, if so, the effect which the Contractor anticipates that the variation will have on the construction program, time for Practical Completion and costs.

The Contractor is bound only to execute a variation which is within the general scope of the Contract.

The Contractor shall not be bound to execute a variation directed after Practical Completion unless the variation is in respect of rectification work referred to in Clause 37.

If the Contractor requests the Superintendent to approve a variation for the convenience of the Contractor, the Superintendent may do so in writing. The approval may be conditional. The conditions may include but shall not be limited to a condition that the Contractor shall not be entitled to any extension of time for Practical Completion or extra remuneration in respect of the variation or anything arising out of the variation which would not have arisen had the variation not been approved. The Superintendent shall not be obliged to approve a variation for the convenience of the Contractor.

Unless the Superintendent and the Contractor agree upon the price for the variation, the variation directed or approved under Clause 40.1 shall be valued under Clause 40.2.

40.1A Compensation Entitlement.

The Contractor shall be entitled to recompense (under Clause 40.2 or otherwise) for a variation if and only if both (a) and (b) or both (a) and (c) occur:

(a) *the Superintendent had directed in writing the Contractor to*

(i) *do extra work; or*

(ii) *provide something,*

which is different from and out of character with what might reasonably be required to fulfil the Contractor's obligations under the Contract; and

(b) *prior to commencement of the variation, the Superintendent has confirmed in writing to the Contractor that the direction will be regarded as a variation under Clause 40.1; or*

(c) *prior to commencement of the variation, the Contractor has in writing requested the Superintendent to give the confirmation in (b) but the Superintendent has not done so within two working days after the request.*

40.2 Valuation

Where the Contract provides that a valuation shall be made under Clause 40.2, the Principal shall pay or allow the Contractor or the Contractor shall pay or allow the Principal as the case may require, an amount ascertained, as follows—

Where the Contract provides that a valuation shall be made under Clause 40.2, the Principal or the Contractor may claim an entitlement to an adjustment of the Contract Price. The adjustment will be the amount agreed between the Principal and the Contractor. If they cannot agree, the Expert under Clause 46 shall decide the amount on the following basis—

(a) If the Contract prescribes specific rates or prices to be applied in determining the value, those rates or prices shall be used.

(b) If Clause 40.2(a) does not apply, the rates or prices in a Priced Bill of Quantities or Schedule of Rates shall be used to the extent that it is reasonable to use them.

(c) To the extent that neither Clause 40.2(a) or 40.2(b) apply, reasonable rates or prices, *as valued for Daywork under Clause 41*, shall be used.

(d) In determining the deduction to be made for work which is taken out of the Contract, the deduction shall include a reasonable amount for profit and overheads.

~~(e) If the valuation is of an increase or decrease in a fee under Clause 14.3, the value shall be the actual increase or decrease without regard to overheads or profit.~~

(f) If the valuation *under either clause 40.2(a) or 40.2(b)* relates to additional costs incurred by the Contractor for delay or disruption the valuation shall include a reasonable amount for overheads but shall not include profit or loss of profit.

(g) If Clause 11(b) applies, the percentage referred to in Clause 11(b) shall be used for valuing the Contractor's profit and attendance.

- (h) Daywork shall be valued in accordance with Clause 41.

41 DAYWORK

The Superintendent may direct that quantities greater than the upper limit of accuracy referred to in Clause 3.2(b) or variations directed by the Superintendent under Clause 40.1 shall be carried out as Daywork. The Contractor shall thereafter each day record particulars of all resources used by the Contractor for the execution of the Daywork and each day furnish to the Superintendent the particulars and copies of time sheets, wages sheets, invoices, receipts and other documents evidencing the cost of the Daywork. The Superintendent may direct the manner in which matters are to be recorded.

In determining the value of Daywork regard shall be had to—

- (a) the amount of wages and allowances paid or payable by the Contractor at the rates obtaining on the Site at the time as established by the Contractor to the satisfaction of the Superintendent or at such other rates as may be approved by the Superintendent;
- (b) the amount paid or payable by the Contractor in accordance with any statute or award applicable to day labour additional to the wages paid or payable under Clause 41(a);
- (c) the amount of hire charges in respect of Constructional Plant approved by the Superintendent for use on the work in accordance with such hiring rates and conditions as may be agreed between the Superintendent and the Contractor, in the absence of agreement, in accordance with such rates and conditions as may be determined by the Superintendent;
- (d) the amounts paid for services, subcontracts and professional fees;
- (e) the actual cost to the Contractor at the Site of all materials supplied and required for the work;
- (f) the charge stated in the Annexure or if no charge is stated, a charge agreed between the Superintendent and the Contractor to cover overheads, administrative costs, site supervision, establishment costs, attendance, *delay costs*, *disruption costs* and profit, or, in the absence of agreement, a reasonable charge determined by the Superintendent.

Amounts payable for Daywork shall not be subject to adjustment for rise and fall in costs notwithstanding that the Contract may provide for adjustment for rise and fall in costs.

42 ~~CERTIFICATES AND PAYMENTS.~~

Deleted and replaced with

42 PAYMENT.

42.1 Payment Claims and Payment Periods

The Contractor's only entitlement to payment for carrying out work under the Contract is the Contract Price.

Prior to becoming entitled to the Contract Price, the Contractor can make payment claims. In aggregate, payment claims shall not exceed the Contract Price.

At the expiration of each payment period, the Contractor shall make a payment claim. If the Contractor fails to make a payment claim, the Principal may nevertheless make a payment.

The payment period for all work under the Contract is a period ending on the expiration of the Defects Liability Period, or where there is more than one, the last to expire. Not later than 28 days after the end of this payment period, the Contractor shall lodge with the Superintendent a payment claim marked "Final Payment Claim" stating the Contract Price, all payments received on account of the Contract Price and the balance, if any, due to the Contractor. The Final Payment Claim must be accompanied by such information as the Superintendent may reasonably require.

Payment periods for progress payments are the periods specified in the Annexure or, if not specified, then monthly. At the end of each of these payment periods, the Contractor shall lodge with the Superintendent a payment claim marked "Progress Claim" and setting out the progress payment to which the Contractor claims to be entitled and how the amount has been

calculated. The Progress Claim must be accompanied by such information as the Superintendent may reasonably require.

42.2 Amount of Progress Payments

If the amount of a progress payment or the method of valuing a progress payment is not specified in the Annexure, the progress payment shall be an instalment of the Contract Price which reflects the value of the work carried out by the Contractor in performance of the Contract to the end of the payment period to which the Progress Claim relates less:

- (a) *amounts already paid by the Principal on account of the Contract Price;*
- (b) *an amount on account of liquidated damages, if any, calculated in accordance with Clause 35.6 up to and including the date of the Superintendent's payment schedule in respect of the Progress Claim;*
- (c) *amounts equivalent to any liability of the Contractor to the Principal, whether liquidated or not, and whether the liability arises under the Contract or otherwise;*
- (d) *amounts which the Principal is entitled to deduct or withhold under any provision of the Contract.*

Where work is defective or omitted, the estimated cost of rectifying the defect or omission shall be taken into account.

In valuing work, regard shall not be had to the value of variations which value has not been included in the Contract Price.

If the Contractor claims payment for plant or materials intended for incorporation in the Works but not yet incorporated, the Principal shall not be obliged to make payment for the plant or materials unless the Contractor provides security additional to and in one of the forms provided by Clause 5.3 in an amount equal to the payment claimed for the plant or materials.

The only plant or materials to be included in the valuation are those that have become (or on payment) will become the property of the Principal. If requested by the Superintendent, the Contractor shall provide evidence of ownership.

The Principal shall not be obliged to pay for an item to be imported into Australia if the Contractor has not given the Principal a clean on board bill of lading for the item drawn or endorsed to the order of the Principal and a Customs invoice for the item.

With the exception of items to be imported into Australia and items listed in the Annexure, the Principal shall not be obliged to pay for unfixed plant and materials which plant or materials are not on the Site.

42.3 Retention Moneys.

The Principal may deduct from moneys otherwise due to the Contractor amounts up to the limit of the percentages, if any, stated in the Annexure of so much of the value of the respective items stated in the Annexure as is included in the calculation of a payment.

42.4 Payment Schedule

Within 10 Business Days after receipt of a Progress Claim or the Final Payment Claim, the Superintendent on behalf of the Principal will provide to the Contractor a payment schedule identifying the Progress Claim to which it relates and stating the payment, if any, which the Principal will be making. If the payment is to be less than the amount claimed by the Contractor, the payment schedule will indicate why it is less.

[Warning: Even though the payment schedule states that the Principal will be making a particular payment, an order under the Contractors Debts Act 1997 NSW or other legislation could prevent the Principal from making the payment. Under section 127 of the Industrial Relations Act 1996 NSW, the Principal could be relieved of the obligation to pay the Contractor if the Contractor fails to pay the Contractor's employees engaged in carrying out work under the Contract].

42.5 Time for Payment

The time for making a payment is the date which is the later of:
28 days after the Superintendent receives the payment claim; or

if the Contract provides that before the Contractor is entitled to payment or payment of or exceeding a particular amount, a test must be passed, insurance must be effected, evidence (or a statutory declaration) must be provided or some other requirement must be fulfilled, 7 days after the requirement is fulfilled.

All payments by the Principal to the Contractor will be made by Electronic Funds Transfer to a bank, building society or credit union account nominated by the Contractor. No payment will be due to the Contractor until details of the nominated account (name of financial institution, account name and account number) are notified in writing to the Principal. The Contractor shall promptly notify the Principal in writing of any change to the nominated account but the Principal will not be responsible for any payments made into a previously nominated account prior to notification of such change being received by the Principal.

Payment of moneys shall not be evidence of the value of work or an admission of liability or that work has been executed satisfactorily but shall be payment on account only.

42.6 Statement of Outstanding Claims

With the Final Payment Claim the Contractor shall lodge with the Superintendent a Statement of Outstanding Claims. The Statement of Outstanding Claims must identify all claims for extension of time, adjustment of the Contract Price and ex-contractual claims which the Contractor still maintains.

Any claim whatsoever by the Contractor against the Principal under, arising out of or connected with the Contract which has been made or could have been made and which is not included in the Statement of Outstanding Claims shall be deemed to have been abandoned by the Contractor and is barred. This time bar is in addition to and not in substitution for any other time bar.

The Statement of Outstanding Claims is not a claim. All claims must be made separately and at the times provided in the respective clauses dealing with claims. After lodging the Statement of Outstanding Claims the Contractor shall not make any further claim whatsoever against the Principal.

Notwithstanding the preceding paragraph, if subsequent to the lodgment by the Contractor of the Final Payment Claim, a final determination is made under clause 46 increasing the Contract Price, the Contractor can lodge an amended Final Payment Claim to take into account the amount of the increase. The amended claim must be lodged with the Superintendent within 28 days after the final determination is made. If it is not lodged within that time, it is barred.

42.7 Interest on Overdue Payments.

If any moneys due to either party remain unpaid after the date upon which or the expiration of the period within which they should have been paid then interest shall be payable thereon from but excluding the date upon which or the expiration of the period within which they should have been paid to and including the date upon which the moneys are paid. The rate of interest shall be the rate prescribed in the Annexure and if no rate is prescribed the rate shall be 10 percent per annum. Interest shall be compounded at six monthly intervals.

42.8 Set Offs by the Principal.

The Principal may deduct from moneys otherwise due to the Contractor any money due from the Contractor to the Principal and if those moneys are insufficient, the Principal can have recourse to retention moneys and, if they are insufficient, to security under the Contract.

43 PAYMENT OF WORKERS, SUBCONTRACTORS AND SUPPLIERS. (DELETED AND REPLACED WITH)

Before the Contractor is entitled to payment of a payment claim, the Contractor must give the Superintendent a statutory declaration, made out not earlier than the date of the payment claim, by the Contractor, or where the Contractor is a corporation, by a representative of the Contractor who is in a position to know the facts attested to, in the form of Schedule 2. (Note clause 42.5 with respect to the time for payment.)

~~*If any moneys are shown as unpaid in the statutory declaration, then before the Contractor is entitled to payment, the Contractor must give the Superintendent a further statutory declaration in the same form but showing that there are no moneys unpaid. This paragraph does not apply to payment of so much of a payment claim as exceeds the sum of the amounts shown as unpaid in the statutory declaration.*~~

At the request of the Contractor and out of moneys payable to the Contractor, the Principal may on behalf of the Contractor make payments directly to a worker, subcontractor or supplier.

If a worker, subcontractor or supplier obtains a court order in respect of the moneys payable to them in respect of their employment on, materials supplied for or work performed under the Contract, as the case may be, and produces to the Principal the court order and a statutory declaration that it remains unpaid, the Principal may pay the amount of the order and costs included in the order to the worker, subcontractor or supplier, and the amount paid shall be a debt due from the Contractor to the Principal.

In the event of the Principal receiving notice of the making of a sequestration order or winding up order or order of receivership in respect of the Contractor, the Principal shall not make any payment to a worker, subcontractor or supplier without the concurrence of the Trustee or Official Receiver as the case may be of the Estate of the Contractor.

44 DEFAULT OR INSOLVENCY.

44.1 Preservation of Other Rights.

If a party breaches or repudiates the Contract, nothing in Clause 44 shall prejudice the right of the other party to recover damages or exercise any other right.

44.2 Default by the Contractor.

If the Contractor commits a substantial breach of contract and the Principal considers that damages may not be adequate remedy, the Principal may give the Contractor a written notice to show cause.

Substantial breaches include but are not limited to–

- (a) suspension of work, in breach of Clause 33.1;
- (b) failing to proceed with due expedition and without delay, in breach of Clause 33.1;
- (c) failing to use the materials or standards of workmanship required by the Contract, in breach of Clause 30.1;
- (d) failing to comply with a direction of the Superintendent under Clause 30.2, in breach of Clause 23;
- (e) failing to provide evidence of insurance, in breach of Clause 21.1.

44.3 Requirements of a Notice by the Principal to Show Cause.

A notice under Clause 44.2 shall–

- (a) state that it is a notice under Clause 44 of the General Conditions of Contract;
- (b) specify the alleged substantial breach;
- (c) require the Contractor to show cause in writing why the Principal should not exercise a right referred to in Clause 44.4;
- (d) specify the time and date by which the Contractor must show cause (which time shall not be less than 7 clear days after the notice is given to the Contractor);
- (e) specify the place at which cause must be shown.

44.4 Rights of the Principal.

If by the time specified in a notice under Clause 44.2 the Contractor fails to show reasonable cause why the Principal should not exercise a right referred to in Clause 44.4, the Principal may by notice in writing to the Contractor–

- (a) take out of the hands of the Contractor the whole or part of the work remaining to be completed; or
- (b) terminate the Contract.

Upon giving a notice under Clause 44.2 the Principal may suspend payments to the Contractor until the expiration of the earlier of–

- (i) the date upon which the Contractor shows reasonable cause;
- (ii) the date upon which the Principal takes action under Clause 44.4(a) or (b);
- (iii) the date which is 7 days after the last day for showing cause in the notice under Clause 44.2.

If the Principal exercises the right under Clause 44.4(a), the Contractor shall not be entitled to any further payment in respect of the work taken out of the hands of the Contractor unless a payment becomes due to the Contractor under Clause 44.6.

44.5 Procedure When the Principal Takes Over Work.

If the Principal takes work out of the hands of the Contractor under Clause 44.4(a) the Principal shall complete that work and the Principal may without payment of compensation take possession of such of the Constructional Plant and other things on or in the vicinity of the Site as are owned by the Contractor and are reasonably required by the Principal to facilitate completion of the work.

If the Principal takes possession of Constructional Plant or other things, the Principal shall maintain the Constructional Plant and, subject to Clause 44.6, on completion of the work the Principal shall return to the Contractor the Constructional Plant and any things taken under this clause which are surplus.

44.6 Adjustment on Completion of the Work Taken Out of the Hands of the Contractor.

When work taken out of the hands of the Contractor under Clause 44.4(a) is completed the Superintendent shall ascertain the cost incurred by the Principal in completing the work and shall issue a certificate certifying the amount.

If the cost incurred by the Principal is greater than the amount which would have been paid to the Contractor if the work had been completed by the Contractor, the difference shall be a debt due from the Contractor to the Principal. If the cost incurred by the Principal is less than the amount that would have been paid to the Contractor if the work had been completed by the Contractor, the difference shall be a debt due to the Contractor from the Principal.

If the Contractor is indebted to the Principal, the Principal may retain Constructional Plant or other things taken under Clause 44.5 until the debt is met. If after reasonable notice, the Contractor fails to pay the debt, the Principal may sell the Constructional Plant or other things and apply the proceeds to satisfaction of the debt and the costs of sale. Any excess shall be paid to the Contractor.

44.7 Default of the Principal.

If the Principal commits a substantial breach of contract and the Contractor considers that damages may not be adequate remedy, the Contractor may give the Principal a written notice to show cause.

Substantial breaches include but are not limited to—

- (a) failing to make a payment, in breach of Clause 42.1;
- (b) failure by the Superintendent to issue a Certificate of Practical Completion, in breach of Clause 35.2;
- (c) failing to produce evidence of insurance, in breach of Clause 21.1;
- (d) failing to give the Contractor possession of sufficient of the Site, in breach of Clause 27.1, but only if the failure continues for longer than the period stated in the Annexure.

44.8 Requirements of a Notice by the Contractor to Show Cause.

A notice under Clause 44.7 shall—

- (a) state that it is a notice under Clause 44 of the General Conditions of Contract;
- (b) specify the alleged substantial breach;

- (c) require the Principal to show cause in writing why the Contractor should not exercise a right referred to in Clause 44.9;
- (d) specify the time and date by which the Principal must show cause (which shall not be less than 7 clear days after the notice is given to the Principal);
- (e) specify the place at which cause must be shown.

44.9 Rights of Contractor.

If by the time specified in a notice under Clause 44.7 the Principal fails to show reasonable cause why the Contractor should not exercise a right referred to in Clause 44.9, the Contractor may by notice in writing to the Principal suspend the whole or any part of the work under the Contract.

The Contractor shall lift the suspension if the Principal remedies the breach but if within 28 days after the date of suspension under Clause 44.9, the Principal fails to remedy the breach or, if the breach is not capable of remedy, fails to make other arrangement to the reasonable satisfaction of the Contractor, the Contractor may by notice in writing to the Principal terminate the Contract.

The Contractor shall be entitled to recover from the Principal any damages flowing from the suspension.

44.10 Rights of the Parties on Termination.

If the Contract is terminated under Clause 44.4(b) or Clause 44.9 the rights and liabilities of the parties shall be the same as they would be at common law if the defaulting party had wrongfully repudiated the Contract and the other party had elected to treat the Contract as at an end and recover damages.

44.11 Insolvency.

If –

- (a) a party informs the other party in writing or creditors generally that the party is insolvent;
- (b) a party commits an act of bankruptcy;
- (c) a bankruptcy petition is presented against a party;
- (d) a party is made bankrupt;
- (e) a meeting of creditors of a party is called with a view to:
 - entering a scheme of arrangement or composition with creditors; ~~or~~
 - ~~— placing the party under official management;~~
- (f) a party enters a scheme of arrangement or composition with creditors;
- (g) ~~a resolution is passed at a meeting of creditors to place a party under official management; an administrator is appointed to a party;~~
- (h) ~~a party is placed under official management;~~ enters a deed of company arrangement;
- (i) a receiver of the property or part of the property of a party is appointed;
- (j) an application is made to a court for the winding up of a party. *A party resolves that it be wound up, or a meeting of creditors of a party under administration or a deed of company arrangement resolves that the party be wound up;*
- (k) a winding up order is made in respect of a party;
- (l) execution is levied against a party by creditors, debenture holders or trustees or under a floating charge;

- where the other party is the Principal, the Principal may, without giving a notice to show cause, exercise the right under Clause 44.4(a);
- where the other party is the Contractor, the Contractor may without giving a notice to show cause, exercise the right under Clause 44.9.

The rights given by Clause 44.11 are in addition to any other rights and may be exercised notwithstanding that there has been no breach of contract. The rights in Clause 44.11 are subject to any limitations under the Bankruptcy Act or any other act.

45 TERMINATION BY FRUSTRATION.

If, under the law governing the Contract, the Contract is frustrated, the Principal shall pay the Contractor–

- (a) for work executed prior to the date of frustration, the amount which would have been payable if the Contract had not been frustrated and the Contractor had made a progress claim on the date of frustration;
- (b) the cost of materials reasonably ordered by the Contractor for the work under the Contract, which the Contractor is legally liable to accept, but only if the materials become the property of the Principal upon payment;
- (c) costs reasonably incurred by the Contractor in the expectation of completing the whole of the work under the Contract and not included in any payment by the Principal;
- (d) all retention moneys and security;
- (e) the reasonable cost of removal of Constructional Plant;
- (f) the reasonable cost of return to their place of recruitment of the Contractor's employees engaged in the work under the Contract at the date of frustration.

46 DISPUTES. (DELETED AND REPLACED WITH) NOTIFICATION OF CLAIMS AND DISPUTES

46.1 Claims for Adjustment of the Contract Price.

If the Contractor wishes to claim an entitlement to an adjustment of the Contract Price, the Contractor must complete a Notice of Claim for Adjustment of the Contract Price in the following form. Not later than 28 days after the first day upon which the Contractor could reasonably have been aware of the event, circumstance, direction, act or omission which gave rise to the alleged entitlement the Contractor must lodge the notice with the Superintendent's Representative. The Contractor must not delay giving the notice until the event is complete or the amount of the adjustment claimed can be ascertained. If the Contractor fails to lodge the notice within time, the Contractor will not be entitled to an adjustment of the Contract Price on account of the event, circumstance, direction, act or omission.

The Contractor's only entitlement to payment for carrying out work under the Contract is the Contract Price [see clause 2 for definition and clause 42.1].

Notice of Claim for Adjustment of Contract Price

Name of Contractor:

Contract Number:

Project:

The Contractor gives notice of the following claim for adjustment of the Contract Price:

The, event, circumstance, direction or omission which gives rise to the claim is:

The date of event, circumstance, direction, or omission, is:

The provision of the Contract or other basis of the claim is:

The amount or likely amount of the adjustment claimed is:

Signed for the Contractor by:

Date:

46.2 Ex-contractual Claims

An Ex-contractual Claim is any claim whatsoever by the Contractor against the Principal other than a claim under clause 35.5 for an extension of time, a claim under clause 42 for the Contract Price or a Progress Claim on account of the Contract Price or a claim under clause 46.1 for adjustment of the Contract Price. Without limitation, an ex-contractual claim includes a claim for damages [whether in contract, tort or under statute], restitution, injunction, declaration or any other remedy whatsoever.

If the Contractor wishes to make an Ex-contractual Claim, the Contractor must complete a Notice of Ex-contractual Claim in the following form. Not later than 28 days after the first day upon which the Contractor could reasonably have been aware of the breach of contract, event, circumstance, direction, act or omission which gave rise to the alleged entitlement the Contractor must lodge the notice with the Superintendent's Representative. The Contractor must not delay giving the notice until the event is complete or the amount of the adjustment claimed can be ascertained. If the Contractor fails to lodge the notice within time, the Principal shall not be liable in respect of the Ex-contractual Claim and the claim shall be barred.

Notice of Ex Contractual Claim

Name of Contractor:

Contract Number:

Project:

The Contractor gives notice of the following claim:

The, breach of contract, event, circumstance, direction or omission which gives rise to the claim is:

The date of the breach, event, circumstance, direction, or omission, is:

The provision of the Contract which has been breached or other basis of the claim is:

The amount or likely amount of the claim is:

Signed for the Contractor by:

Date:

46.3 Submission of Claims to the Superintendent's Representative.

Claims under clauses 46.1 and 46.2 shall be considered in the first instance by the Superintendent's Representative on behalf of the Principal.

The Superintendent's Representative may accept or reject the claim in part or in full.

If within 28 days after first receipt of a claim the Superintendent's Representative has not made a decision on the claim, the claim shall be deemed to have been rejected on that 28th day.

46.4 Submission of Claims to the Superintendent in Clause A5.2 - Annexure Part A.

If within 14 days after rejection in part or in full, or deemed rejection by the Superintendent's Representative of any claim referred to in Clause 46.2 3, the Contractor does not in writing request a review by the Superintendent in Clause A5.2 - Annexure Part A of that decision, the Contractor shall be deemed to have abandoned the claim and the claim shall be barred. In conducting the review, that Superintendent may, on behalf of the Principal, affirm, reverse or vary the decision of the Superintendent's Representative.

If within 28 days after a request to review the decision of the Superintendent's Representative, the Superintendent has not made a decision on the claim, the claim shall be deemed to have been rejected on that 28th day.

46.5 Submission of Disputes to the Superintendent in Clause A5.1 - Annexure Part A.

If within 14 days after rejection or deemed rejection by the Superintendent in Clause A5.2 - Annexure Part A the Contractor has not given the Superintendent in Clause A5.1 - Annexure Part A a formal notice of dispute, the Contractor shall be deemed to have abandoned the claim and the claim shall be barred.

In the formal notice of dispute, the Contractor shall request a decision of the Superintendent under this Clause 46.5 and set out in writing details of the Contractor's claim and reasons why the Principal is liable. On receipt of the formal notice of dispute, the Superintendent will request the Principal to provide reasons in writing for rejecting the claim. Within 28 days after the formal notice of dispute is given to the Superintendent, the Principal shall provide those reasons to the Superintendent with a copy to the Contractor. The reasons may include claims of set off or cross claims.

If the Contractor has failed to provide full particulars of the claim, then within 14 days after receipt of the claim the Superintendent may request the Contractor to provide further particulars of the claim. If within 14 days after the request the Contractor has not furnished the particulars sought, the Contractor's claim shall be barred.

Within 56 days after receiving the formal notice of dispute, the Superintendent will deliver to each party a written decision on the claims comprising the dispute.

If the Superintendent fails to deliver a decision within the 56 days, the Superintendent will be deemed to have decided on that 56th day that the claim is not valid.

If, within 14 days after the earlier of the date of receipt of the decision, or the date of the deemed decision of the Superintendent under this Clause 46.5 neither party gives notice in writing to the other that the party is dissatisfied with the decision, the parties shall, in respect of each claim which was submitted to the Superintendent, treat the decision as final and binding and give effect to it and, if the decision is that the claim is not valid, the claim shall be barred.

Notwithstanding the existence of a dispute, each party shall continue to perform the Contract. In particular, the Contractor shall continue with the work and the Principal shall continue to comply with Clause 42.1.

46.6 Submission of Disputes to Expert Determination.

Expert Determination is a process in which the parties refer a claim to an Expert for an opinion (the determination). Except as provided below, the parties are bound by the Expert's determination.

If within 14 days after the earlier of the date of receipt of the decision or the date of the deemed decision of the Superintendent under Clause 46.5, either party gives notice in writing to the other that the party is dissatisfied with the decision, the decision shall be of no effect and the parties shall, in respect of each claim which was referred to the Superintendent, refer the following questions to an Expert:

- (a) Was there was an event, act or omission which gives the claimant a right to recompense,
 - (i) Under a term of the Contract;
 - (ii) For damages for breach of the Contract;
 - (iii) Otherwise in law.
- (b) If so,
 - (i) What is the event, act or omission;
 - (ii) On what date did the event act or omission occur;
 - (iii) What is the legal right which gives rise to the liability to make recompense;
 - (iv) Is that right extinguished, barred or reduced by a provision of the Contract, estoppel, waiver, accord and satisfaction, set off, crossclaim or other legal right?
- (c) In the light of the answers to (a) and (b),
 - (i) what is the recompense, if any, due from one party to the other and upon what date did it fall due?
 - (ii) applying the agreed rate of interest specified in the Contract, what interest, if any, is due at the date of the Expert's determination on that recompense?

If the Principal makes a claim including a cross claim against the Contractor under, arising out of or in any way related to the Contract, and the Contractor fails to pay the amount claimed within 28 days, the parties shall similarly refer the above questions to an Expert.

In answer to any claim by the Contractor referred to the Expert, the Principal can raise any defence, set off or cross claim notwithstanding that it was not raised in the Principal's reasons submitted to the Superintendent under clause 46.5. The dispute resolution procedures (as distinct from the outcome) shall not limit any right of the Principal to terminate the Contract or take work out the hands of the Contractor or to deduct from or set off against moneys payable to the Contractor or the Contractor's security, amounts due to the Principal, or to exercise any other right of the Principal under the Contract.

The Expert shall be a person agreed between the parties or, if they fail to agree, a person nominated by the person prescribed in the Annexure. The Expert nominated must not be an employee of the Principal or the Contractor, a person who has been connected with the work under the Contract or a person in respect of whom there has been a failure to agree by the Principal and the Contractor. If the Expert fails, refuses or is unable to make a determination, another expert is to be substituted and can continue from where his or her predecessor ceased.

In respect of each claim which was submitted to the Expert, the parties shall treat the determination as final and binding and give effect to it. If the determination is that a claim is not a valid claim, the claim shall be barred. If the determination is that one party owes the other money, payment shall be made within 28 days of the date of the determination.

If, however, the determination is that an amount (without interest in respect of one claim or several and being the nett amount after allowing for set offs) exceeding \$500,000 is due from one party to the other, within 28 days after the date of receipt of the determination either party may give notice in writing to the other that the party requires the dispute to be referred to arbitration in accordance with Clause 46.8.

46.7 Procedure for Expert Determination

When the person to be the Expert has been agreed or nominated, the Principal, on behalf of both parties will request the Expert to sign an agreement. The agreement will set out the claims and the questions upon which the Expert is asked to give an opinion (the Expert's determination), and the Expert's fees and will state that these are the procedures to be adopted by the Expert and the parties. The date upon which the Expert signs the agreement shall be the "Date of Commencement".

The parties shall share equally the Expert's fees and shall bear their own costs.

If, as a term of accepting the appointment, the Expert has requested security for costs, the parties shall deposit an equal share of the security.

The Expert is not an arbitrator and shall not be liable for any act or omission done bona fide in the exercise or purported exercise of functions as an expert.

The parties shall make submissions to the Expert as follows:

- (a) Within 14 days after the Date of Commencement, the claimant will make a written submission setting out details of the claimant's claim.

- (b) Within 21 days after receipt of a copy of that submission, the other party must make a written response. That response can include crossclaims.
- (c) Within 21 days after receipt of the response, the claimant may reply to the response but must not raise new matters.
- (d) Within 14 days after receipt of that reply, the other party may make comments upon the reply but not raise new matters.

For the purpose of counting days under (a) to (d) public holidays and the period from 24 December to 15 January inclusive shall not be counted.

All submissions must be in writing. Unless the Expert and the parties otherwise agree, the Expert must ignore any submission made later than the time prescribed. A party providing anything to the Expert must at the same time provide a copy to the other party.

The Expert may request further information from either party. The request must be in writing and must provide a time limit for any response. The Expert must send a copy to the other party and give the other party a reasonable opportunity to comment on the response.

Provided that the parties agree, at the request of the Expert and on such terms as the parties may agree, the Expert may arrange a conference. With any request for a conference, the Expert must set out the matters which the Expert wants to discuss at the conference. Any such conference shall be "Without Prejudice".

Within 12 weeks after the Date of Commencement, the Expert must deliver to the parties the Expert's written opinion on the questions referred. Unless the parties agree to extend this time, the Expert cannot deliver a determination after that time. With the determination, the Expert must provide a statement of reasons. If the determination contains clerical or mathematical errors or accidental slips or omissions, the Expert can correct them even after expiration of the time for making the determination.

The process is not arbitration. The Expert must make the determination on the basis of the submissions of the parties, including documents and witness statements, and the Expert's own expertise.

46.8 Arbitration.

Where the Principal or the Contractor is entitled, pursuant to Clause 46.6, to give notice requiring a dispute to be referred to arbitration, such notice ("Notice") shall:

- (a) be given in writing to the other party not later than 28 days after the Expert has given a decision; and*
- (b) if given by the Contractor, be signed by a Director of the Contractor; and*
- (c) if given by the Principal, be signed by the authorised delegate of the Principal; and*
- (d) specify with detailed particulars the matter at issue, including the contractual basis of the claim,*

and thereupon the dispute shall be determined by arbitration.

If, however, a party does not, within the said period of 28 days, give the Notice to the other party, the determination of the Expert shall not be subject to arbitration.

Arbitration will be conducted under the Commercial Arbitration Act NSW 1984 (as amended)(Act) subject to the following–

- (a) With reference to section 14 of the Act, the arbitrator must conduct proceedings in accordance with this clause 46.8, which overrides section 14 of the Act.
- (b) With reference to section 19 of the Act, the arbitrator is bound by the rules of evidence.
- (c) With reference to section 19 of the Act, evidence must be in the form of written statements.
- (d) With reference to section 22 of the Act, all questions that arise for determination in the course of the Arbitration must be determined according to law.
- (e) With reference to section 29 of the Act, the arbitrator makes the award in writing, signs the award and includes in the award fully detailed reasons to enable the parties to understand adequately the basis for the award and each determination of the arbitrator in the award.

- (f) With reference to section 34 of the Act, costs of a predominantly successful party must be paid by the other party, pre-agreed to be assessed in the amount of 60% of party-party costs. Costs of the arbitrator, room hire, transcript service and other such costs must be shared equally.
- (g) Arbitration is to be conducted by an arbitrator agreed by the parties, or, failing agreement, appointed by the President of the Law Society of NSW. The arbitrator must be an experienced lawyer, who may request technical assistance.
- (h) Arbitration must be conducted in Sydney.
- (i) Whenever possible, the arbitrator must apply the following procedure, unless it is clear to the arbitrator after a submission by a party that an injustice might occur:
 - (j) limited number of lay witnesses (maximum of 5);
 - (iii) limited experts (1 per discipline); and
 - (iv) limited hearing (5 days maximum).

SCHEDULE 1

APPROVED FORM OF UNCONDITIONAL UNDERTAKING

(Clause 5.3)

[To be submitted on a Financial Institution's letterhead and show, at a minimum, the Financial Institution's name and address]

At the request of ('the Contractor')
and in consideration of ('the Principal')
accepting this undertaking in respect of the contract for
..... ('the Contract'),
..... ('the Financial Institution')
unconditionally undertakes to pay on demand any sum or sums which may from time to time
be demanded by the Principal to a maximum aggregate sum of
.....(\$.....)('the Sum').

The undertaking is to continue until notification has been received from the Principal that the Sum is no longer required by the Principal or until this undertaking is returned to the Financial Institution or until payment to the Principal by the Financial Institution of the Sum or such part as the Principal may require. The Principal must not assign the unconditional undertaking without the prior **written** agreement of the Financial Institution, which must not be unreasonably withheld.

Should the Financial Institution be notified in writing, purporting to be signed by or for and on behalf of the Principal that the Principal requires payment to be made of the whole or any part or parts of the Sum, it is unconditionally agreed that the Financial Institution will make the payment or payments to the Principal forthwith without reference to the Contractor and notwithstanding any notice given by the Contractor not to pay same.

Provided always that the Financial Institution may at any time without being required so to do pay to the Principal the Sum less any amount or amounts it may previously have paid under this undertaking or such lesser sum as may be required and specified by the Principal and thereupon the liability of the Financial Institution hereunder shall immediately cease.

DATED at this day of
20 ..

.....
[Signature]

.....
[Print name of person signing the Undertaking]

.....
[Position / Title]

SCHEDULE 2

Statutory Declaration

Oaths Act (NSW)
Ninth Schedule

Definitions

The Principal is

The Contractor is
ACN/ABN.....

The Contract is Contract No.
Contract Title.....
dated(Date of Acceptance of Tender) between the party
identified as the Principal and the party identified as the Contractor.

Declaration

Full name

Address
.....

do hereby solemnly declare and affirm that:

*Insert position title of
the Declarant* I am the representative of the Contractor in the Office Bearer capacity of
.....

I am in a position to make this statutory declaration about the facts attested to.

REMUNERATION OF CONTRACTOR'S EMPLOYEES ENGAGED TO CARRY OUT WORK IN CONNECTION WITH THE CONTRACT

All remuneration payable to the Contractor's relevant employees for work done in connection with the Contract to the date of this statutory declaration has been paid and the Contractor has made provision for all other benefits accrued in respect of the employees.

Relevant employees are those engaged in carrying out the work done in connection with the Contract.

Remuneration means remuneration or other amounts payable to relevant employees by legislation, or under an industrial instrument, in connection with work done by the employees [s127(6) of the Industrial Relations Act 1996].

REMUNERATION OF THE EMPLOYEES OF SUBCONTRACTORS ENGAGED TO CARRY OUT WORK IN CONNECTION WITH THE CONTRACT

The Contractor is/is not a principal contractor for the work done in connection with the Contract, as defined in section 127 of the Industrial Relations Act 1996.

Delete the words
in italics that are
not applicable.

Where the Contractor is also a principal contractor for work done in connection with the Contract, the Contractor has been given a written statement in its capacity of principal contractor under section 127(2) of the Industrial Relations Act 1996 by each subcontractor in connection with that work stating that all remuneration payable by each subcontractor to the subcontractor's relevant employees for work done in connection with the Contract to the date of this declaration has been paid, and each subcontractor has made provision for all other benefits accrued in respect of each subcontractor's employees.

I am aware that the Industrial Relations Act 1996 requires any written statement provided by subcontractors must be retained for at least 6 years after it was given and declare that the Contractor has accordingly made arrangements for the secure retention of the written statements.

WORKERS COMPENSATION INSURANCE OF THE CONTRACTOR'S WORKERS

All workers compensation insurance premiums payable by the Contractor to the date of this statutory declaration in respect of the work done in connection with the Contract have been paid. This statutory declaration is accompanied by a copy of any relevant certificate of currency in respect of that insurance.

WORKERS COMPENSATION INSURANCE FOR WORKERS OF SUBCONTRACTORS

The Contractor is / is not a principal contractor for work done in connection with the Contract, as defined in section 175B of the Workers Compensation Act 1987.

Delete the words *in italics* that are not applicable.

Where the Contractor is also a principal contractor for work done in connection with the Contract, the Contractor has been given a written statement under section 175B of the Workers Compensation Act 1987 in the capacity of principal contractor in connection with that work to the intent that all workers compensation insurance premiums payable by each subcontractor in respect of that work done to the date of this statutory declaration have been paid, accompanied by a copy of any relevant certificate of currency in respect of that insurance.

I am aware that the Workers Compensation Act 1987 requires any written statement provided by subcontractors and any related certificate of currency must be retained for at least 7 years after it was given and declare that the Contractor has accordingly made arrangements for the secure retention of the written statements.

EMPLOYER UNDER THE PAY-ROLL TAX ACT

The Contractor is registered as / is not required to be registered as an employer under the Pay-roll Tax Act 1971.

Delete the words *in italics* that are not applicable.

All pay-roll tax payable by the Contractor in respect of wages paid or payable to the relevant employees for work done in connection with the Contract to the date of this statutory declaration has been paid.

The Contractor is / is not a principal contractor for work done in connection with the Contract, as defined in section 31G of the Pay-roll Tax Act 1971.

Delete the words *in italics* that are not applicable.

Where the Contractor is also a principal contractor for work done in connection with the Contract, the Contractor has been given a written statement under section 31H of the Pay-roll Tax Act 1971 in the capacity of principal contractor in connection with that work to the intent that all pay-roll tax payable by each subcontractor in respect of the wages paid or payable to the relevant employees for that work done to the date of this statutory declaration has been paid.

I am aware that the Pay-roll Tax Act requires any written statement provided by subcontractors must be retained for at least 5 years after it was given and declare that the Contractor has accordingly made arrangements for the secure retention of the written statements.

PAYMENTS TO SUBCONTRACTORS

The Contractor has paid every subcontractor, supplier and consultant all amounts payable to each of them by the Contractor as at the date of this statutory declaration with respect to engagement of each of them for the performance of work or the supply of materials for or in connection with the Contract.

The provisions of clause "SECURITY OF PAYMENT", if included in the Contract, have been complied with by the Contractor.

The Contractor has been informed by each subcontractor and consultant to the Contractor (except for subcontracts and agreements not exceeding \$25,000 at their commencement) by written statement in equivalent terms to this declaration (made no earlier than the date 14 days before the date of this declaration):

- .1 that their subcontracts with their subcontractors, consultants and suppliers comply with the requirements of clause "SECURITY OF PAYMENT", if included in the Contract, as they apply to them; and
- .2 that all of their employees, subcontractors, consultants and suppliers, as at the date of the making of such a statement have been paid all remuneration and benefits due and payable to them by, and had accrued to their account all benefits to which they are entitled from, the subcontractor or consultant of the Contractor or from any other of their subcontractors or consultants (except for their

1. GENERAL CONDITIONS OF CONTRACT AND ANNEXURE

subcontracts and agreements not exceeding \$25,000 at their commencement) in respect of any work for or in connection with the Contract.

I am not aware of anything to the contrary of any statutory declaration referred to in paragraph 18 of this declaration and on the basis of the statements provided, I believe the matters set out in paragraph 18 to be true.

And I make this solemn declaration, as to the matters aforesaid, according to the law in this behalf made, and subject to the punishment by law provided for any wilfully false statement in any such declaration.

Signature of
Declarant

.....
declared at

Place

.....
on.....

Date

before me

Signature of legally
authorised person*
before whom the
declaration is made

.....

Name and title of
person* before
whom the declaration
is made

.....
.....

Notes:

1. In this declaration:

- (a) the words “principal contractor”, “employee”, “employees” and “relevant employees” have the meanings applicable under the relevant Acts;
- (b) the word “subcontractor” in paragraphs 5, 6, 9, 10, 14 and 15 has the meaning applicable under the relevant Act; and
- (c) otherwise the words “Contractor” and “subcontractor” (including “supplier” and “consultant”) have the meanings given in or applicable under the Contract.

2. * The declaration must be made before one of the following persons:

- (a) where the declaration is sworn within the State of New South Wales:
 - (ii) a justice of the peace of the State of New South Wales;
 - (iii) a solicitor of the Supreme Court of New South Wales with a current practising certificate;
 - (iv) a notary public; or
 - (v) another prescribed person legally authorised to administer an oath under the Oaths Act (NSW); or
- (b) where the declaration is sworn in a place outside the State of New South Wales:
 - (i) a notary public; or
 - (ii) any person having authority to administer an oath in that place.

ANNEXURE PART A

Part A of the Annexure to the General Conditions of Contract shall be deemed to be completed as follows:

A1

The law applicable is that of the State or Territory of: (Clause 1) New South Wales.

A2

Payments under the Contract shall be made at: (Clause 1) Condobolin, NSW.

A3

The Principal: (Clause 2) Lachlan Shire Council

A4

The address of the Principal:

A4.1

For the purposes of Clauses 44 and 46 of the General Conditions of Contract and for the service of legal process: 58-64 Molong Street, Condobolin, NSW 2877

A4.2

For all other matters: 58-64 Molong Street, Condobolin, NSW 2877

A5

The Superintendent: (Clause 2)

A5.1

The Superintendent for the purposes of Clauses 44.6 and 46.5 of the General Conditions of Contract: NSW Department of Commerce Policy Support Services, NSW Procurement

A5.2

The Superintendent for all matters other than for Clauses 44.6 and 46.5 of the General Conditions of Contract: The General Manager, Lachlan Shire Council

A6

The address of the Superintendent:

A6.1

For all purposes relating to Clauses 44.6 and 46.5 of the General Conditions of Contract: McKell Building, 2-24 Rawson Place, . Sydney, NSW 2000

*1. GENERAL CONDITIONS OF CONTRACT AND ANNEXURE
ANNEXURE PART A*

A6.2

For all other matters:

58-64 Molong Street, Condobolin, NSW
2877

A7

Limits of accuracy applying to quantities for which the Principal accepted rates: (Clause 3.2).

Not Applicable.

A8

The Contractor shall provide security in the amount of: (Clause 5.2)

5% of the Contract Sum, but if the Contract Sum exceeds \$10 Million, \$250,000 plus 5% of the Contract Sum.

A9

The percentage to which the entitlement to security and retention moneys is reduced. (Clause 5.7)

Security will be released in full 52 weeks after Practical Completion of Separable Portion 5.

A10

The number of copies to be supplied by the Principal: (Clause 8.3)

3

A11

The number of copies to be supplied by the Contractor: (Clause 8.4)

3 hard copies + one electronic copy

A12

The time within which the Superintendent must give a decision and return the Contractor's copies: (Clause 8.4)

The Contractor does not require approval. Refer Clause 8.4 of the General Conditions of Contract.

A13

Work which cannot be subcontracted without approval: (Clause 9.2)

Any individual subcontract valued at more than \$10,000 or 2% of the Contract Sum, whichever is the greater, as well as the following:

A13A

Works and Public Liability Insurance: (Clause 18.1)

The Contractor must effect the insurance. The amount insured will be minimum of \$4 Million for Works and a minimum of \$20 Million for Public Liability for any one occurrence.

A13B

Asbestos Liability Insurance: (Clause 18.2) As required by law.

A13C

Amount of Professional Indemnity Insurance: (Clause 18.4) A minimum of \$1 Million.

A13D

At least one automatic reinstatement in Professional Indemnity Insurance: (Clause 18.4) At least one automatic reinstatement is/is not required.

A13E

Period for maintaining Professional Indemnity Insurance: (Clause 18.4) 6 years.

A14

The time for giving possession of the Site: (Clause 27.1) The Date of Acceptance of Tender.

A15

The times for Practical Completion of the Separable Portions are: (Clause 35.3) The following times from the Date indicated.

Separable Portion 1: 4 calendar weeks from the Date of Acceptance of Tender.

Separable Portion 2: 16 calendar weeks from the Date of Acceptance of Tender.

Separable Portion 3: 16 calendar weeks from the Date of Acceptance of Tender.

Separable Portion 4: 20 calendar weeks from the Date of Acceptance of Tender. The Principal may request the Contractor to delay the commencement of Separable Portion 4. No additional costs shall apply for any delay up to 4 calendar weeks from the completion of Separable Portion 2.

Separable Portion 5: 24 calendar weeks from the Date of Acceptance of Tender. Refer to Clause A24 for details of Separable Portions.

A16

Liquidated Damages per day: (Clause 35.6) \$1,500 per day for Separable Portion 5.

A17

The Defects Liability Period: (Clause 37)

A period expiring 52 calendar weeks after the Date of Practical Completion of the Separable Portion 5.

A18

The charge for overheads, profit, etc for Daywork: (Clause 41(f))

17.5 % of the sum of the amounts calculated under (a) to (e) of Clause 41.

A19

Times for payment claims: (Clause 42.1)

Where the Principal is to pay the Contractor the day of the month for payment claims shall be the day upon which the Contractor delivers to the Superintendent the first payment claim but if, within 60 days after the Date of Acceptance of Tender, the Contractor has not delivered a payment claim, it shall be the day which is 35 days after the Date of Acceptance of Tender. Thereafter each month the same day of the month shall be the time for a payment claim. If a month does not contain such a day, then the time will be the last day of the month. Where, in contracts involving demolition, the Contractor is to pay the Principal, the total amount is to be paid before commencement of the work under the Contract.

A20

Unfixed plant and materials for which payment claims may be made notwithstanding that they are not on the Site: (Clause 42.2)

Not Applicable

A21

Retention Moneys on: (Clause 42.3)

Not applicable.

A22

The rate of interest on overdue payments: (Clause 42.7)

The rates from time to time prescribed for judgment debts under the NSW Supreme Court Rules.

A23

The delay in giving possession of the Site which shall be a substantial breach: (Clause 44.7)

3 months.

A24

The Works comprise the following Separable Portions:

Separable Portion 1: Completion of detail design and documentation of all process, mechanical, electrical, instrumentation and control equipment listed under Clause 4 of Sub-Section 3.1 General.

Separable Portion 2: Manufacture & supply of all process, mechanical, electrical, instrumentation and control equipment listed under Clause 4 of Sub-Section 3.1 General.

Separable Portion 3 (Optional): Completion of detail design and construction of civil and associated work listed under Clause 5 of Sub-Section 3.1 General.

Separable Portion 4: Installation of all process, mechanical, electrical, instrumentation and control equipment listed under Clause 4 of Sub-Section 3.1 General.

Separable Portion 5: Testing, Demonstration and successful Commissioning of the Plant, submission of Operation & Maintenance Manuals and provision of Operator Training.

A25

The person prescribed to nominate the Expert if the parties fail to agree on a person to be the Expert: (Clause 46.6)

Chief Executive Officer of the Australian Commercial Disputes Centre Limited at Sydney.

ANNEXURE PART B

Part B of the Annexure to the General Conditions of Contract shall be deemed to be completed as follows:

1 ADDITIONS

The following clauses have been added to those of AS 2124-1986 as amended:

1.1 DESIGN, DOCUMENTATION AND CONSTRUCTION OBLIGATIONS

General

Ultimately, the Contractor must provide a Dissolved Air Flotation raw water pre-treatment system for the Lake Cargelligo water treatment plant that complies with the requirements of this specification.

The work under the Contract is not limited to construction, but includes design and documentation. That means that the Primary Documents provided by the Principal and listed in subclause THE PRIMARY DOCUMENTS are not complete.

The Contractor must complete the incomplete design, document the design and construct the work under the Contract. The Principal is relying upon the Contractor to carry out this work.

General Compliance

Subject to subclause CONFLICTS IN PRIMARY DOCUMENTS, the work under the Contract and the Works must comply with:

- all statutory requirements;
- all approved Codes of Practice under the Occupational Health and Safety Act 2000;
- the requirements of persons acting in the exercise of statutory powers enabling them to give directions affecting the work under the Contract or the Works;
- the Building Code of Australia;
- all Australian Standards;
- suitability for purpose;
- the Australian Drinking Water Guidelines.

Additional work to that expressly shown in the Primary Documents may be required in order to comply with these requirements, and the Contractor shall not be entitled to any additional payment on that account.

Suitability for Purpose

Suitability for purpose of the Works is the responsibility of the Contractor. The Contractor's design and documentation must ensure that the Works will perform as required and are suitable for the purposes expressly stated or which can reasonably be inferred from the Primary Documents. The Principal is relying on the Contractor's knowledge, skill, care and judgment in carrying out this responsibility.

The Primary Documents

- The following are documents supplied by the Principal. They must not be used for construction. They are called the "Primary Documents".
- Tender documents;
- Reports and studies carried out. Not all documents or reports have been attached to this Tender Document. Copies of such reports and documents may be obtained or made available to view by contacting the Superintendent.

No inference should be drawn from the fact that an item is shown as required in one place, or several places, but is not shown elsewhere in the Primary Documents. It may be that to complete the work in a workmanlike manner or in accordance with the requirements of the law or the Building Code of Australia or to make the Works suitable for purpose, the Contractor will have to provide the item in other places also.

Conflicts in Primary Documents

As the design is incomplete, the Primary Documents probably contain errors and omissions. They may even be inconsistent or misleading. They may conflict with statutory requirements or the requirements of the Building Code of Australia or some other code or standard which the Contract requires the Contractor to follow. The Principal is relying upon the Contractor to find and overcome these problems.

But in doing so, the Contractor must not, without the prior approval in writing of the Superintendent, do or provide anything which is different (as distinct from additional) to what is shown in the Primary Documents. The Contractor does not require prior approval when providing something additional to that shown in the Primary Documents.

If a provision (other than an omission) in the Primary Documents conflicts with any requirement of subclause GENERAL COMPLIANCE, then before commencing that aspect of the work, notify the Superintendent in writing of the conflict. The Superintendent will give a direction.

If the direction is to follow a requirement under subclause GENERAL COMPLIANCE instead of the other provision in the Primary Documents and compliance with the direction increases or reduces the cost to the Contractor of carrying out the work under the Contract, the increase or reduction will be valued under Clause 40.2 of the General Conditions of Contract.

If the direction is to follow the other provision in the Primary Documents, there will be no adjustment of moneys payable to the Contractor.

In the case of the conflict being an omission in the Primary Documents the Contractor shall follow the requirements under subclause GENERAL COMPLIANCE and there will be no adjustment of moneys payable to the Contractor.

Design

The Contractor must complete the design provided in the Primary Documents, including designing those aspects of the work under the Contract which have not already been designed. The design must be completed to the highest standard of professionalism.

Completion of the design includes but is not limited to:

- Design of all process, mechanical, and electrical works including upgrade on the raw water pumps
- Design of all civil works unless it has been agreed that a third party will carry out the civil designs

Use of Qualified Designers

Use persons professionally qualified in the relevant disciplines when completing the design in the Primary Documents. The Principal relies upon the Contractor, with the design and documentation, to produce a finished product that is suitable for its intended purpose. The use of persons professionally qualified shall not relieve the Contractor of liability and the Contractor shall accept responsibility for their errors and omissions.

Construction Documents

In accordance with the design, prepare construction documents for all construction work. Construction documentation must be to the highest standard of professionalism. Construction documents must also ensure appropriate fit, and specify the workmanship and materials described in the Primary Documents or where not so described, first class workmanship and materials suitable for purpose. In addition, the construction documents must fully detail the form, nature and character of the Works to be constructed in a fully coordinated manner. Completion of construction documentation includes but is not limited to:

- All process, mechanical, and civil works,
- All of the civil works unless that the civil works design have agreed to be carried out by the Council or a third party.

Natspec Subscription

When any part of the construction documents are based on NATSPEC, the producer of such documents must be a subscriber to NATSPEC. When submitting NATSPEC based documents to the Superintendent, provide proof of currency of such subscription with the initial submission.

Submission of Construction Documents

Not less than 28 days before commencing any construction work under the Contract for which a construction document is required, the Contractor must give the Superintendent the required number of copies of the document. The Superintendent may reduce the period of 28 days but only by notice in writing to the Contractor. The Contractor must endeavour to submit construction documents in batches and on not more than 5 occasions. If the Contractor exceeds 5 occasions, the Contractor must pay the Principal \$250 on each additional occasion upon which the Contractor submits construction documents. Each batch of construction documents must comprise complete discrete areas of work which are fully detailed and coordinated.

Corrections

If any of the documents supplied by the Contractor to the Superintendent contain errors, the Contractor must supply to the Superintendent corrected documents prior to commencing construction.

Refer also Clause 8.4 of the General Conditions of Contract.

Construction

The Contractor must construct the Works in accordance with the Contractor's construction documents supplied to the Superintendent. Without limiting the generality of that obligation, construction must satisfy the requirements of the Primary Documents and in addition be of the highest standard.

Post Commissioning Inspection

Further to As2124 General Conditions of Contract Clause 2, the works will not reach Practical Completion until satisfactory completion of the Post Commissioning Inspection.

1.2 EXPRESSED WARRANTY ON COMPLIANCE

There will be deemed to be an expressed warranty by the Contractor that what the Contractor supplies or constructs will meet requirements of the documents supplied by the Principal, unless the Contractor has EXPRESSLY WARNED the Principal in the tender that what the Contractor offers will not meet some or any of these requirements.

1.3 EXTENSIONS OF TIME

Except when the cause of a delay is a cause described in Clause 35.5 (b) (i), (iv), (vi) or (ix) of the General Conditions of Contract, notwithstanding anything in Clause 35.5 of the General Conditions of Contract the Contractor shall not be entitled to any extension of time in respect of:

- (i) any delay to the design and documentation work; or
- (ii) any delay to construction work as a consequence of or arising out of the design and documentation.

1.4 TERMINATION FOR THE PRINCIPAL'S CONVENIENCE

The Principal may terminate the Contract by giving notice with effect from the date stated in the notice, for its convenience and without the need to give reasons. The Contractor must leave the Site by the date stated in the termination notice and remove all plant, equipment and amenities it has brought onto the Site for the construction of the Works.

After termination for the Principal's convenience, the Principal must pay the Contractor:

- the value of all work carried out (as determined under Clause 42) to the date the termination notice takes effect, after taking into account previous payments and any deductions under Clause 42;
- the cost of materials reasonably ordered by the Contractor for the Works which it is legally liable to accept, but only if on payment the materials become the property of the Principal, free of any encumbrance;
- the reasonable, direct costs of removal from the Site incurred by the Contractor, but only if the Contractor complies with a strict duty to mitigate costs;
- an amount of 2% of the unpaid portion of the Contract Price; and

- costs reasonably incurred by the Contractor in the expectation of completing the Works and not included in any other payment by the Principal.

After termination for the Principal's convenience, the Principal must return the security, subject to its rights under the Contract.

The payments to the Contractor referred to in this clause are full compensation for termination under this Clause B1.4, and the Contractor has no claim for damages or other entitlement whether under the Contract or otherwise.

The Contractor must, wherever possible, include in all subcontracts and supply agreements an equivalent provision to this Clause B1.4.

1.5 LATENT CONDITIONS

Notwithstanding anything in Clause 12 of the General Conditions, the Contractor will not be entitled to any extra remuneration as a consequence of a Latent Condition or any delay or additional cost caused by or arising from the Latent Condition. In the event that a Latent Condition is such that without a direction by the Superintendent under Clause 40.1 to vary the work, the Contract would be terminated by the doctrine of frustration, the Contractor must notify the Superintendent in writing forthwith. If, in order to avoid the Contract being terminated by frustration, the Superintendent orders a variation under Clause 40.1, the parties' entitlement, if any, in carrying out the variation shall not be affected by this paragraph.

END OF SECTION – GENERAL CONDITIONS OF CONTRACT AND ANNEXURE

2 PRELIMINARIES

THERE ARE 13 PAGES IN THIS SECTION

1 GENERAL

1.1 ELECTRONIC COMMUNICATIONS

The parties agree and consent that notices and communications may be by electronic communication in accordance with the *Electronic Transactions Act 2000* (NSW).

1.2 USE OF QUALIFIED DESIGNERS

Use persons professionally qualified in the relevant disciplines when completing the Design of the Works. The use of such persons shall not relieve the Contractor of liability for the fitness of the Works for the purposes required by the Contract.

1.3 USE OF QUALIFIED TRADEPERSONS

Use qualified tradepersons when completing the Works. The use of such persons shall not relieve the Contractor of liability for the fitness of the Works for the purposes required by the Contract.

1.4 LICENCES AND APPROVALS

The Principal has obtained the following licences, approvals and consents for the Site and the Works:

- Development consent
- S60 approval under the Local Government Act 1993 for water treatment from the NSW Department of Water and Energy
- Building approval
- Consent to enter

The Contractor must provide the Principal with a copy of all other licences and approvals required, and pay all associated fees prior to commencing the affected work.

1.5 CERTIFICATION OF COMPLIANCE WITH BUILDING AND FIRE REGULATIONS

Provide a certificate obtained from a consultant appropriately accredited as an Accredited Certifier in accordance with the *Environmental Planning and Assessment Act 1979* (NSW) stating that the Works fully comply with all applicable building and fire regulation statutory requirements.

1.6 CONTRACTOR PERFORMANCE REPORTING

During the course of the Contract, the Contractor's performance may be monitored and assessed in accordance with the *Performance management system guidelines* which are available on the Internet at:

www.managingprocurement.commerce.nsw.gov.au/system/index_performance_management.doc

1.7 EXCHANGE OF INFORMATION BETWEEN GOVERNMENT AGENCIES

The Contractor authorises the Principal and its employees and agents to make information concerning the Contractor and its performance available to NSW government agencies and local government authorities, which may take such information into account in considering whether to offer the Contractor future opportunities for work.

The Principal regards the provision of information about the Contractor to any NSW government agency or local government authority as privileged under the *Defamation Act 2005*. The Contractor agrees that it will have no entitlement to make any claim against the Principal in respect of any matter arising out of the provision or receipt of such information.

2 DOCUMENTS

2.1 SITE INFORMATION SUPPLIED BY THE PRINCIPAL

Site Conditions

The information made available by the Principal does not completely show the existing Site conditions. The Principal is not responsible for any interpretations, deductions or conclusions made by the Contractor from the information made available and the Contractor shall accept full responsibility for any such interpretations, deductions or conclusions.

Where the Principal has not given possession of all the Site, the Contractor may apply for approval, which shall not be unreasonably withheld to carry out further site investigation.

Errors and Omissions

The following documents supplied by the Principal to the Contractor before the Date of Acceptance of Tender could include errors or omissions or could be misleading. Notwithstanding that the Principal may have been negligent, or would but for this Clause “Site Information Supplied by the Principal” be vicariously liable for the negligence of others, in preparing or supplying the information, the Contractor shall have no claim in tort, contract or otherwise against the Principal arising from the errors or omissions or the fact that the Contractor was misled.

- Geotechnical Report
- Site Survey

Contractor's Rights

Nothing in this Clause “Site Information Supplied by the Principal” will detract from any other rights of the Contractor under Clause 8.1 or Clause 12 of the General Conditions of Contract.

Indemnity

If the Contractor supplied to anyone else, including a subcontractor any information supplied by the Principal, the Contractor shall indemnify the Principal against any claim by that person arising out of errors or omissions or the misleading nature of the advice.

2.2 CONTRACTOR'S TENDER CONCEPT/ DESIGN

In preparing the Contractor's Documents, the Contractor must not alter the Contractor's accepted tender concept/ design without the Principal's agreement.

2.3 CONTRACTOR'S DOCUMENTS

Drawings

Submit drawings on sheets the same size as full size drawings issued to the Contractor printed in black on white background.

Delays

Extensions of time will not be granted for delays caused by documents not meeting the requirements of the Specification and requiring subsequent amendment, re-submission and further review.

2.4 WORK AS EXECUTED DRAWINGS

Submission of Drawings

Progressively produce work as executed drawings. Submit work as executed drawings showing work which has been completed within 28 days of completion of that work. Endorse each drawing certifying accuracy and correctness.

Submit the drawings in a format that acceptable by the Superintendent.

Practical Completion

Failure to comply with the above requirements could delay Practical Completion of the Works or the relevant Separable Portion.

3 CONTRACTING

3.1 INSURANCE

Claims and deductibles

The Contractor is responsible for making and managing claims and meeting the costs of any deductibles.

Works and public liability insurance

The Contractor must arrange insurance of the Works (and any temporary works) and public liability and pay all premiums in accordance with General Conditions of Contract clause – **Insurance**.

Professional indemnity insurance

If the Contractor is required under the Contract to provide a professional indemnity insurance, the policy must cover the Contractor for liability to the Principal for loss, whether economic loss only or other loss, up to the amount shown in Annexure A to the General Conditions of Contract for any single occurrence.

Contractor's default in effecting and maintaining insurance.

If, when required in writing by the Principal to do so, the Contractor fails to produce evidence of having paid insurance premiums and other compliance with insurance obligations under General Conditions of Contract to the satisfaction of the Principal, and the Principal pays insurance premiums, the Principal may deduct from payments due to the Contractor, or otherwise recover, the amounts paid plus an additional amount of \$250 to cover the Principal's costs.

3.2 GUARANTEES

Obtain and ensure that the Lachlan Shire Council will have the benefit of warranties and guarantees as specified in the Contract or offered by product suppliers/subcontractors, including warranties and guarantees that are obtained by, or offered to the subcontractors of the Contractor.

4 ADMINISTRATION

4.1 PROGRAMMING OF WORK

Requirement

Within 4 weeks of the Date of Acceptance of Tender, supply a detailed program for carrying out the Works, including all work activities.

Format

Set out the program on a time scale of calendar weeks with individual activity durations not generally exceeding two weeks. The program shall show but not be limited to:

- a project calendar clearly denoting which days are work days (allow for restrictions on working time and contingencies for which the Contractor is responsible under the terms of the Contract. This would include but not be limited to week-ends, holidays, Christmas close-down, union designated and other days off and manufacture and trade delays);
- the inter-relationships between activities;
- the estimated duration of significant activities, the plant and manpower resources and projected productivity rates for each activity;
- the sequence of activities which constitutes the critical path or paths;
- mobilisation to the Site;
- appointment of subcontractors and their respective programs;
- order dates, supply lead time and the Site delivery dates for all major items, including those to be supplied by the Principal, as well as details of off-site manufacturing and fabrication activities;
- the time allowed for testing and commissioning of major items of plant or equipment;

- the estimated value of work completed for each calendar month for the Contract duration;
- the preparation of, and approval process for, all calculations, designs and documents required;
- the differences or divergences from the tender program.

If requested, submit the required program in electronic format.

Progress

With each payment claim supply a marked-up copy of the program amended to show time extensions granted, progress achieved against the program and the actual workforce and plant resources utilised on completed parts of the Works or engaged upon activities in progress. List all specific actions to correct or address any deviation from the program.

Program Update

A revised program may be requested if the Superintendent considers the current program cannot be adhered to. Within 2 weeks of such a request, submit an updated program incorporating changes in methods, times or sequence of activities, and showing the planned progress towards the Date for Practical Completion, to the same detail required for the original program.

Failure to Comply

If at any time the Contractor has not supplied a program as specified, then notwithstanding any other provision of the Contract no payment will become due to the Contractor before 7 days after the specified action has been carried out.

4.2 QUALITY MANAGEMENT REQUIREMENTS

Quality Management System

Maintain the Contractor's Quality Management System. Obtain evidence from proposed Subcontractors and certify that Subcontractors' quality management systems meet the requirements of the Contractor's Quality Management System.

Project Quality Management Plan

Develop and implement a Project Quality Management Plan that complies with the NSW Government *Quality Management Systems Guidelines (QMS Guidelines)*. The *QMS Guidelines* are available on the Internet at:

www.managingprocurement.commerce.nsw.gov.au/system/index_procurement_guideline_documents.doc

Submit the Project Quality Management Plan within 28 days of the Date of Contract together with *QMS Guidelines* Appendix D, **Quality Management Plan assessment checklist**, completed by the Contractor, with cross-referencing of the AS/NZS ISO 9001:2000 clause numbers to the Contractor's Project Quality Management Plan.

The Project Quality Management Plan must cover the relevant elements of the Contractor's Quality Management System and include an index of the Contractor's quality procedures and proposed Inspection and Test Plans and associated checklists.

Include a schedule of internal audits for the Contract. Submit a copy of each audit report within 14 days of the date of audit.

Design Plan

Prior to commencing design work, prepare and implement a Design Plan complying with the *QMS Guidelines*, covering each phase of *Design* and addressing the key activities.

Managing work quality

Prepare and implement Inspection and Test Plans, complying with the *QMS Guidelines*, incorporating the Hold and Witness points specified in the Contract.

Submit copies of Inspection and Test Plans and checklists not less than 7 days before commencing the work to which they apply. Also submit certification that the relevant quality management plans and Inspection and Test Plans of Subcontractors and Consultants meet the requirements of the *QMS Guidelines*. Do not start any work before this documentation is submitted.

Give at least 24 hours notice prior to reaching a Hold or Witness point.

The Contractor must not proceed beyond a Hold point without endorsement by the Principal or its authorised representative.

The Principal, at its discretion, may inspect the work at a Witness point, but work may proceed without endorsement.

Endorsement by the Principal at a Hold or Witness point does not release the Contractor from its obligations to achieve the specified requirements of the Contract.

Surveillance (monitoring) by the Principal will apply to all work associated with the Contract.

Conformance records

Submit copies of conformance records as specified, including:

Product/Service Conformance Records	Time Records Required
Design Documents	With each submission of Design Documents
Construction Drawings (including written authorisation from manufacturer of any modifications by the Contractor to proprietary equipment)	With each submission of Construction Drawings
Safety Plan	No later than 7 days before the relevant work is commenced
Commissioning Program	Four (4) weeks before starting commissioning
Test Certificates	Prior to dispatch of item from works
Completed Inspection and Test Plans and associated Checklists	With each Progress Claim
Final Work as Executed Documents	Prior to Practical Completion
Draft copies of Operation and Maintenance Manual and Schedules	With each submission of drafts.
Final copy of Operation and Maintenance Manual and Schedules	Prior to Practical Completion
Certification of HOLD and WITNESS points for design, documentation and construction work by Others	Design and documents within 7 days of said HOLD or WITNESS point. Construction work, on the next day of site inspection of said HOLD or WITNESS point..

Failure to Comply

If the Contractor fails to comply with the requirements of this clause, the Principal may implement such inspections and tests as the Principal determines and the cost incurred by the Principal shall be a debt due from the Contractor.

4.3 AUDIT AND REVIEW

Make available, on request, all records, including those of or relating to Subcontractors or suppliers, relevant to compliance with requirements of the Contract, for the purposes of audit, review or surveillance. Provide all reasonable assistance during the audits or reviews including attendance by the Contractor.

Promptly implement effective corrective action on matters disclosed by audit or review.

4.4 SECURITY OF PAYMENT

General

In this Clause “Security of Payment”, “subcontract” includes an agreement for supply of goods or services (including professional services and plant hire) or both and “subcontractor” includes a supplier of goods or services (including professional services and plant hire) or both.

The Contractor shall ensure that each subcontract, whether written or oral, entered into by the Contractor or any subcontractor in respect of the work under the Contract and which has a value of \$25,000 or more at the commencement of the subcontract, includes provisions in the form or to the effect of the form, as the case may be, of those contained in this Clause "Security of Payment", including the provisions of this subclause.

Options as to Form of Security

Each subcontract which:

- requires the subcontractor to provide a cash security to its principal;
- allows the subcontractor's principal to deduct retention moneys from any payment made by it to the subcontractor; or
- provides for both of the above,

shall allow the subcontractor the option at any time to provide an unconditional undertaking or unconditional undertakings in lieu of a cash security or retention moneys. To the extent that the subcontractor provides an unconditional undertaking or undertakings, the subcontractor's principal shall not deduct retention moneys and shall forthwith release to the subcontractor any retention moneys or cash security then held.

Trust for Cash Security and Retention Moneys

Each subcontract shall include a provision having the effect that:

- when a party receives or retains security in cash or converts security to cash, that security is held in trust by the security holder from the time of receipt, retention or conversion, as the case may be, and the security holder must forthwith deposit the money into a trust account in a bank selected by that party;
- the moneys shall be held in trust for whichever party is entitled to receive them until they are paid in favour of that party and the security holder shall maintain proper records to account for such moneys; and
- any interest earned by the trust account shall not be held in trust, and shall be owned by the party holding the security.

If the party holding security has a policy of insurance protecting subcontract payments due to the other party which is equivalent to the HIA Security of Payment Bond, then compliance with the above of this subclause is not required.

Whenever requested by the Principal to provide evidence verifying that the Contractor is holding in trust an amount which the Contractor should be holding in trust, the Contractor shall provide evidence to the reasonable satisfaction of the Principal that the amount is held in trust. If the Contractor fails to do so then, in addition to any other remedy which the Principal may have against the Contractor, the Principal may withhold an equivalent amount from payments to the Contractor.

Payments

Each subcontract shall include:

- an obligation for the subcontractor's principal to pay the subcontractor regular progress payments of 100% of the value of work, goods or services provided by the subcontractor less only retention moneys, if any, paid into the trust account referred to in subclause "Trust for Cash Security and Retention Moneys".
- an entitlement to progress payments within a period not exceeding,
 - in the case of the Contractor's subcontractors, 35 days;
 - in the case of all other subcontractors, 42 days,

after the date upon which a Progress Claim, which includes work, goods or services provided under the subcontract, is lodged by the Contractor with the Superintendent.

- provisions equivalent to the next two paragraphs of this subclause.
 - Nothing in this subclause shall be read so as to prevent the Contractor from paying a subcontractor an amount in excess of that claimed from the Principal, or before the time stipulated in this subclause;

- If any provision of the first paragraph of this subclause is inconsistent with any other provision in a subcontract, the provisions of the first paragraph shall prevail to the extent of the inconsistency.

Interest on Overdue Payments

Each subcontract shall include provisions equivalent to Clause 42.7 of the General Conditions of Contract and shall prescribe a rate on interest which is not less than the rate prescribed pursuant to that Clause.

Alternative Dispute Resolution

Each subcontract shall include provisions incorporating the dispute resolution procedures outlined in the Contract except that, in each case, it shall not be mandatory for the subcontractor to pursue the contractual dispute resolution mechanism if the only remedy sought by the subcontractor is an order that the subcontractor's principal pay to it an amount which is not disputed to be due and payable under the subcontract.

Documents to be Provided to Subcontractors

Each subcontract shall include a provision which requires the subcontractor's principal to provide to the subcontractor, before the subcontractor commences work under the subcontract, a copy of the following provisions of the contract between the subcontractor's principal and its principal:

- the provision equivalent to this Clause –“Security of Payment”; and
- the clauses relating to proof of payment of subcontractors, times for payment claims and payment and alternative dispute resolution.

Register of Subcontracts

The Contractor shall maintain a register of all subcontracts which have a value of \$25,000 or greater showing brief details of the subcontract work, the name, address and telephone number of the subcontractor, and provide an up to date copy of the register when requested by the Superintendent.

If further requested by the Superintendent, provide an unpriced copy of the subcontract agreement within 14 days of such request.

5 SITE

5.1 OCCUPIED PREMISES

Occupancy by Principal

The Principal or persons authorised by the Principal will continue in possession and occupancy of:

- Lake Cargelligo Water Treatment Plant

Principal's Access

Provide safe access to such premises for the Principal and authorised persons notified to the Contractor by the Principal.

Contractor's Responsibility

Take responsibility for the suitability of all workers and Subcontractors on Site, set reasonable standards of conduct, investigate complaints about their behaviour and take appropriate action including removal from Site if so warranted.

5.2 EXISTING SERVICES

Locating Existing Services – Dial Before You Dig

The Contractor is responsible for locating services and in doing so, must comply with the WorkCover *Work Near Underground Assets Guideline*, which is available on the Internet at:

www.workcover.nsw.gov.au/NR/rdonlyres/96ACDD20-8FC0-4583-A6F4-97292055A954/0/work_near_underground_asset_1419.pdf

Before commencing excavation the Contractor must obtain, from the Dial Before You Dig information service or relevant public authorities or owners of underground services, written

confirmation of the exact positions of all underground services at and around the Site, and verify and prominently mark the locations of the underground services on the Site.

Dealing with Existing Services

Existing services (such as drains, watercourses, public utilities, telecommunications and other services) obstructing the Works or if damaged in the course of the Contract, must be dealt with as follows:

- if the service is to be continued: repair, divert, relocate as required;
- if the service is to be abandoned: cut and seal or disconnect and make safe as required;

Cost and Delay

Where an existing service obstructs the Works and requires diversion or relocation, the Contractor must bear all resulting costs and delays except to the extent that the Contractor is entitled to an adjustment of the Contract Price or payment for a Variation in accordance with General Conditions of Contract clause - **Latent Conditions**.

Where an existing service is damaged by the Contractor for any reason whatsoever, the Contractor shall bear all costs and any delays for repairing or disconnecting the service.

Notification

Notify the Principal immediately upon the discovery of services obstructing the Works not shown in the Principal's Documents.

5.3 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

Specification and Statutory Requirements

The Contractor must comply with the *NSW Government Occupational Health and Safety Management Systems Guidelines 4th Edition (OHSM Guidelines)* and all statutory requirements including, but not limited to, the Occupational Health and Safety Act 2000 (OHS Act 2000) and Occupational Health and Safety Regulation 2001 (OHS Regulation 2001). In the event of any inconsistency, the Contractor must comply with the statutory provisions.

Appointment as principal contractor

Unless otherwise specified, the Contractor, having responsibility for the construction work at all times until the work is completed under the Contract, is appointed principal contractor and controller of the premises for the construction work under Clause 210 of the *Occupational Health and Safety Regulation 2001* (NSW), and is authorised to exercise such authority of the owner as is necessary to enable it to discharge the responsibilities of principal contractor and controller of premises imposed by the *Occupational Health and Safety Act 2000* (NSW) and Chapter 8 of the *Occupational Health and Safety Regulation 2001* (NSW).

Design

The Contractor must ensure that systematic assessments are undertaken during *Design*, to the extent *Design* is specified, that:

- identify hazards and analyse the associated risks, probability and consequences of injury or illness;
- involve consultation with appropriate people on the safe construction, use and maintenance of the designed asset;
- establish a Design Hazard Register for the designed asset to record any hazards not eliminated in the design that may impose a risk to those constructing, using or maintaining the asset.

An up to date copy of the Design Hazard Register must be provided to the Principal at the *Actual Completion Date* of the Works or the date the Works are occupied or taken over, whichever is earlier.

Project OHS Management Plan

Develop and implement a Project OHS Management Plan that complies with the NSW Government *Occupational Health and Safety Management Guidelines*.

Submit the Project OHS Management Plan no later than 14 days before construction work commences. Do not start construction work before a complying Project OHS Management Plan has been submitted.

Incident Reports

Ensure compliance with the notification and other requirements of *OHS Regulation 2001* Clauses 341 and 344 for accidents, incidents and non-disturbance occurrences, including immediate notification of WorkCover where required.

Immediately notify the Principal of any accident or incident defined in *OHS Regulation 2001* Clauses 341 and 344.

Provide a written report to the Principal within twenty-four hours of the incident, giving details of the incident and evidence that notification requirements have been met.

When requested, provide an incident investigation report, including identification of the cause of the incident and corrective actions taken, in the form directed.

Prohibition and Improvement Notices and On-The-Spot Fines

Immediately notify the Principal of any Prohibition and Improvement Notice (PIN) or on-the-spot fine issued by WorkCover. Provide the Principal with a copy of the PIN or fine notice and written details of the corrective action taken by the Contractor and/or the applicable subcontractor to rectify the breach and to prevent recurrence.

Failure to Comply

If at any time the Contractor has not carried out its obligations under the Contract in relation to occupational health and safety management, then notwithstanding any other provisions of the Contract, no payment will be due to the Contractor until the 7th day after the required action has been carried out.

5.4 HAZARDOUS SUBSTANCES

Definition

Hazardous Substance means a substance that is listed in the document entitled *List of Designated Hazardous Substances* published by Worksafe Australia; or a substance that fits the criteria for a hazardous substance set out in the document entitled *Approved Criteria for Classifying Hazardous Substances* published by Worksafe Australia.

Asbestos, material containing asbestos, polychlorinated biphenyl (PCB) and lead based paints are recognised as hazardous substances. Other substances in certain situations are also considered hazardous and therefore require controlled handling. Examples are glues, solvents, cleaning agents, paints, and water treatment chemicals.

Work involving stone, rock, concrete, masonry and such materials containing silica, is work under the Contract whether explicitly identified in the Specification or not. The Contractor is responsible for the control of any hazard which may arise from the presence of silica.

Response to Unexpected Discovery

If any hazardous substance not specified in work under the Contract is discovered on the Site the Contractor must suspend all work which may result in exposure to such hazardous substance and notify the Principal immediately of the type of substance and its location.

With the initial notification, or as soon as practicable thereafter, submit details, including:

- the additional work and additional resources the Contractor estimates to be necessary to deal with the substance so that work and subsequent use of the Works may proceed safely and without risk to health
- the Contractor's estimate of the cost of the measures necessary to deal with the substance; and
- other details reasonably required by the Principal.

The Contractor must, in planning and carrying out any work dealing with the substance take all reasonable steps:

- to carry out the work concurrently with other work wherever possible; and
- to otherwise minimise effects of the work on the Contractual Completion Date.

Responsibility For Decontamination

Control and decontamination of any hazardous substances is the responsibility of:

- the Principal, in respect of any such substances not identified in the Contract Documents, which are discovered on the Site; and

- the Contractor, in respect of any such substances identified in the Contract Documents.

Decontamination By Principal

Where the Principal is responsible for the control and decontamination of any hazardous substances, the Principal may suspend the whole or any part of the Works until the hazardous substances are isolated or removed. Should such suspension occur, the provisions of General Conditions of Contract clause - **Suspension of the Works** applies.

Decontamination By Contractor

Where the Contractor is responsible for the control and decontamination of the Site following the discovery of hazardous substances, handle, use, isolate, remove and dispose of such substances in accordance with statutory requirements.

The Environment Protection Authority or Waste Service NSW may advise of suitable disposal sites.

Working Hours

When the Contractor is required to decontaminate hazardous substances on occupied Sites, all such decontamination shall be carried out outside normal hours of occupation, unless otherwise approved in writing by the Principal. Normal hours of occupation are:

- 8 am-5pm.

6 ENVIRONMENTAL PROTECTION

6.1 ENVIRONMENTAL MANAGEMENT

Requirements

The Contractor must comply, and ensure all subcontractors comply, with the NSW Government *Environmental Management Systems Guidelines* (EMS Guidelines).

The environmental management requirements in the Contract:

- may be in addition to, but are not in substitution for, any statutory requirements; and
- do not limit the powers of the Superintendent or Principal or the liabilities and responsibilities of the Contractor.

Design

Periodically review and revise design prepared under the Contract to ensure that all reasonably foreseeable hazards and risks to, and opportunities to improve, the environment (including in the execution of the design, and in the use, maintenance, repair, operation and demolition of the built asset designed) are identified and assessed, and the risks eliminated (where practicable) and opportunities realised. Where it is not practicable to eliminate risks, to the extent practicable, effectively control the risks by design or, where this is not practicable, by operational requirements. Document and report on, as part of regular design reports, the review and the identification of hazards/risks, opportunities and controls, including any operational requirements.

Induction and Training

As part of the implementation of the Project Environmental Management Plan:

- identify the environmental training, including environmental awareness and management training, needs of all personnel involved in the work under the Contract in conjunction with the Project Training Management Plan;
- ensure all persons working on or visiting a work site complete, and display evidence of completing, environmental induction prior to entering the work site (though visitors may enter a work site without completing an induction if accompanied by a person who has attended a site induction) as part of industry and site induction required; and
- maintain records of environmental training and induction.

Incident Management

Before commencing any work on the Site, nominate to the Superintendent the persons who will be responsible for investigating environmental incidents and initiating corrective actions

outside normal working hours. Nominate procedures for contacting them. Notify promptly any changes to such nominations and procedures.

Failure to comply

If at any time the Contractor has not carried out its environmental management obligations under the Contract, then notwithstanding any other provisions of the Contract, no payment is due to the Contractor until the 7th day after the required action has been carried out.

6.2 WASTE MANAGEMENT

Requirement

Implement waste minimisation and management measures, including:

- recycling and diverting from landfill surplus soil, rock, and other excavated or demolition materials, wherever practical;
- separately collecting and streaming quantities of waste concrete, bricks, blocks, timber, metals, plasterboard, paper and packaging, glass and plastics, and offering them for recycling where practical.

Ensure that no waste from the Site is conveyed to or deposited at any place that cannot lawfully be used as a waste facility for that waste.

Monitoring

Monitor and record the volumes of waste and the methods and locations of disposal.

Submit a progress report every two months, and a summary report before Completion, on the implementation of waste management measures, including the total quantity of material purchased, the quantity purchased with recycled content, the total quantity of waste generated, the total quantity recycled, the total quantity disposed of and the method and location of disposal in the form of a *Waste Recycling and Purchasing Report* available on the Internet at:

www.managingprocurement.commerce.nsw.gov.au/contract_management/cm_sf_waste_recycling_and_purchasing_report.doc

With the *Waste Recycling and Purchasing Report*, submit waste disposal certificates and/or company certification confirming appropriate, lawful disposal of waste.

6.3 WORK METHOD

If the Contract prescribes a particular work method or the Principal or Principal's Representative directs that a particular work method must be used to the exclusion of the other work methods, then that work method is part of the Contract.

Otherwise, the work method is not part of the Contract and the Contractor is free to use any work method. This is so even though, before or after acceptance of the tender, the Contractor made known to the Principal the Contractor's proposed work method and the Principal accepted or approved it.

If the work method is not part of the Contract, the fact that the proposed work method is impractical or impossible or the Contractor, with or without the approval of the Principal's Representative, uses another work method will:

- not entitle the Contractor to make a claim on the Principal;
- not be grounds for an extension of time for Practical Completion; and
- not cause the Contract to be frustrated.

7 MATERIALS AND WORKMANSHIP

7.1 STANDARDS

Where the Contract requires compliance with a standard or Code, unless otherwise specified that Standard or Code shall be the one current at the closing date for tenders, except for the Building Code of Australia, which shall be the one current at the Date of Completion.

Where the Contract refers to an Australian Standard it does not preclude the adoption of a relevant international standard.

7.2 CLEANING UP

All visible external and internal surfaces, including fittings, fixtures and equipment, must be free of marks, dirt, dust, vermin and unwanted materials, at Completion.

7.3 SAMPLES

Match any approved samples throughout the Works. Give notice before commencing work affected by samples unless the samples have been approved. Keep approved samples in good condition on the Site until Completion.

7.4 TESTING

Independent Testing Authority

Any testing required to be by an independent authority shall be carried out by an authority registered with the National Association of Testing Authorities Australia (NATA) to perform the specified testing.

7.5 PROPRIETARY ITEMS

Identification by the Principal of a proprietary item does not necessarily imply exclusive preference for that item, but indicates the required properties of the item.

The Contractor may offer an alternative to any proprietary item. Apply in writing for approval to use the alternative. The request must be accompanied by all available technical information and describe how, if at all, the alternative differs from the proprietary item and how it will affect other parts of the Works and performance of the Works.

Except to the extent that the approval, if any, of the Principal includes a contrary provision, the approval is deemed to include the conditions that:

- use of the alternative must not directly or indirectly result in any increase in the cost to the Principal of the Works;
- the Contractor must indemnify the Principal against any increase in costs;
- use of the alternative must not directly or indirectly cause any delay to the Works and if it does, the Contractor will compensate the Principal for any loss which the delay causes.

END OF SECTION – PRELIMINARIES



Specification

Lake Cargelligo Water Supply

**The Design and Construction of
a Dissolved Air Flotation (DAF)
Raw Water Pre-Treatment
System for the Lake Cargelligo
Water Treatment Plant**

Tender No. 0900677

Contract 02/2009

Specification



Funding Partner:

NSW Department of Water and Energy

Document Prepared by:



NSW Water Solutions

APRIL

2009

TECHNICAL

1 GENERAL

1 EXISTING SCHEME

1.1 OVERVIEW

Lake Cargelligo is a township with a population of approximately 1300 located in the western section of Lachlan shire, approximately 550km west of Sydney. In 2003 an ultra filtration membrane water treatment plant with a daily peak production capacity of 4.5ML was commissioned for the supply of potable water to the Lake Cargelligo Township and the villages of Tullibigeal, Murrin Bridge and Kikoira. The primary water source for the treatment plant is the Lake Cargelligo storage which is supplied from the Lachlan River.

Raw water quality has deteriorated greatly since the plant was commissioned, due to unprecedented drought conditions within the Lachlan Valley Catchment to the extent where the treatment process has failed for prolonged periods. The current treatment process has a capacity to treat raw water with turbidity levels below 80 NTU and algal levels not exceeding 250,000 cells per millilitre or a biomass equivalent volume not exceeding 5 mm³ per litre. Raw water extracted from the Lake Cargelligo storage has exhibited turbidities at times as high as 974 NTU and algal counts have been as high as 45,000,000 cells/mL with a biomass equivalent volume of 334 mm³/L.

Lachlan Shire Council has decided to construct a Dissolved Air Flootation (DAF) system to provide a raw water pre-treatment that will allow the ultra filtration membrane water treatment plant to perform within its design parameters under highly deteriorated raw water conditions thus ensuring a secure and safe potable water supply.

1.2 EXISTING WATER SUPPLY SYSTEM

The existing Lake Cargelligo water supply system consists of a water treatment plant (WTP) with a peak production capacity of 4.5ML/d. Water is pumped from Lake Cargelligo storage by submersible pumps, to a feed tank at the WTP. Polyaluminium chloride (PACl) as coagulant and hydrochloric acid for pH correction are dosed into the water before entering the feed tank. From the feed tank water is pumped through Amiad screen filters and then through two skids of pressure membranes filters. From the two skids of pressure membrane filters water then passes through Granulated Activated Carbon (GAC) filters. This water is then chlorinated using sodium hypochlorite and discharged on-site into the 4.0ML town water supply reservoir. The water gravitates to the township from the town water supply reservoir. Backwash water for all membrane backwashing is sourced from the town water supply reservoir.

Backwash water from the Amiad screen filters, membrane filters and GAC filters is collected in a wastewater holding tank and treated in a Dissolved Air Flotation system. The sludge from the DAF system is discharged to the drying beds, while the water recovered is recycled to the raw water feed tank. Chemical cleaning of the membranes is also undertaken periodically. Wastewater from membrane chemical cleaning is discharged to evaporation ponds at site.

Drawing No 0101341-501 shows the Process and Instrumentation Diagram of the existing WTP.

2 NEW SCHEME

An off-take from the current inlet raw water pipeline to the WTP will provide the raw water to the new DAF pre-treatment system. PACl and hydrochloric acid will be dosed into the new raw water pipeline to the DAF plant. An in-line static mixer shall be provided for effective mixing of the chemicals in the water. Pre-treated water from the DAF units will be collected in a tank and discharge

via a pipeline back to the suction side of the existing WTP feed water pumps. Flooded suction conditions shall be maintained at all times with this arrangement.

The float and the settled sludge from the DAF unit will be discharged to the existing sludge lagoons.

3 SCHEME OPERATION AND CONTROL

The operation and control of the proposed scheme shall remain the same except where required in the tender specification. Operation and control changes include, but are not limited to, instead of the raw water being pumped to the existing feed tank it shall be pumped to the proposed DAF raw water pre-treatment system. Treated water from the DAF pre-treatment system shall be connected directly to the suction side of the feed water pumps. Control of the raw water pumps at the Lake raw water pump station shall be by level in the DAF balance tank. The subsequent process shall be the same as the existing system.

The backwash wastewater generated by the existing WTP shall be pumped to the inlet of the DAF pre-treatment system. The wastewater generated from the float and underflow of the DAF system shall be discharged to the existing sludge lagoons. The supernatant from the sludge lagoons shall discharge to the existing drying beds supernatant pump pit from where it shall be pumped to the existing evaporation ponds.

4 EXTENT OF WORKS

This Contract covers all the work, except the civil and structural work, to Design and Construct a Dissolved Air Flotation (DAF) raw water pre-treatment system for the Lake Cargelligo WTP.

The tenderers are encouraged to submit a price to carry out all the work including the civil and structural work as an alternative (optional) tender.

4.1 PRELIMINARY DESIGN

The preliminary design shall include the following works:

- (i) Modifications to site layout plans showing layout of the existing WTP, DAF, lagoons, tanks, and other structures and the equipment loadings (weight).
- (ii) Plan dimensions, elevations and sections through the equipment, tanks and pipework arrangements.
- (iii) Preliminary design of wastewater collection and transfer system with sufficient details, such as hydraulic levels of structures, lagoons, collection tanks, pumps, pipework diameters, location plan, layout.
- (iv) Layout and locations of plinths for all plant and equipment, including their weights.
- (v) Layout and locations of electrical equipment including the Main Switchboard, Motors, Instruments, Emergency Stop, cabling (conduits, ducts, etc.) routes, junction boxes, etc.
- (vi) A pipework arrangement drawing showing interconnections to all the other pipework at the Limits of Contract, in particular:
 - Required diameters of the pipes and types of connection e.g. flanges, sockets or spigots;
 - Required invert levels;

- Exact location of the pipe connections at the Limits of Contract with relation to the WTP.
- (vii) Hydraulic Profile Drawings and Process and Instrumentation Diagrams.
- (viii) Total power requirements (maximum demand) for the operation of the pre-treatment system and all ancillary items. List of all motors and other loads.
- (ix) Identify Hold and Witness Points during the design and construction of the plant to verify that the civil works, foundation plinths, etc. will suit the installation of equipment supplied under this contract, if the Civil work is constructed under a separate Contract.

4.2 DETAILED DESIGN AND CONSTRUCTION

Detailed design, supply, install and construct the following:

- (i) All process, mechanical and electrical equipment instrumentation and control system including the wastewater treatment system required for the DAF system;
- (ii) Mixing arrangement in raw water pipeline downstream of chemical dosing and backwash water return stream injection points;
- (iii) Relocate the existing magflow meter above ground to the raw water line entering the DAF unit and provide signals from the magflow meter to start the chemical dosing pumps and the DAF system;
- (iv) Chemical dosing pipework from dosing pumps to dosing point on inlet raw water line;
- (v) Bypass of existing wastewater DAF thickener;
- (vi) All communications equipment and systems;
- (vii) All interconnecting and associated pipework, fittings and equipment to discharge the waste streams from the DAF system in accordance with the requirements specified;
- (viii) Variable speed drive controllers and the fitting of new cables for the existing raw water pumps at the Lake Cargelligo storage;
- (ix) All equipment, instruments, electrical and control systems associated with the installation of variable speed drive controllers for the raw water pumps;
- (x) Any additional service water pipework and fittings required for the DAF pre-treatment system;
- (xi) Electrical design drawings for the electrical, instrumentation and control systems;
- (xii) All necessary equipment and systems for automatic control and monitoring of the DAF pre-treatment system including PLC, and connection to the existing SCADA system.
- (xiii) Sampling taps at source;
- (xiv) Flow control and measuring equipment;
- (xv) Soundproofing provisions required to meet the equipment noise requirement of 85 dB (A) at one metre from any piece of equipment.
- (xvi) All required modifications to existing WTP PLC, RadTel Telemetry and CITECT SCADA System to allow operation of WTP and pre-treatment DAF.

4.3 MISCELLANEOUS

- (i) Provide Operation and Maintenance Manuals and Work-As-Executed Drawings for the Equipment provided under this Contract,
- (ii) Provide Operator training for all the plant and equipment provided under this Contract.
- (iii) Testing, Demonstration and commissioning of all equipment supplied and installed under the Contract.
- (iv) Compliance tests during the commissioning period.
- (v) Carry out one site inspection and provide inspection report on the equipment conditions during the 11th month from the date of satisfactory completion of commissioning.
- (vi) Rectification of all defects identified by the Contractor or Principal within 12 months from date of satisfactory completion of commissioning.
- (vii) Provide Water Quality Performance guarantees for 12 months from the date of satisfactory completion of Commissioning.

5 WORK BY OTHERS - OPTIONAL TENDER

The following work will be carried out by others. However Tenders are encouraged to submit an optional tender to complete this work:

- (i) Site establishment work;
- (ii) Design and construction of pipeline from the existing raw water rising main to the DAF system;
- (iii) Design and construction of pipeline from the DAF pre-treated water storage tank to the existing raw water line downstream of the existing magflowmeter;
- (iv) Design and Construction of a concrete slab to install the DAF system, pre-treated water tank, recycle pumps, air compressors and other systems;
- (v) Design and construction of an elevated platform to install the DAF system, with appropriate access and hand rails;
- (vi) Design and construction of a roof for the DAF system and necessary sides to act as a wind break. which may affect the DAF process;
- (vii) Reinstate the profiles of the lagoon embankment slopes and the floor;
- (viii) Stabilise lagoon embankments;
- (ix) Design and construction of a backwash pipeline from the membrane/GAC backwash wastewater transfer pumps to the inlet of the DAF system;
- (x) Design and construction of inlet structures at the existing lagoons;
- (xi) Design and construction of a lagoon inlet distribution pit with gate valves;
- (xii) Design and construction of sludge/scum discharge line from the DAF units to the lagoon inlet distribution pit;
- (xiii) Design and construction of outlet structures with stop boards and access platforms at the existing lagoons;
- (xiv) Design and construction of a lagoon outlet collection pit with gate valves;

- (xv) Design and construction of pipeline from the lagoon outlet collection pit to the existing sludge drying bed supernatant pump pit;
- (xvi) Site restoration; and
- (xvii) All other Civil work required for the operation of the DAF unit.

6 LIMITS OF THIS CONTRACT

The Limits of Contract under this Contract shall be as follows:

1. Interconnecting Pipework
 - The raw water feed line to the DAF unit shall be connected to the raw water pipeline supplied by others and terminating approximately 2 m from the DAF unit;
 - The Pre-treated water outlet from the DAF system shall be connected to the pre-treated water feed line to the membrane plant supplied by others and terminating 2m from the edge of the DAF system; and
 - The scum/defloat discharge pipeline shall be connected to the scum/defloat transfer line to the lagoons supplied by others and terminating 2m from the edge of the DAF system.
2. Power Supply
 - The power supply to the DAF unit shall be obtained from the existing main switchboard.
3. Supporting Structure
 - The DAF unit shall be mounted on a concrete slab and provided with a roof, both supplied by others.

If the optional tender as in Clause 5 is offered the Limits of Contract under this Contract shall be as follows:

1. Interconnecting Pipework
 - The DAF raw water feed line shall be connected to the existing raw water feedline upstream of the isolation valve.
 - The Pre-treated outlet from the DAF system shall be connected to the Membrane filtration plant downstream of the above isolation valve.
2. Power Supply
 - The power supply to the DAF unit shall be obtained from the existing main switchboard.

7 CONTRACTOR'S DESIGN AND CONSTRUCTION RESPONSIBILITY

7.1 DESIGN AND LAYOUT OF EQUIPMENT

The Contractor shall be responsible for the design, layout and function of all equipment and control systems specified in this contract and for ensuring that all equipment and control systems are suitable for the purpose stated in the Tender Document.

Verify and incorporate any necessary adjustments to the area allocated for the DAF on the site layout shown on the drawings detailed in the Tender Document, into the designs.

Prepare layouts for the pipework, equipment and electrical work to be designed and provided under this contract.

Verify that the information provided is adequate and accurate for the works to be designed under this contract. Be responsible for modifying the information and dimensions provided to suit equipment tendered.

7.2 ADDITIONAL WORKS

The specification nominates some equipment and designs. If during the course of the Contract, additional features are considered necessary by the Contractor to ensure satisfactory operation of all equipment and compliance with all guarantees, then these additional features shall be included at no extra cost to the Principal. These shall not be considered as Contract Variations.

7.3 CONSTRUCTION

Deliver to site, unload and install all equipment, accessories, etc, required to fulfil the requirements of this Contract.

Be responsible for grouting in of foundation bolts, etc. Make good blockouts, and any and all damages to plinths, foundations, concrete, masonry, building works, etc.

8 WATER QUALITY REQUIREMENTS

The DAF system shall provide a raw water pre-treatment that will allow the existing membrane water treatment plant to perform within its design parameters under highly deteriorated raw water conditions. The DAF raw water pre-treatment system shall be designed to treat raw water with maximum quality listed in Table 1 and produce pre-treated water to meet the water quality requirements set out in Table 3.

Table 1: Design Raw Water Quality

Parameter	Average Maximum	Maximum
Algae (bio volume)	45.0 mm ³ /L	334 mm ³ /L
Apparent Turbidity	209 NTU	975 NTU
pH	8.0 – 9.6	8-10

The predominant species of algae are *Microcystis flosaquae*, *Anabaena* Spp, *Aphanocapsa* sp, *Planktolyngbya* sp, *Spirulina* sp and *Synechococcus* sp.

The average maximum quality shall be used to estimate the normal chemical dosages and in the selection of the dosing pump.

9 NETT TREATED WATER QUANTITY REQUIREMENTS

The operating flowrates of the existing WTP are provided in Table 2.

Table 2: Flowrate of Existing WTP

	Average Flow (L/s)	Maximum Flow (L/s)
Summer	52.2	64.4
Winter	41.7	48.6

The DAF pre-treatment system shall be able to deliver a maximum nett treated water throughput of 64.4L/s and a minimum of 41.7L/s, excluding all wastewater production.

10 PRE-TREATED WATER QUALITY REQUIREMENTS

The DAF pre-treated water shall meet the quality requirements as specified in **Table 3**.

The specified sampling point shall be at the outlet of the DAF pre-treated water storage tank.

Table 3: Treated Water Quality Requirement

Parameter	Requirement	Test Method
True Colour	≤ 10 Hazen Units	AWWA Standard Methods
Turbidity	≤ 5 NTU 95% of the time ≤ 10 NTU 100% of the time	AWWA Standard Methods
pH	7.2 – 8.0	AWWA Standard Methods

11 DESIGN PHILOSOPHY

Required General Philosophy

Treatment Capability

Water Quality Must be able to produce treated water that meets specified quality standards, from the raw water.

By-products Management Waste by-products should be minimised.

Reliability

Robust Performer High operating reliability to consistently achieve quality standards, over a range of conditions:

- Mechanical and/or Electrical failures.
- Variations in raw water quality e.g. range of turbidity & colour.
- Seasonal variations in raw water quality e.g. blue green algae.

Maintainability/Sustainable Flexibility Level of backup support/parts and accessible training.

Automatic Control

Fully automatic Fully automatic for continuous or stop and start operation with alarm functions for any equipment, or control function 24hrs/day.

Safety

Low levels of Occupational Health and Safety risk to staff and visitors.

Environmental Integrity

Regional Minimise consumption of energy, materials, chemicals and resources.

Local Low levels of risk from noise, odour, land pollution, water pollution to local environment.

Augmentation

Ease of future expansion or retrofit.

Space

Footprint Low space requirement.

12 DESIGN PARAMETERS FOR DAF PROCESS

The minimum design parameters shall be as listed in the Sub-Section 2, Process of this Document.

13 CHEMICAL DOSING SYSTEMS

The existing WTP at Lake Cargelligo has a Polyaluminium Chloride (PACl) and hydrochloric acid (HCl) dosing system. The existing system shall continue to be used for dosing into the raw water to the DAF pre-treatment system.

13.1 PRE-DOSING CHEMICALS

The pre-dosing chemicals for the DAF process shall be:

- ☐ Polyaluminium (Hardman Alchlor Premium ACH 23% Al_2O_3) chloride as a coagulant
- ☐ Hydrochloric (Orica HCl Acid 33% solution) acid for pH correction.

The existing WTP at Lake Cargelligo has a Polyaluminium Chloride (PACl) and hydrochloric acid (HCl) dosing system. The existing shall continue to be used for dosing into the raw water to the DAF pre-treatment system.

Currently one metering pump has been provided for each dosing system. The capacity of the existing duty pumps, to meet the required dosage for the DAF system, shall be checked and new pumps shall be provided if required. In addition to the duty pump a standby pump shall also be provided. Auto changeover of duty/standby pump shall be provided i.e. standby pump shall be automatically started if duty pump fails.

13.2 CHEMICAL DOSAGES AND STORAGES

Chemical dosing shall be automatic and proportional to the raw water flow and turbidity. The metering pumps shall be programmed to dose automatically and proportionally to raw water flow.

14 RAW WATER PUMPS AT LAKE

The existing raw water pumps at the Lake are submersible motor type fixed speed pumps located in a wet well. The pumps are capable of delivering a maximum flow of 64.4L/s when pumping to the raw

water feed tank. The Contractor shall determine the maximum flow capability of the pumps when pumping to the DAF pre-treatment system.

Since the WTP operates at different flowrates during summer and winter, the raw water pumps have to be throttled during winter to match the flowrate of the plant. As part of this Contract the Contractor shall install variable speed drives to control the flowrate from the pumps. The speed shall be manually set to deliver the required flowrates as listed in Table 2 to the raw water feed tank when pumping to the DAF pre-treatment system.

If the pumps need to be removed to fit cables that are suitable for operation with the variable speed drives then the Contractor shall liaise with the Client and obtain the Client's approval to ensure that there is no interruption of the raw water supply to the plant when required.

15 PRE-TREATED WATER STORAGE TANK

A storage tank shall be provided to store the DAF pre-treated water. The storage tank shall provide flow balancing when one of the two membrane skids is backwashed and shall provide the recycled water for the DAF system. The tank shall have a minimum useable capacity of 30kL.

From the storage tank the water shall flow by gravity directly to the suction of the feed water pumps, eliminating the existing raw water feed tank from the system. The storage tank shall provide a flooded suction for the feed water pumps with a suction head sufficient to ensure that the WTP feed water pumps can sustain 232m³/hr without the likelihood of cavitation of the pumps. The tank shall also have sufficient capacity above the normal operating level, to provide flow balancing when only one membrane skid is operating and the other is being backwashed.

16 PROVISION FOR FUTURE EXPANSION

The site layout and arrangement of the DAF system shall be designed to make provision for the addition of a third DAF cell in the future.

17 STANDBY EQUIPMENT

Automatic standby equipment only for critical equipment shall be provided.

18 MECHANICAL EQUIPMENT

In addition to the technical requirements specified in Sub-Section 3 – Mechanical, valves with control functions, which are required as part of the operations of DAF system, shall be fitted with travel limit switches. The control program shall generate the valve fault on the basis of limit switch operation and not on the basis of a consequential event caused by the valve failure.

19 WASTEWATER TREATMENT SYSTEM

19.1 EXISTING WASTEWATER TREATMENT SYSTEM

In the current WTP wastewater is generated from backwashing the following:

- The inlet screen filters;
- The membrane filters; and

- The GAC filters

The maximum wastewater is generated when all six GAC filters are backwashed in one hour. The GAC filters are normally backwashed once a week. The maximum wastewater generated in one hour is calculated in **Table 4**.

Table 4: Backwash Water Volume Generated at Existing WTP per hour

Equipment	Backwash Flow (m ³ /hr)	Backwash Time (seconds)	No of Backwashes per hour	Backwash Volume (litres/hour)
Inlet Screens	54	30	4.0	2,000
Membrane Filters	350	30	2.3	7,000
GAC Filters	40	15/pair	3	30,000
Total				39,000

The backwash water generated is collected in a wastewater holding tank and pumped into a DAF system where it is treated. The sludge from the DAF system is discharged by pumping to drying beds, while the water recovered is pumped back to the raw water feed tank. ASM diaphragm pumps transfer the sludge from the DAF sludge collection sump to the sludge drying beds.

Chemical cleaning of the membrane is also performed periodically. The membrane chemical cleaning waste stream is discharged to an evaporation pond.

The sizes of the existing backwash water storage and transport equipment are as follows:

Backwash water holding tank usable storage: 16,500L

Wastewater DAF supernatant recycle pump 8.3L/s

19.2 NEW WASTEWATER TREATMENT PHILOSOPHY

The backwash wastewater generated by the existing WTP shall be pumped to the inlet of the DAF pre-treatment system. The flowrate at which the wastewater is pumped to the DAF shall at no time exceed 10% of the inlet flowrate to the DAF required produce the nett pre-treated water specified in Clause 9 of this Section of the Specification.

The backwash water storage and transport system shall be designed to cater for the maximum backwash water generated in an hour, calculated in **Table 4**. The existing backwash water holding tank, DAF supernatant storage tank and supernatant recycle pumps may be used for the storage and transfer of the backwash water from the WTP to the DAF inlet. If the Contractor uses existing equipment then all modifications or any other work, fittings and equipment required to make the system complete, reliable and suitable for the intended work shall be provided under this contract. Variable Frequency Drive (VFD) controllers may be provided on the supernatant pumps if required.

If the existing equipment is found to be unsuitable then new equipment shall be provided to transfer the backwash wastewater from the WTP to the DAF inlet.

19.3 WASTEWATER GENERATED BY DAF SYSTEM

The wastewater generated from the float and underflow of the DAF system shall be discharged to the existing sludge lagoons. The discharge could be either a hydraulic discharge or by sludge pumps. The supernatant from the sludge lagoons shall gravitate to the existing drying beds supernatant pump pit from where it shall be pumped to the existing evaporation ponds.

The drying beds supernatant pumps currently also pump to the evaporation ponds the water from the chemical membrane backwash, the turbidimeter wastewater and the drain from the existing wastewater holding tank and DAF supernatant return tank. Contractor shall check that the pumps are suitable to pump the combination of the above flows and the supernatant from the sludge lagoons.

20 PLANT OPERATION AND CONTROL

20.1 PLANT FLOW CONTROL

Provide a Mag flow meter at the inlet to the DAF system to measure and record the raw water flow and to provide a signal for the starting and stopping of the chemical dosing pumps.

20.2 NORMAL PLANT START UP AND SHUT DOWN

The DAF system shall start as follows:

- The feed water feed pumps at the WTP shall start when the level in the Town Water Supply Reservoir reaches a pre-set low level;
- The level in the DAF treated water storage tank shall draw down to a pre-set low level;
- The raw water pumps at the Lake shall start when the level in the DAF treated water storage tank draws down to a pre-set low level;
- The 4-20mA signal from the magflow meter in the raw water pipeline prior to the DAF shall detect flow and start the following equipment:
 - The recycle water pump;
 - The chemical dosing pumps; and
 - DAF float roll and bottom scraper.

The DAF system shall stop as follows:

- The feed water feed pumps at the WTP shall stop when the level in the Town Water Supply Reservoir reaches a pre-set high level;
- The level in the DAF treated water storage tank shall rise to a pre-set high level;
- The raw water pumps at the Lake shall stop when the level in the DAF treated water storage tank rises to a pre-set high level;
- The 4-20mA signal from the magflow meter in the raw water pipeline prior to the DAF shall detect no-flow and stop the following equipment:
 - The recycle water pump;
 - The chemical dosing pumps; and
 - DAF float roll and bottom scraper.

20.3 LEVEL OF AUTOMATION

The overall operation of the DAF pre-treatment system shall be controlled by a PLC/HMI on the local switchboard of the DAF system. The plant shall be designed to operate in two modes:

- Automatic operation based on pre-treated water demand; and

- Manual initiation via Local HMI.

In the first mode the plant shall be started and stopped with the starting and stopping of the raw water pumps at the lake. The chemical dosing systems shall start and stop automatically with the flow signal from the new magflow meter.

In the second mode, the design shall also allow operation of the plant equipment via local HMI/PLC. This will only be required under abnormal situations where equipment does not operate automatically.

21 ELECTRICAL SERVICES

Refer to Section-4: Electrical for details.

22 PERFORMANCE GUARANTEES

Conduct tests and measurements during the commissioning period to prove plant performance compliance with the Tender Document and Performance Guarantees. The parameters and frequency of testing is listed in Sub-Section 6 under Clause – Compliance Tests.

23 AUTHORITY CONSULTATION

The Contractor shall ensure that the design of the equipment under this Contract shall conform to the requirements of all applicable Regulatory Authorities.

24 DRAWINGS

24.1 TENDER DOCUMENT DRAWINGS

The Drawings attached to this Document may not fully represent the conditions on site either above ground or below ground.

All references to Drawing Numbers shall refer to the latest issue of that Drawing as included in the Tender Documents.

Typical and Standard Specification drawings indicate the format and quality of drawings which are required.

24.2 CONTRACTOR'S PRELIMINARY AND DETAILED DESIGN DRAWINGS

Submit five (5) paper copies each of the following design drawings and other necessary drawings to cover the scope of works under this Contract:

Also submit the drawings electronically in autocad 'dxf' format on IBM compatible CD. Three copies of the CD shall be provided.

24.2.1 Preliminary Design Drawings

General

- ☐ Drawing list
- ☐ Process and instrumentation diagram
- ☐ Hydraulic Profile

- ❑ Design Criteria Summary
- ❑ A general site layout plan of the WTP
- ❑ A general layout for the WTP building
- ❑ Preliminary design drawing of the wastewater treatment system.

24.2.2 Detailed Design Drawings

General

- ❑ Drawing list
- ❑ Process and instrumentation diagram
- ❑ Hydraulic Profile
- ❑ Schematic Flow Diagram
- ❑ Design Criteria Summary

Process and Chemical Feeding Equipment

- ❑ Process and instrumentation diagram
- ❑ Dissolved air flotation equipment arrangement and details
- ❑ Mechanical Equipment
- ❑ Recycle pumps for DAF Process including saturator details.
- ❑ All major pipework with valves, general arrangement and details.
- ❑ Wastewater pumps and pipework arrangement and details.

Electrical, Control and Instrumentation

Refer Section-4: Electrical for electrical design drawings and documentation requirements.

Miscellaneous

Provide all other drawings considered necessary for this Contract.

General Requirement

All drawings required to be submitted by the Contractor shall be on A3 size sheets printed in black on a white background. All Drawings shall conform to AS 1100 Technical Drawings. Abbreviations and units shall be in accordance with AS 1000; dimensions shall be in metric units. All drawings shall remain perfectly legible when reduced to A3 size.

All Work-As-Executed drawings shall also be provided in electronic files in AutoCAD 2000.

Drawing Titles

All Drawings, including manufacturer's standard drawings, workshop drawings, outline drawings and certified drawings required to be submitted by the Contractor, shall clearly define the name of the Contractor, the name of **Lachlan Shire Council**, the name of the drawing, together with other relevant details in the title block of the Drawing.

Drawing Numbers

The drawing numbering system shall be nominated and finalised by the Superintendent's Representative during the preliminary design stage.

25 STANDARD TECHNICAL SPECIFICATIONS

The following Standard Specifications form part of this Specification:

Water Services Specification (WS-SPEC)

Department of Commerce's Electrical Services Minimum Requirements – MEW E101. The latest version of MEW E101, issued in September 2007, may be downloaded from the following website:

<http://www.dpws.nsw.gov.au/Buildings+and+Infrastructure/Water+Services/mewe+101.htm>

WS-SPEC is also not bound into this document. Contractor shall make own arrangements to purchase a copy of this document from Standards Australia International Ltd, 286 Sussex Street, Sydney, 2000.

Unless otherwise stated in the Specification, all work shall comply with the relevant Sections of the Standard Technical Specifications.

Within the Specification, reference to the Standard Specifications is made by designating the letters and number of applicable Section (e.g. TR13).

26 NOISE CONTROL

Provide all equipment with suitable acoustic design to limit the workplace noise level from the equipment in the plant to 85 dB (A) at one metre from that equipment, without the need for operators to wear Personal Protection Equipment (PPE).

Equipment offered with sound proofing devices shall be designed so that:

- (i) The sound proofing devices form an integral part of equipment.
- (ii) The sound proofing devices are well designed and manufactured using first class materials and workmanship, are neat fitting around the equipment and do not impede the flow of cooling air such that motor temperature will rise to an unsafe level during normal load conditions.
- (iii) Easy access is provided for connection/inspection of the terminal box; maintenance/inspection of bearings, oil filler and dipstick.

27 MATERIALS OF CONSTRUCTION

This section refers to all materials supplied and installed by the Contractor.

27.1 SUBMERGED METALS

All steelwork under water or in contact with water and all pipework, shall be of Type 316 stainless steel (SS), unless specified otherwise.

All fabricated stainless steel shall be passivated after fabrication.

27.2 BOLT MATERIAL

Use Grade 316 SS bolts and anchors with Grade 304 SS nuts and washers in the following locations:

- (i) connections which are continuously or intermittently submerged in water;
- (ii) all fixings into concrete;
- (iii) in below ground connections;

- (iv) bolting of aluminium members;
- (v) all flanged pipework

Any bolts and nuts that are galvanised shall be hot dip galvanised to AS/NZS 4680. Threads of all bolts and nuts shall be smeared with graphite grease before assembly. Any bolts and nuts provided as part of a mechanical device shall be painted as per requirement in Clause 28 – Corrosion Protection.

28 CORROSION PROTECTION

All parts in contact with chemicals, chemical solutions or water shall be resistant or adequately protected against corrosion. Corrosion protection for all equipment or metallic items provided in this Contract shall be as follows:

28.1 METALS (NON STAINLESS STEEL) SUBJECT TO IMMERSION, SPLASH OR SPRAY

Steel, Cast and Ductile Iron

The following paint system shall be used for the protection of steel which are either submerged or in intermittent contact with water.

The coating system shall consist of 2 or 3 coats of a high build epoxy paint applied in accordance with Clause 6.3 in Section TR20 Protective Coatings of WS-Spec.

28.2 METALS (NON STAINLESS STEEL) IN ATMOSPHERIC ENVIRONMENT

Steel

“4 Coat Acrylic” System as specified in Clause 6.2 Section TR20 shall be used.

Cast Iron and Ductile Iron

“4 Coat Acrylic” system as specified in Clause 6.3 Section TR20 shall be used.

Galvanised Steel

“4 Coat Acrylic” System as specified in Clause 6.6 Section TR20 shall be used.

28.3 GALVANIC CORROSION

Where different metals are in contact, insulation shall be provided between the metals.

28.4 BURIED DI (DUCTILE IRON) AND CI (CAST IRON)

DI pipes and DI/CI valves and fittings shall be protected by System Code DI-PT as described in Section TR3.

29 PIPE MATERIALS

Supply suitable pipe materials in accordance with the pipe material schedule as below:

Type of Liquid	Area of Application	Pipe Material
Water	- Above ground (outside building)	DICL
	- Above ground (inside building)	Stainless Steel 316
	- Underground	DICL

	- Through concrete	Stainless steel 316
Chemicals	- Above ground	Corrosion resistant material in accordance with chemical manufacturer's recommendation.
	- Through concrete	Stainless steel, unless metallic pipe is not recommended by manufacturer.

30 IDENTIFICATION OF EQUIPMENT AND PIPEWORK

30.1 EQUIPMENT LABELS

All equipment including chemical tanks and feeders (metering pumps), pumps, valves and instruments shall be identified and tagged:

- For indoor and outdoor – traffolyte labels, white background, black engraved lettering.

Safety, Danger and warning signs shall be installed to comply with the relevant Australian Standards and other statutory requirements.

Labels shall be screwed to equipment or walls with Type 304 stainless steel screws. Minimum size of lettering shall be 10 mm high.

30.2 PIPE MARKERS FOR EXPOSED PIPES

All unburied pipes including those in pipe trays and trenches shall be marked with either vinyl or plastic pipe markers. Markers shall indicate direction of flow and fluid carried. Maximum distance between markers shall be 3m. Self-adhesive pipe markers of vinyl cloth shall be fixed to the pipes.

The size shall be suitable for the pipe diameter and the colour shall be clearly visible against the pipe colour.

30.3 EQUIPMENT AND PIPE COLOURS

Except for SS316 components, all pipework, equipment items, valves and tanks provided under this Contract shall have the final finish colour as shown in the following table. A manufacturer's standard equipment colour is acceptable for proprietary equipment items. Labelling only of SS316 components shall be sufficient.

All uPVC pipes, visible and exposed to sunlight, shall be painted with a suitable PVA or acrylic based paint.

Marker tape shall be provided for buried pipes carrying chemicals or compressed gases, and for buried electrical cables.

All external small diameter water or chemical solution pipework shall be suitably lagged to prevent freezing. Pipework in cable trays outdoors shall be blanketed to prevent freezing.

Overflow and drains external to the buildings shall be grey to match the concrete. If internal, they shall be painted black. Painting is not required where the pipes are covered in trenches.

The colours of those submerged metallic items shall be those commercially available in accordance to Clause 12, Corrosion Protection, however black is not acceptable.

Select only the items as appropriate to this Contract.

Material or Item	Colour to AS2700 (except where indicated otherwise)
PACl dosing pipework	X53 Golden Tan
Filtered Water Sampling Pipework	T15 Turquoise
Pre-Treated Water Pipework	B41 Blue Bell
Backwash Main	G21 Jade
Valve Handles	Y11 Canary
Equipment Guards	Y11 Canary
Electric Motors and Conduits	X15 Orange
Compressed Air Plant	R42 Salmon Pink
Compressed Air Line	B13 Navy Blue
DAF saturated water pipework	B21 Ultramarine
DAF unsaturated water pipework	B41 Blue Bell
DAF saturator vessel	B21 Ultramarine
Hydraulic Actuation Pipework	B53 Dark Grey Blue
Raw Water Sampling Line	G44 Palm Green
Raw Water inlet Line	G44 Palm Green
Switchboards/Central Control Panel	
- exterior	X15 Orange
- interior	Y55 Off White

30.4 LABELLING AND IDENTIFICATION OF ELECTRICAL EQUIPMENT

Labels which identify all electrical equipment in accordance with the equipment identification as detailed on the contractor's drawings shall be supplied and installed. Labels within switchboards and cabinets shall not be obstructed by wiring. Labels shall not be fixed on removable wiring duct covers.

Identify all electrical equipment, such as motors, push-button stations, isolating switches, limit and level switches and the like with labels.

Motor labels shall include "kW" rating and submains or final sub-circuit details e.g. "6.0 mm² 3 core + E".

Fix all labels to permanent structures adjacent to the particular item of equipment they identify with the wording horizontal. Labels shall not be fixed directly on the item of equipment.

All labels shall be fixed with at least two chrome plated screws. Self adhesive labels shall not be acceptable. All indoor labels shall be manufactured from traffolyte or similar material with black lettering engraved on white background.

Labels exposed to the weather shall be engraved brass infilled with black paint.

Each item or sets of machinery shall have a danger sign mounted near and clearly visible:

WARNING - THIS MACHINERY STARTS AUTOMATICALLY.

31 AMBIENT CONDITIONS

Typical climate data at Lake Cargelligo are as follows:

Mean maximum temperature	26.2°C
Highest temperature	47.0°C
Mean minimum temperature	10.2°C
Lowest temperature	-6.1°C
Mean 9 am Relative Humidity	66 %
Mean annual rainfall	740 mm

The above information was obtained from the Australian Bureau of Meteorology monitoring site no 075039 and could be used for consideration in the design of the system.

32 EQUIPMENT CONDITION

All items of equipment shall be designed, manufactured and installed to adequately perform their required functions reliably and efficiently. All equipment shall be installed to manufacturer's specification and all materials and components shall be new and the best of their respective kinds.

32.1 PLINTHS AND GUARDS

Plinths

All machinery, feeders, metering pumps, chemical slurry and solution tanks shall be mounted in elevated positions (at least 300 mm above floor level) to facilitate maintenance.

Guards

All exposed moving parts shall be provided with guards in accordance with the requirements of the WorkCover Authority. Guards shall be designed to be easily and readily removed to permit maintenance of the equipment.

32.2 INSTALLATION REQUIREMENTS

Dynamic Equipment

Design and supply anchor bolts where required. Blockouts shall be provided at locations nominated under this contract. Blockouts shall be grouted by others.

Static Equipment

For all equipment located indoors, chemical anchors may be used and these shall be provided under this contract. For all equipment located outdoors, provide anchor bolts.

33 OH & S REQUIREMENTS

Allow sufficient space around all new equipment and plant installed under this Contract for easy access for operation, painting and maintenance. A clear distance of at least 1000 mm is required for the maintenance access side of the equipment.

34 PROPRIETARY EQUIPMENT

Install all proprietary equipment in accordance to the manufacturer's instructions. Do not modify proprietary equipment without the manufacturer's written authorisation.

END OF SUB-SECTION – GENERAL

2 PROCESS

Not all the process items specified in this Section are expected to apply to this Contract. For those processes applicable to this contract, the equipment used shall be in accordance with this Specification and shall be suitable for the function.

1 FLASH MIXING

Flash Mixing shall be achieved either by hydraulic mixing or by an in-line static mixer.

2 FLOCCULATION

Provide two stage tapered flocculator for each DAF tank. Provide two (2) flocculation chambers for each flocculator. Each chamber volume shall allow for a minimum detention time of 10 minutes at maximum design flow. There shall be provision for desludging and draining.

Flocculation tank shall be provided with baffles to avoid short circuiting. Each chamber shall be mechanically stirred by vertically mounted stirrer.

All support frames shall be hot dipped galvanised in accordance with AS1650 if located above water or SS 316 if located below water.

3 DISSOLVED AIR FLOTATION SYSTEM

3.1 OVERVIEW

The DAF system shall consist of two (2) DAF tanks. The system shall be designed to automatically start and stop in accordance with the starting and stopping of the raw water pumps.

Provide a complete, fully automatic, DAF plant, which includes all chemical dosing, process control system with monitoring and control requirements. Provide DAF tank constructed of pre-fabricated 316 stainless steel. The plant shall be suitable for unattended operation, designed for a fail safe condition on power failure (i.e. the control system shall be able to stop the raw water pumps), and restart automatically on restoration of power. The system shall operate economically and efficiently.

3.2 SATURATED WATER SYSTEM

The pressurised saturated water shall be produced by pressurising pre-treated water from the DAF in a vessel with compressed air at 550 to 600kPa.

The water for the saturation system, float cutting, and dilution sprays shall be provided by a pressure system which delivers water from the DAF pre-treated water storage tank. This pressure system shall deliver over a range of flows from 5% of the minimum throughput to 15% of the maximum throughput of the DAF system, plus the cutting and dilution sprays, at a pressure to maintain 550 to 600 kPa pressure in the saturation vessel, taking into account the headloss in the pipework, and the operating pressures required by the control system. If necessary, a pressure reducing valve shall be provided to reduce the pressure to the float cutting and float dilution water sprays.

3.3 SATURATION VESSEL/S

The saturation vessel/s shall be manufactured in accordance with AS 1210. The material shall be 316 stainless steel.

All vessel connections shall be flanged. The connections to auxiliary items such as level transducers and indicators, pressure gauges and switches, and air induction connections shall be fitted with an isolating valve. There shall not be an isolating valve for the pressure relief valves.

Each saturation vessel shall also have a drain at the bottom complete with an isolating valve.

In addition to the various connections for monitoring and control devices, there shall also be a bypass around the water inlet control valve to allow the vessels to be manually filled to the desired level or topped up during the setting up process.

An inspection opening of at least 450mm shall be provided in the vessel. This shall be at a level which provides for inspection of internal surfaces when standing at the level on which the vessel is supported.

3.4 SATURATION SYSTEM CONTROL

Each saturation vessel shall be complete with a level control device to control the inflow control valve and provide high and low level alarms that will stop the individual system or prevent it from starting in the event that high or low levels occurs in the saturation vessel.

In addition to the level control device there shall be a level indicator. This indicator shall cover a range in excess of high and low alarm levels. The external device shall be a colour change magnetic flap type.

A pressure gauge shall be installed on each saturation vessel to provide visual indication of the operating pressure together with a pressure transducer to provide remote pressure monitoring and pressure alarms.

There shall be a local flow indicator installed in the recycle water pipeline from the saturation vessel to assist in the adjustment of the nozzles in each cell to provide for even distribution between saturators. There shall also be a flow indicator on the common recycle water delivery pipeline to the saturators to measure the flow rate to the saturation systems.

The inlet recycle water flow control valve to saturators shall be a pneumatically operated control valve complete with positioner and detachable manual override. This valve shall control the flow into the saturation vessel with the control function from the level controller.

A manually operated butterfly valve shall be installed in the delivery pipework upstream of the level control valve. This valve shall be fitted with a worm and segment actuator, with an extension spindle if necessary, to allow operation from the platform on which the saturation vessel is mounted.

3.5 DEFLOATING

The float shall be removed (defloating) periodically by a rotating skimmer installed at the end of the DAF unit. The float shall be discharged to the sludge lagoons directly. During defloating process a water spray directed towards the wall at the surface shall assist to cut the float at the wall. Additional dilution water shall also be sprayed into the sludge (float) discharge launder via a header installed along the channel to avoid any build up of sludge in the channel.

3.6 BOTTOM SCRAPER

Provide a suitable scraper to collect the solids that settle at the bottom of the tank, to the discharge point. The scraper shall be provided in stainless steel grade 316 with rubber squeegee. The movement of the scraper shall be timer based and the time shall be adjustable.

3.7 DAF SYSTEM CONTROL

The DAF system shall be designed to automatically start/stop with the flow signal from the magflow meter in the raw water rising main.

The defloating function shall be automatic on a timer pre-set by the Operator via the HMI. Manual initiation of the defloating function shall also be provided.

The system components pumps, saturators etc. shall be located for ease operation, maintenance, repair and calibration. Equipment requiring adjustments shall be readily accessible for adjustment in the field by the operator.

3.8 PREFERRED ARRANGEMENT

The general arrangement of the systems shall allow for easy access to the individual components which require manual adjustment and calibration to set up and/or modify the operation of the systems.

3.9 DESIGN PARAMETERS FOR THE DISSOLVED AIR FLOTATION (DAF) SYSTEM

The design parameters of the DAF and other process equipment shall be as given in the Table below:

Table 3.2 – DAF Water Treatment Process Design Parameters

Design Parameters	Requirements
Number of DAF tanks	2
Rise Rate (max)	10 m/hr (including saturated water)
Net output from DAF tanks	As per Clause 9 of Sub-Section 1 General
Number of saturator vessels	1 or 2 (Contractor to decide)
Number of recycle pumps	Contractor to decide
Variable speed control for recycle pumps	Required
Flowmeter on recycle line	One magflow meter
Flow indicator on saturated water lines	One for each DAF unit – paddle or helical type
Air saturator tank operating pressure	550 – 600 kPa
Number of compressors	2 (duty and standby)
Capacity of each compressor	Sized to operate for 50% of duty cycle
Pre-treated water (DAF outlet) turbidity	≤ 5 NTU for 95% of the time ≤ 10 NTU for 100% of the time
Pre-treated water (DAF outlet) true colour	≤ 10 HU
% of DAF water recirculation (min/max)	Variable between 5% and 15% of plant operating range
De-float mechanism	Rotating skimmer at end
DAF treated water storage (minimum)	30kL useable volume

The compressed air unit shall provide sufficient air for the maximum saturation at the 15% recycle rate. The DAF treated water storage tank shall have a useable volume of 30kL between the high and low level set points of the tank.

3.10 RECYCLE PUMPS, COMPRESSORS AND PIPEWORK

See Section 3 Mechanical.

4 POLYALUMINIUM CHLORIDE AND HYDROCHLORIC ACID DOSING SYSTEM

Use existing equipment wherever possible, i.e. the existing calibration tubes, pulse dampeners, back pressure valves, strainers, etc. New equipment shall be provided only where the existing equipment is not capable of supplying the required level of service.

4.1 GENERAL

Determine if the existing dosing pump is suitable for the DAF system. If the existing pump is suitable provide an additional pump in a duty standby pumping arrangement. If the existing pump is not suitable provide two (2) new pumps in a duty standby pumping arrangement. Both pumps shall be capable of running in parallel, if necessary.

4.2 METERING PUMPS

Provide and install positive displacement variable stroke metering pumps, in duty standby arrangement. The metering pump shall be designed to dose into the maximum raw water flowrate into the DAF system.

The dosage shall be manually adjusted based on raw water quality while the pump flow shall be automatic and paced proportional to the raw water flow within the operating range with a repeatable accuracy of ± 2.5 per cent of the set rate. The stroke adjustment shall incorporate a calibrated dial (0-1 or 0-100%) to facilitate pre-setting and shall be capable of adjustment while the pump is either running or stationary.

Connect a pulsation dampener to the delivery line.

Pump operation shall be automatically controlled by “flow” and “no flow” signals from the raw water magnetic flow meter.

Pumps shall have indication of set rate in L/hr. A polycarbonate calibration tube shall be included adjacent to the metering pumps.

The calibration tube shall have a diameter of 50 mm and shall be graduated in one (1) litre and decilitre marks. The top of the calibration tube shall extend at least 500 mm above the overflow pipe of the alum storage tank.

Pumps shall be provided with suction strainers of 316 stainless steel with a maximum opening of 1 mm. Fit each pump with a pressure relief valve with a return line to the suction side. Include appropriate isolation valves. Whenever the pressure relief valve operates, there shall be obvious visual indication.

Install a back pressure valve on the discharge line from the metering pumps to maintain dosing accuracy at various depths in the storage tank. The back pressure setting shall be set externally without dismantling the valve.

5 WATER QUALITY MONITORING

Provide sampling taps in the raw water line prior to the chemical injection points and in the DAF pre-treated water line from each DAF tank, to allow collection of grab samples for bench and jar testing.

END OF SUB-SECTION – PROCESS

3 MECHANICAL

1 EXTENT OF WORK

The work covered in this section includes the design manufacture, supply, delivery to site and installation of all mechanical equipment associated with the flocculation and DAF system and associated equipment together with the waste water supernatant return, flow meters, all valves and valve actuators (excepting specific process valves), compressed air system.

All of the mechanical items specified in the following may not apply to this Contract but all the equipment used shall be in accordance with this Specification and shall be suitable for the function.

2 PUMPING MACHINERY

Pumping machinery to the DAF recycle water shall be supplied and installed under this contract. The backwash return pump shall be examined to determine if the existing pump will perform the duty now required when returning the backwash water to the DAF system feed line at a maximum of 10% of the nominal inlet flow rate. If the existing pump is not capable of performing the new duty this pump shall be replaced with a new pump which is capable of returning the backwash water at the rate required

2.1 IDENTIFICATION

Each pump shall be fitted with a stamped or embossed stainless steel identification plate. The identification plate shall be attached using stainless steel screws and the information thereon shall be given in the English Language. Identification plate details shall include manufacturers name and address, pump type, pump size, pump serial number, motor serial number, motor kW, DPWS contract number, speed of rotation, year of manufacture and pump duty.

2.1.1 DAF Recycle Pumps

The pumping machinery for the DAF shall be either multiple vertical multistage centrifugal pumps or a pressure booster system.

The pumps or pressure booster system shall be capable of delivering a flow range from 2 to 9 L/s to the saturation vessel at a pressure which will maintain an operating pressure in the saturation vessel of 550-600 kPa. The operating head of the pumps or pressure booster system shall take into account the head loss in the delivery systems and head loss required for the valves and control system.

2.1.2 Pump Arrangement

If a multiple pump installation is used, the pumps shall be controlled by VSDs and a cascade control of the pumps for optimal efficiency.

There shall be a standby pump which shall automatically start if any of the duty pumps fail.

The pumps shall be installed with isolating valves on the suction and discharge of each pump and a non-return valve for each pump. The discharge isolation valve shall be downstream of the non-return valve.

2.1.3 Materials

The materials of construction are as follows;

Pump Head	Cast Iron ASTM 25B
All other wetted components except shaft	Stainless SteelASTM276 316
Shaft	Stainless SteelASTM276 431
Non wetted casing bolts	Stainless SteelASTM276 304
Protective Coatings	In accordance with WS- SPEC SP30*

Pressure gauges shall be installed on the suction and discharge of each pump and single gauge on the common delivery pipe downstream of the connection from the pumps.

The installation shall be arranged so that a pump can be removed for maintenance or repair whilst the others are still in operation.

3 PRESSURE BOOSTER SYSTEMS

3.1 GENERAL

The recycle (saturation) water for the DAF process can be supplied by a pressure system, capable of delivering the nominated flow range and constant pressure for the system, taking into account the head losses in the delivery system and control system.

The system shall be made up of a number of pumps required to meet the duty with an installed standby which shall automatically start as required and perform the duty of a failed pump.

The pressure system shall operate in conjunction with a diaphragm pressure tank on the discharge, if required, to maintain the constant pressures.

The operation shall be controlled by a multiple pump control system, to control the number of pumps in operation and the speed of the individual pumps in order to adjust the performance of the systems to meet the variations in demands. The control unit shall have the following functions and features:

- Constant pressure control through continuously variable adjustments of the speed of individual pumps;
- Constant pressure at a set point , independent of the inlet pressure;
- Automatic cascade control of the pumps for optimal efficiency;
- A backup sensor on the discharge side of the system;
- Pump and system control and monitoring functions, both locally and remotely to the PLC/SCADA;
- Display and indicator functions locally.

3.1.1 General Arrangement

The pressure system shall be made up of the following:

- Flanged suction manifold;

- Flanged Discharge manifold;
- Flanged suction isolating valve for each pump;
- Flanged discharge isolating valve for each pump;
- Non-return valve for each pump;
- Pressure gauge and isolating valve (suction and discharge).

The arrangement shall also allow for the removal or replacement of a failed non return valve whilst the remainder of the pumps continue to operate.

The layout and arrangement shall also allow for a failed pump to be removed without stopping the other pumps. Isolating the pump from the operating system and unbolting, complete separation and removal shall be possible.

3.1.2 Materials of Construction

The materials of construction are as follows:

Manifold	
Pipework	Stainless Steel ASTM276 316
Pumps	
Pump Head	Cast Iron ASTM 25B
All other wetted components except shaft	Stainless Steel ASTM276 316
Shaft	Stainless Steel ASTM276 431
Non wetted casing bolts	Stainless Steel ASTM276 304
Base Frame	Stainless Steel ASTM276 304
Isolating Valves	Contractor to nominate
Non Return Valves	Contractor to nominate
Protective Coatings	In accordance with WS- SPEC SP30*

4 VALVES

4.1 GENERAL

All valves tendered shall be suitable for the function intended and shall be in accordance with the following requirements except the valves used for chemical dosing pipework where they shall be selected for the particular duty.

All valves throughout the plant shall be supplied in accordance with the appropriate Australian Standard and the specific requirements of this specification.

4.2 ISOLATING VALVES

- | | |
|----------------------|---|
| Buried Water Service | - Gate Valve to AS 2638, Part 1 and Part 2 with resilient seats and nylon coated up to 300mm and metal seated above 300mm. |
| Not Buried Service | - Butterfly Valves to AS 4795 or as specified for a particular location or duty, Butterfly valves shall have worm and segment manual operation. |

4.3 CONTROL VALVES

- | | |
|------------------------|---|
| On-Off Duty | - Butterfly valve with pneumatic actuators, travel limit switches and declutchable manual override. |
| Flow and Level Control | - Butterfly valve - pneumatic actuator with positioner and declutchable manual override. |

4.4 MANUAL VALVES AND MANUAL OVERRIDES

- | | |
|----------------------|-------------|
| Direction of Closing | - clockwise |
|----------------------|-------------|

4.5 MODULATING CONTROL VALVES

The contractor shall check the size of the butterfly valves which are to be used for flow and level control to ensure that their size is suitable for the duty required.

4.6 ON-OFF CONTROL

The contractor shall check the valve sizing for on-off control valves with respect to the headloss and flow requirements.

4.7 FAIL-SAFE OPERATION

In the event of the power failure or emergency shut down for whatever cause, all valves shall be required to move to fail-safe position in order to prevent flooding or drain down, or a suitable restart position.

4.8 INSTALLATION

All valves with associated actuators and ancillary equipment shall be installed in strict accordance with the manufacturer's recommendations and requirements.

The orientation for installation shall be such that all items required for maintenance, manual operation and checking of operation shall be easily and safely accessible.

Where possible, butterfly valves shall be installed with the spindle in the horizontal position and the disc opening in the direction of flow from the bottom. For butterfly valves in raw water pipelines this is a mandatory requirement. Inlet valves to the flocculation chamber can be mounted with valve spindle in the vertical position.

4.9 BUTTERFLY VALVES

Butterfly valves shall be of the wafer or flange type, depending on the duty. All pumping machinery isolation valves shall be flanged valves suitable for end of line service, that is with the pipework removed from one side of the valve the valve is capable of sealing with the full pressure on the other side.

The valves shall be suitable for installation between pipework flanges in accordance with AS 4087.

Regardless of the actual operating pressure the valves supplied and installed shall have the minimum pressure rating of PN 10 as nominated in AS 4795. For valves which are installed in a location where PN 10 is lower than the operating pressure that can occur, under any circumstances, the valves shall have a pressure rating which is in excess of the maximum operating pressure.

4.10 VALVE ACTUATION

Generally all automatically operated valves throughout the plant shall be pneumatically actuated, unless these are specifically nominated as having another form of actuation.

4.10.1 Solenoid Valves

All solenoid valves, for the control of the pneumatic actuators shall be sized to provide the speed of operation required. A manual override shall be incorporated in the solenoid valves to allow local operation.

For valves which require speed control, to produce the operation required, the solenoid valves shall have adjustable speed controlling devices, for both the opening and or closing functions. The adjustment shall provide for a movement from fully closed to fully open or from fully open to fully closed to be up to 120 seconds.

Solenoids shall have silencers on the exhaust ports.

The solenoids shall be selected and installed to provide for, fail safe function in the event of a power failure, to prevent overflow or draindown within the plant, and/or a position for specific valves to provide for a safe automatic start of equipment when the plant is restarted.

4.10.2 Pneumatic Actuators

Actuators shall be the double acting cylinder type suitable for smooth operation with supply air pressure of 500 kPa and shall be capable of operating satisfactorily at pressure of 900 kPa. They shall require no lubrication for normal operation. The torque output from the actuator shall be 1.5 times the torque required of the valve with a supply air pressure of 500 KPa.

The cylinder shall be of a size that shall ensure smooth opening and closing of the valve under all operating conditions.

Positive end of travel stops shall be incorporated in the actuator mechanism to prevent over travel and damage to any valve components.

4.10.3 Pneumatic Valve Positioners

The positioners required for valves shall be suitable for control by a standard 4 - 20 mA signal. Positioners shall be direct proportional and arranged for air-to-open relative to control signal.

Positioner performance shall be to within $\pm 1\%$ of span. Detailed performance specifications for all positioners shall be supplied with the tender.

The positioners shall be mounted directly to the actuator. The mechanism housing shall be weatherproof and constructed of a corrosion resistant alloy. There must be easy access for adjustment of the mechanism.

4.10.4 Limit Switches

Pneumatic valves shall be provided with end of travel indication. They shall be fitted with limit switches adjustable to suit the movement.

The limit switches shall be firmly secured. The over travel of valves shall be incapable of causing damage to the limit switches.

The enclosure housing the limit switch shall:

- i) have a degree of protection equal to IP 66, AS 1939.
- ii) have a conduit entry suitable for 20 mm screwed conduit fittings and facilities to terminate 2.5 mm² conductors.

The limit switches shall:

- i) have two (2) pole double throw (2PDT) electrical contacts.
- ii) have electrical contacts which have a minimum operational current (Ie) of 5 A 240V AC complying with AC11, AS 1431

4.10.5 Manual Overrides

All pneumatic valves are to be installed complete with a declutchable manual override. These overrides shall be complete with an automatic port equalising function and pipework of a size that will allow the valve to be manually operated with a force of no more than 135 Newtons at the rim of the handwheel. The size of the handwheel shall be between 200 mm and 400 mm diameter.

4.11 NON- RETURN VALVES

The non-return valves for the multi pump DAF recycle system shall be full bodied swing check valves.

In all the design and construction details, the valves would comply with AS 4794.

The valves shall be supplied complete with a lever arm positively fixed to the valve spindle with an adjustable counter weight to assist the closing function together with limit switches to provide a low flow signal which is to be used to stop the individual pump in the event of a low flow.

5 COMPRESSED AIR SYSTEM

A compressed air system shall be required to primarily provide compressed air for the DAF saturation system. All alarms and critical parameters shall be taken to the SCADA. Instrument quality air shall be used for the saturation system control valves. Instrument quality air available from the existing Water Treatment Plant shall be used for this control valve.

The compressed air system shall meet the following requirements. The after cooler and dryer may be deleted from the system if instrument quality air is supplied from the existing plant and the low pressure alarm would be generated from the delivery line to the saturators

5.1 GENERAL REQUIRMENTS

The compressed air system shall be constructed in accordance with the following:

Two (2) Air Compressors and Motors

One (1) Air Receiver

Two (2) Air Filters Main Line

One (1) System Pressure Regulator

One (1) Main Isolation Valve

and associated valves (manually and solenoid controlled), fittings, pipework, draining system, air delivery lines and ring-main specified herein.

The compressed air system shall be installed in accordance with unfired pressure vessel code AS1210.

The Tenderer shall be required to submit a schematic diagram of the proposed layout showing all items to be supplied.

All bolts to be embedded in concrete or shall be 316 stainless steel.

Bolts and nuts other than stainless steel shall be galvanised. Threads are to be coated with graphite grease prior to assembly.

Where there is contact between dissimilar metals protective gaskets and/or inserts shall be used.

Electrical installation is covered under the Electrical Instrumentation Section of this specification.

5.2 SYSTEM DESCRIPTION

The compressed air system shall comprise of two compressors (duty and stand-by), complete with combined oil/condensate separator and after cooler for rotary screw compressors, or aftercooler and auto drain for reciprocating components, delivering air to the receiver.

Air shall be delivered from the receiver through an air filtering system and refrigerated air drier. The dried air passes through a system pressure regulator which maintains a constant nominal 550 kPa for operation of the plant. Finally, it passes through the system main isolating valve, which isolates the equipment and service air line from the delivery air line and distribution system.

Air for saturators shall be delivered from an offtake located after the filters but before the dryers.

5.3 SYSTEM OPERATIONS

One air compressor will be selected for DUTY and the other for automatic standby. On demand, (i.e. at 700 kPa) the duty compressor shall start or load and the receiver pressure raised to 900 kPa, upon which the compressor is stopped or unloaded. The pressures nominated are examples only. The final operating pressure is to be nominated by the Contractor.

Air shall be drawn from the receiver through the air filtering system consisting of two filters in series for the removal of oil and dirt particles and condensation.

From the main isolation valve the air is delivered to the operational control valves by either delivery air mains or a ring-main.

If the duty compressor cannot maintain air pressure in the receiver above 675 kPa an alarm is to be annunciated and the standby compressor started automatically, the duty compressor then being closed down. If the standby compressor cannot maintain 640 kPa a second alarm is to be annunciated and the water treatment plant shuts down automatically, including compressors. Once again the pressures given are for example of the system operation only. Actual pressures shall depend on system requirements but the shut down pressure must be above the minimum working pressure required the operation of the plant.

5.4 AIR COMPRESSOR REQUIREMENTS

The compressors, when operating in conjunction with the receiver, shall be sized so that each compressor shall be capable of delivering the air required by the plant with a 50% duty cycle measured in accordance with BS1571 (Part 1).

The compressors shall be either air cooled, reciprocating, oil lubricated type or screw type.

The compressors and motors shall be either direct-coupled or belt driven and mounted on a common baseplate.

The compressors shall be fitted with an air cleaner/silencer on the air intake.

The air compressor sets shall be mounted on designed vibration isolators so that the force transmitted to the foundations is not greater than one tenth (1/10) the maximum out-of-balance force in the compressor set.

5.4.1 Controls

For reciprocating compressors, each compressor shall be fitted with an unloader valve which shall give delayed compressor loading when the motor is energised. The rotary screw compressors shall operate continuously and load and unload as required.

Each compressor shall have a pressure safety valve and isolation valve on the delivery line. The compressors shall be isolated from each other by non-return valves. In addition each compressor shall be complete with a flexible connection to the air pipework.

The compressor starters, automatic control system, alarms and cabling between the starters and the stop/start control at each compressor are covered in Sub-section 4 of this Specification.

5.5 AIR RECEIVER - DESIGN AND CONSTRUCTION

The air receiver shall be a free standing vertical steel tank constructed in accordance with AS1210 Unfired Pressure Vessel Code with a design pressure rating of 1050 kPa.

It shall have a capacity which, when combined with the compressor output at 50% duty cycle, which provides for no more than 6 starts/hour for reciprocating compressors.

It shall be fitted with the following items:

- (a) Pressure gauge, 100 mm face and isolation cock and vibration mount pipe;
- (b) Pressure-relief-safety valves, set at 1050 kPa;
- (c) Automatic condensate drain with isolation valve and drain line;
- (d) A separate drain valve for draining the receiver;
- (e) Provision for 12 mm - ½ outlets with isolation valves for pressure switches. The pressure outlets shall be mounted on a manifold positioned approximately 1.5 metres from the floor. The manifold shall be suitable retained to prevent vibration oscillation.

The low low pressure switch to cut out the water treatment plant is to be installed in the pipework downstream of the dryers and the system pressure regulator, or in the delivery line to the saturator.

Ample height provision shall be made between the floor and the bottom of the receiver for the automatic and manual drainage system specified herein.

5.6 AIR FILTER SYSTEM

The air filtering system shall comprise inline filters. The filter shall contain a mist separator comprised with a replaceable cartridge type coalescent system for the removal of oil and particles larger than 0.5 microns in size. This filter shall be provided with colour-change type indicator and shall have a design pressure rating of 1050 kPa.

The filtering system shall be fitted with a differential pressure gauge to indicate pressure drop across the filters.

The filter body shall be manufactured from material compatible with the air line material with regards to corrosion or painted internally with a corrosion resistant-epoxy coating to the manufacturers specification.

Inlet and outlet connections shall be sized to match the flow required and the pipe size.

5.7 SYSTEM PRESSURE REGULATOR

5.7.1 Performance

The pressure regulator shall be capable of maintaining a regulator pressure between 500 kPa and 550 kPa at not less than air requirements at the plant.

The pressure regulator shall “default open” if the input air pressure falls to or below the nominated regulated output pressure.

5.7.2 Design and Construction

The pressure regulator shall be manufactured from material corrosion-compatible with that of the system air line.

The regulator shall have a maximum working pressure of 1050 kPa.

5.8 SYSTEM MAIN ISOLATION VALVE

The Contractor shall supply and install a system main isolation valve.

It shall have a maximum working pressure of 1050 kPa.

The valve body shall not be less than 1 ½ (inch) B.S.P.T.

5.9 PIPEWORK AND ASSOCIATED ITEMS

An air distribution network shall be supplied and installed at follows:

All pipework shall be copper tube, to AS1432 suitable for a working pressure of 1,050 kPa.

All copper pipe joints shall be silver soldered, (the Silver Content shall not be less than 15% by weight) except for connections to equipment where union type couplings shall be used in order to facilitate removal for maintenance and/or repair.

The size of system air line between the compressor and the receiver shall not be less than the compressor air outlet and the size of the air line between the receiver and the ring-main isolation valve shall not be less than 38 mm outside diameter.

Equipment connected to the air line producing vibration (compressor and air dryers) shall be adequately isolated from the air line by flexible metal connectors.

All pipework shall be adequately bracketed and firmly retained commensurate with that of general engineering pipework practice.

Isolating valves throughout the system shall be air-tight when closed. Isolating valves are to be arranged so that each item can be isolated from the system and removed for replacement or repair without depleting the whole system.

5.10 MAIN DISTRIBUTION PIPE

The distribution pipe shall be constructed from the receiver to the equipment location.

The main distribution pipe shall be sized for the delivery of air required but not less than 20 mm.

The main distribution pipe shall be installed with, where practicable, a continuous downward slope of not less than 1:100 in the direction of the air flow. A condensate trap and auto drain shall be installed at each low point in the distribution pipe.

Drop-line take off's shall be taken from the top of the pipe directly above a valve grouping and shall not be less than 13 mm OD tube, terminating with a (needle type) valve.

The instrument take-offs shall be sized to meet the requirements, supplied with isolation (needle type) valve.

5.11 DELIVERY AIR LINES - REMOTE LOCATIONS

Delivery air lines shall be taken from the top of the service air main at a point downstream from the system isolation valve.

The air lines shall be 13 mm OD copper tube.

Isolation valves shall be provided at the ends of these lines.

5.12 DRAIN LINES

All drain points, auto or manual, shall be piped to floor wastes and connected to the building drainage system.

6 FLOWMETERS

6.1 ELECTROMAGNETIC FLOW METER

An electromagnetic meter system shall comprise a flow tube together with a converter. The flow tube body shall be flanged and the liner shall be suitable for raw and potable water and be designed to resist wear and corrosion. The flow tube body shall be provided with flanges sized in accordance with AS4087.

The converter shall be the variable range type suitable for connection to a 240 AC +/- 10% volts and 50 Hz power supply. It shall provide a pulse rate output for totalised flow and a 4 - 20 mA current output proportional to flow rate. Integration shall cease at less than 2% of flow rate. The converter shall also have a display showing flowrate and totalised flow.

Accuracy shall be $\pm 1\%$ of flow from 10% to 100%.

Flow tube enclosure rating: IP 68D

Converter enclosure rating: IP 65

Where the converter is mounted in a location where IP65 is not sufficient an IP68 enclosure/cabinet shall be installed to contain the converter. If mechanical damage is a possibility the converter shall be housed in a lockable stainless steel enclosure.

7 PRESSURE GAUGES

Pressure gauges installed throughout the plant shall be 100 mm in diameter and in accordance with AS 1349. All water pressure gauges shall be calibrated in metres head.

All gauges shall be installed complete with isolating needle valves.

Gauges installed with pumping installations shall have a range capable of covering the minimum suction conditions and shut off head of the pumps whilst still able to produce accurate and usable readings under normal operating conditions.

END OF SUB-SECTION – MECHANICAL

4 ELECTRICAL

1 PROJECT SPECIFIC REQUIREMENTS

1.1 GENERAL REQUIREMENTS

Carry out the design, supply, installation, testing, demonstration and commissioning of all the electrical, instrumentation, control and automation works required for the DAF Pre-Treatment System. Provide all electrical, instrumentation, automation and control components.

All works including design and construction shall meet the requirements of: -

This specification.

Department of Commerce's Electrical Services Minimum Requirements – MEW E101. The latest version of MEW E101, issued in September 2007, may be downloaded from the following website:

<http://www.dpws.nsw.gov.au/Buildings+and+Infrastructure/Water+Services/mewe+101.htm>

Relevant Australian Standards, such as: -

- AS/NZS 3000 – SAA Wiring Rules
- AS/NZS 3008 – Electrical Installation and Selection of Cables
- AS/NZS 3439 – Low Voltage Switchgear and Control Assemblies
- AS 1930 – Circuit Breakers for Distribution Circuits.
- AS 2184 – Low Voltage Switchgear and Controlgear MCCBs.
- AS 1939 – Degree of Protection provided by Enclosures for Electrical Equipment.
- AS/NZS 1768 – Lightning Protection
- AS/NZS 1158 – Public Lighting Code
- AS/NZS 4168 – Programmable Controllers
- AS 3011.2 – Electrical Installations – Secondary Batteries Installed in Buildings
- AS/NZS 2053 – Conduits and fittings for electrical installations
- AS/NZS 2648 – Underground marking tapes

Other statutory requirements, such as:-

- Supply Authority Regulations
- NSW Workcover Authority
- Occupation Health and Safety Act

1.2 DESIGN DRAWINGS AND DOCUMENTATION REQUIREMENTS

1.2.1 General

Submit all electrical design drawings and documentation for review by the Principal prior to manufacturing and/or construction. All comments made by the Principal shall be addressed and incorporated into design drawings and documentation, as applicable, prior to manufacturing and/or construction. If requested by the Principal, the Contractor shall re-submit part or all design drawings and documentation for further review by the Principal prior to manufacturing and/or construction.

1.2.2 Design Drawings

Submit, as appropriate the following electrical design drawings: -

- 1) Legend of symbols.
- 2) Single line diagram for the Local Switchboard.
- 3) UPS 240V power reticulation – circuit diagrams if applicable.
- 4) Separate power monitoring and phase failure alarm circuit diagram.
- 5) Separate Circuit Diagram for each motor starter.
- 6) Separate Instrumentation Loop Diagram for each instrument.
- 7) PLC control circuit diagrams.
- 8) ELV power distribution circuit diagrams.
- 9) Outdoor Lighting Circuit Diagrams and Layout
- 10) Outdoor Socket Outlets (GPO) Circuit Diagrams and Layout.
- 11) Switchboard general arrangement, sections and internal equipment layout drawings.
- 12) Switchboard equipment schedules detailing make and models, ratings, Cat. Nos. etc. drawings.
- 13) Cabling block diagram (giving an overview of cable interconnections between switchboards, control panels and major drives – with cable label markings).
- 14) Cable termination / connection diagrams.
- 15) Interconnection diagram showing connection of field items.
- 16) Site layouts showing location of switchboards, street lighting, pits, trenches, cable routes, etc.
- 17) Field equipment installation details.
- 18) Installation diagrams and details.
- 19) Any other engineering drawings required to fully describe the works.

All electrical drawings shall be printed in black on a white background on A3 size sheets. All Drawings shall conform to AS1100 Technical Drawings. Abbreviations and units shall be in accordance with AS 1000; dimensions shall be in metric units.

Each drawing shall contain Department of Commerce Logo, and Logo of the end customer – **Lachlan Shire Council**.

Note that the Department of Commerce's standard drawings (E314, E316, E317, E510, E531, E600, E601, and E604), provided in the specification, indicate the format and quality of drawings required for drawing submissions, and where appropriate, the nature of design and installation provisions.

1.2.3 Documentation

Submit, as a minimum, the following electrical design documentation: -

- 1) Within 4 weeks of issue of Letter of Acceptance provide the following to the Principal:-
 - List of all loads together with (nameplate) kW ratings, expected operating load, and proposed method of starting;
 - Maximum Demand for the DAF pre-treatment system site.

- 2) Plain English Functional Description (PEFD) and Functional Design Specification (FDS) for the DAF Plant. The FDS shall be used as the basis for PLC Configuration and Programming.
- 3) PLC Software Programs including PLC ladder/logic diagrams, as installed, hard copy and soft copy in a disk.
- 4) Cable Schedules for Power, Control, Instrumentation and Communications cables.

The cable schedules shall show origin and destination, length, number of cores, conductor sizes, type, voltage grade, outer diameters, minimum bending radii etc.
- 5) Input Output (IO) Schedules for analogue and digital signals to and from PLC/SCADA/HMI/Telemetry system.

The IO schedules, as a minimum, shall show signal type (e.g. DI, DO, AI, AO, etc.), signal description (e.g. DAF Recycle Water Pump No.1 Overload, DAF Recycle Water Pump No.1 Running, etc.), signal source (e.g. Motor Starter, Instrument, etc.), purpose (e.g. Status Indication, Alarm, etc.), IO Address, etc.
- 6) Schedule of labels for each equipment/component, e.g. front panels of switchboards, control panels, equipment ID/tag and description, etc. Develop equipment ID/Tag numbers as per the Council's asset numbering system.
- 7) Schedule of instrumentation. This schedule shall include instrument ID/Tag/Asset No., and Instrument type, make and model, range, accuracy, IP rating, and other parameters.
- 8) Inspection and test plans, and check sheets for works testing, and for on site testing, demonstration and commissioning.
- 9) Any other engineering documentation to fully describe the Works.

1.2.4 Work-As Executed Electrical Design Drawings and Documentation

Submit all work as executed (WAE) design drawings and documentations including Operation and Maintenance (O&M) Manuals, as detailed elsewhere in this specification.

1.3 ELECTRICAL REQUIREMENTS

1.3.1 DAF PRE-TREATMENT SYSTEM

- (i) Within 4 weeks of issue of the Letter of Acceptance, provide :-
 - List of all electrical plant to be provided for the proposed DAF system, together with the connected load, in kW, of each and the operating load, power factor;
 - Method of starting each item of electrical plant
 - Maximum Demand of the DAF pre-treatment system
- (ii) Carry out all necessary procedures to inform Country Energy of the intention of connecting the above additional power to the existing power supply to the WTP, obtain the required permissions from the Supply Authority, pay any required fees, etc.
- (iii) Ensure that the existing power supply to the WTP, ie the sub-station/transformer rating, rating of the consumers mains, size of incoming circuit breaker to the existing Main Switchboard (MSB), rating of bus-bars to the MSB, are suitable for the additional load as per Item 1 above to be added to the existing load on the MSB.

If any additional work in relation to these items is necessary, provide a complete and detailed list of the works and the costs as a separate item in the Tender.

The present Transformer at the sub-station which provides 415V/240V power to the Water Treatment Plant is rated at 315 kVA. It is estimated that the existing maximum demand is in the order of 150 kVA. It is to be noted that this is not a definitive figure. Tenderers/Contractor are required to establish as to whether the additional load of the DAF Plant offered/being provided can be catered for by the existing power system – ie. by the Transformer, consumers mains, main incoming circuit breaker and busbars of the main switchboard, etc.

- (iv) Supply and install a suitably rated 3-pole circuit breaker on the MSB to control and protect the submain to the DAF Plant if an existing spare circuit breaker of the appropriate rating is not available. This circuit breaker shall be fitted with magnetic and adjustable thermal overload trips, and shall be rated to carry the above maximum demand of the proposed DAF Plant plus 30%. The fault rating of this circuit breaker shall not be less than the fault rating of other sub-main circuit breakers.
If an existing spare circuit breaker of the appropriate rating is not available, then one of the existing spare circuit breakers may be replaced by a suitable circuit breaker of the required rating.
- (v) Supply and install a three phase, neutral and earth sub-main from the above circuit breaker to the location of the Local Switchboard (LSB) for the DAF Plant. This sub-main shall be by PVC/PVC, single core, copper conductor cable, drawn in HD uPVC conduit buried in the ground from the MSB to the LSB for the DAF Plant. The size of the conductor shall be suitable to carry the Maximum Demand of the DAF Plant plus 50%, at which load the voltage drop at the busbars of the DAF LSB shall not be more than 3% of the voltage at the bus-bars of the Main Switchboard.
- (vi) Supply and install one Local Switchboard (LSB) in a suitable location for the operation and control of the DAF plant. As this LSB is expected to be located under a 'lean-to' type cover, the LSB shall be of weatherproof, IP56 (min) construction, Type DU Assembly to Department of Commerce Technical Specification MEW E101, and arranged for bottom cable entry only. The LSB shall contain as a minimum :-
 - 1 incoming main circuit breaker with adjustable thermal overload protection
 - 1 set surge suppressors, within a separate compartment
 - 1 power meter, to read volts, amps, power factor, kW
 - 1 suitable starter for each of the recycle pumps
 - 1 starter and/or control for de-float provision for the filters (each)
 - 1 suitably rated circuit breaker for sub-main to the compressor(s), if packaged compressor units are provided. Alternatively, provide necessary starters and common control on the LSB
 - Provide a PLC within a segregated control compartment for monitoring and control of the relevant plant and equipment. Provide all requirements such as 240 V conditioned power supply, 24V DC power distribution, thermostat controlled anti-condensation heaters, fuses, terminals, surge protection units, communications devices, etc.
 - HMI (touch screen) for local monitoring and control of the DAF plant/system including software and programming. Mount the HMI on the PLC compartment door and ensure that the top edge of the HMI is (no more than) 1.6m above the finished floor level
 - Provide internal lighting for the PLC compartment
- (vii) Select motors required to be controlled by Variable Speed Drive Controllers (VSD) such that they operate without overheating or overloading within the entire range of speed control required. Undue noise shall not occur during starting, running, or stopping of these motors when under control of the VSD.

Install VSD controllers with due considerations to the required cooling and thermal characteristics. Dedicated ventilation/cooling system shall be provided for each VSD as may be required for its location, and to ensure: -

- satisfactory operation of the VSD under maximum ambient temperature condition;
- that heat generated in the VSD will not raise the temperature of the room by more than 3°C above the ambient.

Install cabling from the VSD Controller to the motor so as to eliminate/minimise Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI) to other cables/circuits. Provide any suppressors required for this purpose, and for eliminating production of harmonics.

Provide all instrumentation as may be required for the control and monitoring of the DAF Process/System, including those shown on P&ID drawings. Submit a data sheet for each instrument for review by the Principal. Ensure that each instrument is suitable for the application, and for the environmental conditions. Provide all accessories for installation of instruments, and wire signal(s) from each instrument to PLC/SCADA system. Provide surge suppressors at each end of all instrumentation signal loops.

Ensure that segregation is maintained between instrument cables and 240V/415V AC power cable through out the installation.

- (viii) Provide a lock-off (emergency) stop station for each machinery and for each pump motor. Determine the final location for installation of the emergency stop station on site in consultation with the Principal. When equipment is operating in 'automatic', under the control of the PLC/SCADA system and if the Emergency STOP station is operated, then it shall be necessary to also Reset the drive from the SCADA before the drive can be restarted.
- (ix) Provide an indoor type, wall mountable, IP52 rated Distribution Board (DB) for 415V/240V AC power for lighting and socket outlets. Mount the DB within the DAF Plant building. This DB shall contain: -
- a suitably rated 3-pole Main Circuit Breaker;
 - a suitably rated 1-pole Circuit Breaker with RCD protection for each lighting circuit;
 - a suitably rated 1-pole Circuit Breaker with RCD protection for each 240V socket outlet circuit;
 - a suitably rated 3-pole Circuit Breaker with RCD protection for each 415V socket outlet, if any;
 - 3-off (min) spare 10Amp rated 1-pole Circuit Breakers with RCDs;
- (x) Provide indoor and outdoor lightings as appropriate for :-
- DAF Building/Plant area
 - Access path to the DAF building
- (xi) Provide any emergency lighting and EXIT signs (lights), as may be necessary, in compliance with relevant Australian Standards.
- (xii) Provide suitable access and security lighting for roadways, paths, etc. to the DAF building. Lighting fittings for this purpose may be installed on buildings, or on suitable lighting poles/posts. Submit drawing(s) of proposed lighting poles/posts for review and/or approval by the Principal. Provide suitable provisions for changing light bulbs in these luminaries. Security lighting shall be photo-electrical cell operated with provision for manual operation. Control switches shall be located in the WTP or within the DAF building.

- (xiii) Provide suitably rated 240V AC (3-pin) socket outlets for general power and other power requirements.
Ensure that the General purpose Socket Outlets (GPO) are switched, industrial type, weatherproof, IP56 (minimum). All GPO in plant areas shall be industrial type, weatherproof, IP56 rated. Domestic type (flush mounted) GPO shall only be provided within control room, office and administrative area (if any), and within switchboards or control panels.
 - (xiv) Provide a Lightning Protection System for the entire WTP site similar to the ERITECH System 3000 Lightning Protection System.
 - (xv) Undertake a risk assessment as per AS1768, and determine the required protection level.
 - (xvi) Prepare a Lightning Protection Design Scheme for the entire WTP site. Ensure that all tall structures on the site, e.g. Reservoirs, are particularly protected. Submit the scheme for review by the Principal prior to commencing installation.
 - (xvii) Provide all power cables from VSD Controllers to Motors by means of suitably sized, PVC/PVC, Screened, 3-Core+Earth, Cu conductor, 0.6/1kV rated cable, installed in HD UPVC conduits, and/or in floor trench/ducts, and/or cable tray/ladder. Install cabling from the VSD Controller to the motor so as to eliminate/minimise Electromagnetic Interference (EMI) and Radio frequency interference (RFI) to other cable/circuits. Any suppressors required for this purpose, and for eliminating production of harmonics shall be provided within the, and/or with the VSD. In all instances size cables to ensure that voltage drop from motor starter to motor will not exceed 1% in running and 10% during starting conditions.
 - (xviii) Provide all power cables to all other motors (except motors controlled by VSD) and equipment requiring 415V / 240V AC supply by means of suitably sized, PVC/PVC, Cu conductor, 0.6/1kV rated cable, installed in HD UPVC conduits, and/or in floor trench/ducts, and/or cable tray/ladder. In all instances size cables to ensure that voltage drop from motor starter to motor will not exceed 1% when running and 10% during starting.
 - (xix) Provide all necessary control cables to motors, instruments for digital signals, and to equipment requiring control cabling by means of multi-core, 1.5mm² (minimum), PVC/PVC, Cu conductor, 0.6/1kV rated cable, installed in HD UPVC conduits, and/or in floor trench/ducts, and/or cable tray/ladder. All spare conductors shall be terminated on to terminal blocks at each end, labelled SPARE.
 - (xx) Note that cabling to motor's anti-condensation heaters shall suit the rating of the heater and shall be minimum 2.5mm².
 - (xxi) Provide all necessary instrument cabling for analogue (4-20mA) signals by means of overall screened, 1.5mm² (1-pair) / 0.75mm² (multi-pair), PVC/PVC, Cu conductor, instrument cable (similar to Dekoron), installed in HD UPVC conduits, and/or in floor trench/ducts, and/or cable tray/ladder. Provide surge protection at both ends of each instrument loop. All spare conductors shall be terminated on to terminal blocks at each end, labelled SPARE.
 - (xxii) Provide all necessary cable supports including underground HD UPVC conduits, cable tray (where applicable), flexible metal conduits, galvanised steel conduits, etc. for power, control, instrument and data cabling.
 - (xxiii) Provide suitably sized cable pits, as required, for all outdoor underground cable/conduit routes, including cable pits at the sub-station outside the main switchboard and outside each LSB. Provide suitable draining for all cable pits.
- Provide minimum one spare 80mm (diameter) size HD UPVC conduit between the Main Switchboard at the WTP and the DAF LSB. Provide suitable (nylon) draw cord in the spare conduit and cap all spare conduits at both ends.

Excess and unused cable/conduit entry holes that may have been drilled into gland plates shall be blanked off.

All openings into Switchboards, Control Panels, Enclosures, containing electrical equipment shall be sealed after installation of cables, conduits, etc. to prevent entry of insects and vermin.

- (xxiv) Provide equipment identification and warning labels, and warning and danger signs
- (xxv) Provide effective labelling at each Switchboard, Local Switchboard, Distribution Board, terminal point etc. to identify from where that power is obtained. This is in addition to any other necessary labelling.
- (xxvi) Provide all other necessary arrangements, equipment and systems to complete the installation and to ensure correct operation of the DAF scheme and the WTP.
- (xxvii) Carry out Works Testing of all electrical Switchboards and PLC Control Panel.
- (xxviii) Check and test the correct working of the completed electrical wiring, arrangements and systems after installation. Submit a report of all these tests to the Principal for information.
- (xxix) Carry out a comprehensive Demonstration Program, as described elsewhere, to demonstrate the correct and specified operation of each element of the WTP scheme, and of the entire WTP scheme.
- (xxx) Provide separate Manuals for operations (Operations Manual) and maintenance (Maintenance Manual). Submit each manual in hard (bounded) and soft (electronic) copies. Provide appropriate links between these two manuals.
- (xxxi) Carry out Commissioning of the complete project.
- (xxxii) Provide a PLC within a segregated control compartment for monitoring and control of the relevant plant and equipment. Provide all accessories, such as 24V DC power distribution, thermostat controlled anti-condensation heaters, fuses, terminals, surge protection units, communications devices, etc.

Provide a complete set of spare for PLC components including CPU, power supply unit and IO modules.

- (xxxiii) Provide HMIs (Touch Screen) for local monitoring and control of the relevant plant and equipment. Provide control panel as may be required, either as separate units or as part of the Local Switchboard, to accommodate PLC, HMI and/or control equipment for the DAF plant.

Provide suitable cabling for power supply (24V DC / 240V AC from UPS) and for data communications to each HMI. Provide all accessories for installation of HMI at each location

- (xxxiv) Carry out necessary programming and configuration of the PLC for controlling and monitoring the DAF Plant. The PLC provided shall be similar to and/or compatible with the existing PLC at the WTP, which is a GE Faunic Series 90/30 PLC unit.

This PLC shall be a stand-alone unit for the operation of the DAF unit. Provide all necessary wiring between the DAF Plant and the existing SCADA/Telemetry at the WTP of all alarms required to be transmitted to Council's Offices. This wiring shall be carried out by means of the appropriate cables in HD uPVC conduit buried in the ground between the DAF Plant and the Main Switchboard/Control Panel.

- (xxxv) Earth the entire installation as required by AS 3000, and by the Supply Authority.

- (xxxvi) Ensure that the power factor shall be minimum 0,95 lagging during all operating conditions.

If necessary provide power factor correction devices to ensure this power factor is achieved. Provide a three phase power meter to read current, volts, power factor, kW, on the LSB. If VSDs are used ensure that the power factor correction devices are not adversely affected by harmonics generated by electronic equipment, VSDs, etc.

1.4 REQUIREMENTS FOR AUTOMATION AND CONTROLS

1.4.1 GENERAL REQUIREMENTS

This work shall include, but not be limited to: -

- (a) Incorporate the monitoring and control of all the DAF system components into the PLC system.
- (b) Provide all PLC/HMI hardware and software components including software licence(s).

All PLCs including those supplied with proprietary equipment/system, shall be from the same manufacturer and shall be of same model and type – compatible with each other.

- (c) Configure and program PLC to provide automatic operation, control and monitoring of the DAF system. Provide arrangement for remote control and monitoring of the DAF system via Telemetry RTU at the WTP.
- (d) Submit a Plain English Functional Description (PEFD) to the Principal for review. This PEFD shall incorporate main aspects of control and monitoring systems including interlocks, alarm, security, access, adjustments, redundancy, and other operator interface requirements. Any comments made by the Principal shall be addressed and incorporated, as appropriate, into a revised version of the PEFD.
- (e) Provide a Control Panel within the LSB, which will contain the PLC, 24V DC power distribution, and other accessories such as thermostat controlled anti-condensation heaters, fuses, terminals, surge protection units, communications devices, etc.
- (f) Provide a PLC within the control compartment for monitoring and control of the DAF plant. Provide all accessories, such as 24V DC power distribution, thermostat controlled anti-condensation heaters, fuses, terminals, surge protection units, communications devices, etc.
- (g) Provide an UPS, with four-hour battery backup after mains failure, for supplying 240V AC power to the PLC, electronic and instrumentation devices. Provide a well ventilated and secured enclosure for the UPS batteries. UPS batteries shall be dry type batteries, suitable for installation within an Electrical Switchroom.

Install the UPS and the Enclosure for UPS batteries within the electrical switchroom. Wire the following signals from the UPS to PLC for monitoring via PLC/HMI system:-

- UPS Main Power Failure;
 - UPS Fault;
 - UPS Battery Low;
 - UPS in by-pass mode;
 - UPS Battery Charger Failure.
- (h) Provide suitable arrangement including an UPS by-pass switch for carrying out UPS maintenance work.
 - (i) Provide all necessary arrangements, equipment and systems to complete the installation and to ensure correct operation of the PLC.
 - (j) Carry out works testing of the PLC software configuration and programming, and submit test reports.
 - (k) Carry out on site testing of the completed PLC arrangements and systems after installation, and submit test reports to the Principal prior to carrying out demonstration program.

- (l) Carry out a comprehensive Demonstration Program to demonstrate the correct operation of each component of the PLC arrangement and system.
- (m) Provide separate Manuals for operations (Operations Manual) and maintenance (Maintenance Manual). Submit each manual in hard (bound) and soft (electronic) copies. Provide appropriate links between these two manuals.

1.4.2 SIGNAL REQUIREMENTS FOR CONTROL AND MONITORING

Provide all necessary signals to the PLC for automatic and effective control and monitoring of the entire DAF system. Included in these signals ensure that the following signals are provided: -

1.4.2.1 SIGNALS FOR MONITORING AND CONTROL OF MOTORS UP TO 5KW

For monitoring: -

- Motor available for operation in AUTO mode;
- Emergency Stop Activated;
- Motor Over-load Fault;
- No-Flow Alarm;
- Motor Running;
- VSD Fault (applicable for VSD type motor starters).
- Soft Starter Fault (applicable for soft start/stop type motor starters).

For control: -

- Motor Start/Stop;
- VSD speed reference analogue (4-20mA) signal (applicable for VSD type motor starters).

1.4.2.2 SIGNALS FOR MONITORING AND CONTROL OF MOTORS ABOVE 5KW

For monitoring: -

- Motor available for operation in AUTO mode;
- Emergency Stop Activated;
- Motor Over-load Fault;
- Motor Winding/Bearing Over-temperature Alarm;
- Motor Winding/Bearing Over-temperature Trip;
- No-Flow Alarm;
- Motor Running;
- VSD Fault (applicable for VSD type motor starters);
- Soft Starter Fault (applicable for soft start/stop type motor starters);
- Seal Failure Alarm (applicable for submersible motors);
- Motor Operating information from VSD, if applicable.

For control: -

- Motor Start/Stop;
- VSD speed reference analogue (4-20mA) signal (applicable for VSD type motor starters).

1.4.2.3 SIGNALS FOR MONITORING AND CONTROL OF VALVE ACTUATORS

For monitoring: -

- Valve Fault;
- Valve Fully Opened;
- Valve Fully Closed.
- Valve Position (applicable for modulating type valve actuators);

For control: -

- Open Valve;
- Close Valve;
- Valve reference analogue (4-20mA) signal (applicable for modulating type valve actuators).

1.4.2.4 SIGNALS FROM INSTRUMENTATION

Signals from all instruments, including: -

- Flow Meters – flow rate (4-20mA) and totalised flow;
- Flow Switches;
- Level Transmitters;
- Level Switches;
- Pressure Transmitters;
- Pressure Switches;
- Turbidity Meters;
- Conductivity Meters;
- pH Meters;
- Proximity Switches;
- Etc.

1.4.2.5 SIGNALS FOR MONITORING OF POWER SUPPLY

From the Switchboard: -

- Main Power/Phase Failure Alarm;
- Surge Diverter Fault Alarm;
- Phase and Line Voltages;

- Phase and Line Currents;
- Power Factor;
- kWh.

2 STANDARD ELECTRICAL REQUIREMENTS

This section covers the standard electrical, instrumentation and control requirements for equipment and works that may be incorporated within this Contract.

Not all the electrical items specified in the following are expected to apply to this Contract but all the equipment used and the manner of the installation shall be in accordance with this Specification and shall be suitable for the function for which they have been provided.

If any of the requirements specified below are not provided for in the Tenderer's offered equipment it shall be stated in the SCHEDULE OF DEPARTURES and an alternative shall be nominated.

2.1 WORKS TESTING

Electrical Switchboard: A test certificate shall be provided indicating that the switchboard is compliant with the relevant Australian Standards with a declaration stating that it is compliant with the tender specification or alternatives accepted by the Principal.

2.2 EARTHING

Supply and installation of Earthing shall comply with the requirements of MEW E101 and AS/ANZ 3000.

In addition to the requirements of the Supply Authority and AS/NZS 3000 the main earthing conductors shall be run in conduit to the main earthing electrodes. The main earthing connections shall be contained in earthing electrode connection boxes similar to ALM type ERB-1 up to 50 mm² cables and a type-4 pit for larger cables.

2.3 POWER FACTOR REQUIREMENTS

The power factor shall meet the Supply Authority requirements and in any event shall be minimum 0.95 lagging during all operating conditions.

The Power Factor Correction equipment shall be designed to cater for any adverse effect from harmonics, generated / originated by Variable Speed Drive Controllers and other non-linear electrical equipment on site.

If necessary power factor correction devices shall be installed to meet this power factor. The preferred method of power factor correction is using a controlled capacitor bank which affords stepped power factor correction for the entire plant. Alternative methods of power factor correction to maintain the specified minimum power factor during all operation conditions will be considered.

2.4 EFFECT OF HARMONICS ON POWER SYSTEM

It is known that the non-linear loads, such as VSD Controller, UPS, etc. generate harmonic current, which may:-

- Cause an unacceptable disturbances on the power reticulation system;
- Adversely affect the operation of other (existing and/or new) electrical equipment including power transformer, power factor correction capacitors, etc.;

- Reduce life expectancy of various plants and equipment including transformer, motors, electronic devices, power cabling, power factor correction equipment, etc.

Provide suitable means for harmonic reduction, and ensure that the Total Harmonic Distortion (THD) for both current and voltage components is no more than 5%.

2.5 ELECTRICAL SWITCHBOARDS

2.5.1 ACCEPTED SWITCHBOARD MANUFACTURERS

The switchboard manufacturer shall have obtained Quality Assurance Certification to ISO 9001 and ISO 9002.

2.5.2 GENERAL REQUIREMENT

All work performed and equipment selected shall conform in design, material, construction, workmanship and performance to MEW E101, AS/NZS 3000, AS/NZS 3439.1 and other relevant Australian Standards and shall meet the requirements of the Supply Authority.

2.5.3 LOCAL SWITCHBOARD (LSB)

2.5.3.1 GENERAL

The LSB shall be manufactured as a weatherproof, min IP56, custom-built assembly type “DU” as per MEW E101. Local Switchboards shall comply with the requirements of MEW E101 and relevant Australian Standards. The Main Switchboard shall contain all necessary equipment/devices for 415/240V AC power reticulation and protection including the followings:-

- A Main Switch (Circuit Breaker). This Circuit Breaker shall be rated for maximum demand plus 30% (minimum) load on the LSB, and shall have adjustable thermal over-load and adjustable over-current protections. This circuit breaker rating and the trip settings shall be graded with corresponding settings of the associated sub-main circuit breaker on the Main Switchboard.
- Surge diverters similar to Critec-Erico Main Shunt Power surge diverters for incoming power supply, installed within a separate compartment.
- Phase Failure Alarm Circuitry with two voltage free changeover contacts wired out to PLC system. All equipment shall be installed within a separate compartment.
- Arrangement for 415V/240V power reticulation including suitably rated bus-bars (3-phase+Neutral+Earth), etc. The earthing bar shall be directly connected to main earthing bar of the Main Switchboard.
- Suitably rated Circuit Breakers for Sub-mains to other Services / Panels, as necessary. Each Circuit shall have adjustable thermal and adjustable magnetic over-current protection.
- One spare 3-pole, 32A rated Circuit Breaker with adjustable thermal and adjustable magnetic over-current protection.
- All necessary motor starters. Control voltage for starters shall be 240 Volts AC. Control voltage for automatic and common control circuitry shall be extra low voltage. Control Circuits shall be connected to the white phase.
- PLC Compartment for housing necessary devices and circuitry including PLC, 24V DC Power Supply, terminals, communications devices, FO cable termination panel, instruments, etc. for automatic controls and remote monitoring via PLC system.
- Internal lighting for PLC Control Compartment, controlled by door switch.
- Thermostat controlled anti-condensation heater(s) in the PLC compartment/cubicle, and where required, to ensure that condensation will not affect components / equipment.

- All necessary devices for communications with the main PLC system.
- 24V power supply system for supplying power to PLC, instrument, and other electronic devices. Supply 240V AC to the 240VAC/24VDC power supply unit from UPS.
- Distribution Board, minimum 12 poles, for supplying 415V/240V power for lighting and general power outlets. Provide minimum 4-off, single-pole, 10 A rated circuit breakers as spares.
- One 10 Amp, RCD protected, 250V, double/twin (switched) GPO within the PLC Control Compartment with power supply from UPS.
- All other necessary devices and circuitry including terminals, relays, transducers, surge suppressors, etc.

Single line diagram Control shall be generally in accordance with Drawings No. E600, E601 and E604, included in this Specification.

2.5.3.2 FEATURES

The LSB shall have following features: -

- (a) All access to the switchboard shall be only from the front via a door or doors. All busbars and busbar joints shall also be accessible from the front of the switchboard. There shall be no need to access any portion of the switchboards for maintenance or repairs from the rear.
- (b) Control voltage for starters shall be 240 Volts AC. Control voltage for automatic and common control circuitry shall be extra low voltage. Control Circuits shall be connected to the white phase.
- (c) Separate compartment for each motor starter.
- (d) Internal and door mounted equipment relating to a starter shall be grouped together.
- (e) Equipment knobs requiring plant operator adjustment, (e.g. manual speed control for VSD, pacing rate, times, etc.) shall be front panel mounted.
- (f) Internal lighting controlled by door switch.
- (g) Any circuit which is not isolated when the main switch is in the *OFF* position shall be at extra low voltage (24V DC).
- (h) All internal cables shall be enclosed in slotted PVC cable duct.
- (i) Cable entry into the cabling zone shall be from top and/or bottom. Gland plate shall be minimum 4mm thick marine grade aluminium.
- (j) Have terminals for all outgoing cables with low voltage and extra low voltage terminals segregated by dividers. The terminals for a motor and its associated ancillary devices shall be located together. All terminals shall be tagged with the number of the cable connected to it on each side. Each terminal set shall be labelled, e.g. Polyaluminium Dosing Pump No.1.
- (k) The Switchboard shall be mounted on hot dipped galvanised channel iron plinths, minimum 75mm high.
- (l) All cables entering or leaving the switchboard(s) shall do so via suitable terminals. Tag terminals with the number of the wire connected to them on each side. Terminals shall be grouped and suitable traffolyte labels shall be provided.

2.5.3.3 FAULT CURRENT WITHSTAND CAPABILITY

The Switchboard shall be designed and manufactured to withstand the prospective fault current or 10kA, whichever is higher, for 1 second (peak factor 2.1). The value of the prospective fault current shall be calculated by the Contractor.

The Contractor shall confirm to the Principal that the Switchboard and all equipment used are suitable for the prospective fault current.

2.5.4 SHORT CIRCUIT COORDINATION

The contractor shall supply data from the switchgear supplier confirming Type "2" short circuit coordination to the IEC standard 947.4.1 between contactors, motor protection relays and corresponding circuit breakers.

2.5.5 MOTOR STARTERS

In addition to the requirements of MEW E101, each starter shall include the following:

2.5.5.1 FOR DRIVE MOTORS UP TO 5 KW

- (i) Thermal Overload protection as in MEW E101
- (ii) Run indicating light.
- (iii) Motor over-load indicating light.
- (iv) ON-OFF-AUTO rotary Mode Selector Switch. In the ON mode/position the pump motor shall run at pre-selected/determined speed. In OFF mode/position the pump motor shall stop, if previously running, and shall not start. In the AUTO mode/position the pump motor shall be controlled automatically via PLC system.
- (v) Lamp test facility with only one lamp test button.
- (vi) Hours run meters.
- (vii) Emergency Stop / Lock-Off-Stop operating in control circuits.
- (viii) Protection relay that de-energises if any fault occurs.

2.5.5.2 FOR DRIVE MOTORS 5.5 KW AND ABOVE

- (i) Thermal overload and thermistor protection to MEW E101.
- (ii) Ammeters scaled so that full scale is at least 20% more than full load current and with six (6) times over scale.
- (iii) Run indicating light.
- (iv) Fault indicating lights (one per fault).
- (v) Fault reset push button (common).
- (vi) ON-OFF-AUTO rotary Mode Selector Switch. In the ON mode/position the pump motor shall run at pre-selected/determined speed. In OFF mode/position the pump motor shall stop, if previously running, and shall not start. In the AUTO mode/position the pump motor shall be controlled automatically via PLC system.
- (vii) Lamp test facility with only one lamp test button.
- (viii) Hours run meter.
- (ix) Emergency Stop / Lock-Off-Stop operating in control circuits.

- (x) Protection relay that de-energises if any fault occurs.
- (xi) Where motor rating exceeds 90 kW motor protection shall be electronic motor protection as in MEW E101.
- (xii) Phase failure and reversal relay.

2.5.5.3 FOR ALL SIZES OF DRIVE MOTORS

- (i) Motor starter type shall be appropriate to the starting current limitation imposed by the Electricity Supply Authority.
- (ii) All motor faults shall be latch-in and be reset-able by a common fault reset button located on the starter door for indoor switchboards. However, thermal overloads shall only be reset-able from inside the starter compartment.
- (iii) No-flow protection for all pumping machinery.
- (iv) Seal failure protection and associated indication to be provided for all submersible motors.

Control circuit shall be generally in accordance with Drawings No. E531 (Requirements for a DOL Motor Starter Circuit Diagram) and E532 (Requirements for a Star-delta Motor Starter Circuit Diagram), included in this Specification.

2.5.5.4 ADDITIONAL REQUIREMENTS FOR MOTOR STARTERS WITH VSD

Refer to the specification and relevant PI&D for the pumps and/or drives which are required to be controlled by Variable Speed Drive (VSD) controllers. In addition to the above requirements, provide VSD and associated circuitry for starting, stopping and speed control /adjustment of the drives / pump motors.

Mount the VSD display/key-pad unit on the respective motor starter compartment door at a suitable height for easy access and vision. The rating of the VSD selected shall cater for the worst ambient condition likely to occur. Provide all necessary filters and suppressors for the VSD to ensure that RFI, EMI and harmonics are within the prescribed limits and that the pump motors / drives are not subjected to damaging voltage (dv/dt) surges.

Provide suitable arrangements for flow through ventilation for the VSD by means of a fan which shall operate when the VSD is controlling the pump motor. Ventilation openings shall be provided to the enclosure. These ventilation openings shall be provided with removable (for cleaning) filters, and a stainless steel mesh screen cover, and shall also be insect and vermin proof.

The control of the ventilation fan motor shall be interlocked with the operation of the pump motors in such a manner that the fan motor will start when any pump motor starts, and stops 5 minutes after all pump motors have stopped operating.

In special circumstances, with prior approval of the Principal, VSD controllers may be separately mounted on wall within the Switchroom.

2.5.5.5 ADDITIONAL REQUIREMENTS FOR MOTOR STARTERS WITH ELECTRONIC SOFT STARTERS

Except for motor starters with VSD, for all motors with nameplate rating of 22kW and over, provide electronic soft start and soft stop (SS) type motor starters. Provide separate SS for each motor starter.

Each SS type motor starter shall include suitable arrangement and circuits for by-passing the SS while operating at full load.

Mount the SS display/key-pad unit on the respective motor starter compartment door at a suitable height for easy access and vision. The rating of the SS selected shall cater for the worst ambient condition likely to occur.

2.5.5.6 MOTOR STARTING METHODS

The contractor shall liaise with the Supply Authority regarding the motor starting requirements. The type of motor starter selected by the contractor shall be in accordance with the Supply Authority requirements. Starting current shall be within the limits imposed by the Supply Authority.

2.5.6 CONTROL PANEL

2.5.6.1 GENERAL

The Control Panel shall be part of the DAF LSB. All work performed and equipment selected shall conform in design, material, construction, workmanship and performance to MEW E101, AS/NZS 3000, AS/NZS 3439.1, and other relevant Australian Standards.

This Control Panel shall contain, as a minimum, the followings: -

- A Main Circuit Breaker for incoming 240V UPS power supply. This Circuit Breaker shall include adjustable over-current and instantaneous fault protections.
- The PLC system for the DAF plant, including hardware, software and programming, for automatic control and monitoring of the entire DAF system.
- All necessary devices for communications with other PLCs, HMI.
- 24V power supply system for supplying power to PLC, instrument, and other electronic devices. Supply 240V AC power to the 240VAC/24VDC power supply unit from UPS.
- Thermostat controlled anti-condensation heater(s).
- Internal lighting controlled by door switch.
- One 10 Amp, RCD protected, 250V AC, double/twin (switched) GPO near the main PLC/communication equipment. Supply 240V AC to this GPO from UPS.
- All other necessary devices and circuitry including terminals, relays, surge suppressors, etc.

2.5.6.2 FEATURES

The control panel shall have following features: -

- Have segregation between power (240V AC) and instrumentation (24V DC) circuitry.
- Gland plates shall be bottom entry. Gland plate shall be minimum 4mm thick marine grade aluminium.
- Internal and door mounted equipment shall be grouped together.
- Have front access only via a door or doors. Each door shall be separately secured. Interlocking doors are not permitted.
- Have sufficient space between equipment.
- Have a minimum 20% spare space.
- Have suitable ventilation to avoid heat build-up.
- All cables entering or leaving the control panel shall do so via suitable terminals. Tag terminals with the number of the wire connected to them on each side. Terminals shall be grouped and suitable traffolyte labels shall be provided.

2.5.7 CONTROL EQUIPMENT

The control equipment used in the Local Switchboard (LSB) and in Control Panel shall comply with the requirements of MEW E101. Equipment used shall be ex-stock in Australia and available within forty eight (48) hours of order.

2.5.8 VARIABLE SPEED DRIVE (VSD) CONTROLLERS

VSD Controller used shall comply with the requirements of MEW E101, and shall be entirely suited for the application. Provide one VSD for each motor.

All other VSD's shall be selected to also produce minimum harmonics. If necessary, separate harmonic filters shall be provided. Ensure that the THD (for both current and voltage components) at the site is within the limits imposed by the Supply Authority.

2.5.9 POWER SURGE DIVERTERS

Equipment housed in the switchboards shall be protected against mains voltage switching and lightning surges by shunt surge protection units installed on incoming supply.

Power surge and transient protection devices (SPD) shall comply with the requirements of AS 1768. The following minimum requirement shall apply: -

Location	Requirements
Main switchboard	I max = 100kA (L-N) U phase < 800V @ 3kA Stand-off > 415V (L-N)
LSB and Distribution Boards	I max = 50kA (L-N) + 40kA (N-E) U phase < 850V @ 3kA Stand-off > 415V (L-N)
Telecommunications main distribution frame	20KA (L+L-G) GDT protection per pair, multi-stage protection

Provide provisions for remote indication of stage failure by means of pre-wired auxiliary contacts. Each contact shall be rated at 1A, 240 VAC/2A, 24 V DC.

100KA SPDs shall be 'T' connected off the load side of the main switch. The wiring to the SPD shall be kept as short and direct as possible, using at least 16mm² SDI cable if the SPD is not supplied with flying leads. Extending the flying leads of a SPD should be avoided where possible. The branch wiring shall be protected by 63A HRC fuses or equivalent circuit breakers if upstream protection is greater than 100A.

50KA SPDs shall be 'T' connected off the load side of the main switch. The wiring to the SPD shall be kept as short and direct as possible, using at least 6mm² SDI cable. The branch wiring shall be protected by 32A HRC fuses or equivalent circuit breakers if upstream protection is greater than 80A.

Telecommunications line protectors (TLPs) shall be installed to protect all pairs of the incoming telephone services in the main distribution frame (MDF). The TLPs are designed to plug-in to the disconnect blocks in Krone LSA and Profil distribution frames. Correct orientation of the TLPs is critical for correct operation. All verticals of the MDF must be earthed to the earth bar of the nearest distribution board, as per ACA requirements. Krone Profil frames will require earth clips between the disconnect blocks and the frame rails. Unused pairs in the incoming telephone and data cables shall

be terminated in the Krone blocks. These unused pairs must be shorted to earth as part of the surge protection system installation.

2.5.10 SURGE AND TRANSIENT PROTECTION FOR INSTRUMENTS

All instrumentation loops e.g. 4 - 20 mA loops shall have transient surge protection at each end of the loop suitable for the instrument being protected. They shall provide both common and differential mode protection with primary clamping and low-pass series impedance filter. The protector shall have a clamp voltage of 36 Volts.

2.5.11 24V DC POWER SUPPLY UNITS

Each 24V DC power supply unit shall be linear, fold-back current limiting and short circuit proof (Radameta or similar). Provide separate power supply unit at each PLC panel/compartment.

Each 24V DC power supply unit shall comply with the following: -

- (i) Rating: As per design requirements, however the minimum rating shall be 5A at 24V DC (120VA).
- (ii) Overload Rating: 115% of continuous full load for 10 min.
- (iii) Ambient Temperature: 0 deg C to +55 deg C
- (iv) Input Voltage: 240V AC $\pm 10\%$
- (v) Input Frequency: 50 ± 1 Hz
- (vi) Output Voltage: 24V DC
- (vii) Alarms: Alarm contacts for unit failed.

Wire the alarm signals from this 24V DC power supply unit to PLC.

2.6 INSTRUMENT LOOP PARAMETERS

Instrument loop parameters shall meet all requirements for automatic control and remote monitoring via PLC/SCADA/HMI/Telemetry systems. The contractor shall determine the specific requirements for each instrument loop.

This clause indicates typical parameters/requirements for some of the instrument loops. Note that not all instrument loop parameters have been described below.

Recycle Water Flowrate

Description	Requirement
Primary Element	Mag-flow primary unit
Size	Size to suit
Scale	To suit
Set Point	As required by the Process.
Secondary Element	Mag-flow transmitter/controller
Analogue Signal	4-20mA
Totaliser	8 digits (also interface into the PLC/HMI system via a slave pulse counter).
Analogue Display	Local flow indication in litres/sec on the Flow Transmitter.
Control	As required by the process for automatic control via PLC/HMI system.

Description	Requirement
Alarm	Other alarms, as required by the Process for remote monitoring via PLC/HMI system.

2.7 ELECTRONIC INSTRUMENTS

2.7.1 SCOPE

This clause indicates the minimum technical requirements for electronic instruments. The Contractor shall determine the specific instruments required for this plant.

2.7.2 GENERAL

Front of panel mounted instruments shall include all instruments considered part of the operator/plant interface. Each instrument shall be capable of being flush panel mounted and suitable for modular assembly applications. Wherever possible, all instruments shall be similar in appearance and size, having frontal display designed for maximum readability.

Cases shall be dust and moisture resistant, enamelled finish of a colour to be specified and shall be provided with anti-glare shatter-proof glass or plastic cover.

Field connections shall be integral with the case chassis with retractable umbilical, plug-in or other similar electrical connections. All functional control knobs/buttons, selector switches, indicating lights etc. shall be accessible from the front of the panel.

Electrically, the instrument shall be of solid state, modular card construction, mounted in a general purpose electrical enclosure and shall be interchangeable with similar instruments for ease of maintenance. Each instrument shall be provided with a separate fuse to prevent internal faults from influencing other instruments from the same circuit breaker.

The instrument shall be suitable for operating from a nominal 240 volt, 50 Hz power supply. Variations in supply voltage of ± 10 volts and frequency of ± 1 hertz shall have no measurable affect on the operation or accuracy of the instrument.

A direct current, 4 - 20 mA, shall be used for transmission of measurement and control signals to and from all panel instruments.

All programming parameters including set points and operating times shall be retained during power loss.

Programming tools/equipment shall be supplied for any instrument if required.

2.7.3 ELECTRONIC MANUAL LOADING STATIONS - TECHNICAL REQUIREMENTS

Electronic manual loading stations shall be capable of generating a 4 - 20 mA DC output signal. The output signal shall be indicated on a scale calibrated 0 – 100%. Output adjustment shall be by 10 turn vernier potentiometer accessible from the front of the panel.

Indication accuracy $\pm 0.5\%$ of span

Repeatability $\pm 0.25\%$ of span

2.7.4 THERMOCOUPLE TO CURRENT CONVERTERS - TECHNICAL REQUIREMENTS

Thermocouple to current converters shall be fully solid state with no moving parts, capable of accepting DC milli-volt input signals from ISA recommended type thermocouples. Output from the converter shall be a 4 - 20 mA DC current signal proportional to thermocouple DC input. Input signals shall be electrically isolated.

Adjustable span, zero and suppression shall be provided with upscale or downscale thermocouple burnout protection and automatic reference junction compensation.

Calibration accuracy $\pm 0.5\%$ of span

Repeatability $\pm 0.2\%$ of span

Sensitivity $\pm 0.2\%$ of span

2.7.5 RESISTANCE TO CURRENT CONVERTERS - TECHNICAL REQUIREMENTS

Resistance to current converters shall be fully solid state with no moving parts, capable of accepting input signals from resistance bulb temperature detectors. Output from the converter shall be a 4 – 20 mA DC output signal linear with temperature. Input signals shall be electrically isolated.

2.7.6 INTEGRATORS - TECHNICAL REQUIREMENTS

Integrators shall be fully solid state, capable of accepting either a linear or square root 4 - 20 mA DC input signal and producing a pulse output compatible with the totaliser unit provided with the unit. Maximum pulse rates shall nominally be in the range of 1 pulse per 10 seconds for full scale measurement but in any event the unit reading shall be kilolitre, 10 x kilolitres or 100 kilolitres.

To prevent erroneous counting with low flow rates a variable dropout adjustment shall be provided. The adjustment shall be from 0 - 10% of maximum flow.

Integrator accuracy $\pm 0.5\%$ of rate over 10 - 100% of full scale.

The integrator may be supplied as an integral part of a recorder.

2.7.7 CURRENT MONITOR RELAYS - TECHNICAL REQUIREMENTS

Current monitor relays shall accept a 4 - 20 mA DC input and provide a high and low relay contact output adjustable over the whole span. The unit shall have a 240 V 50 Hz supply and incorporate a 0.5 second delay.

Repeatability $\pm 0.5\%$ of span

Dead band 0.5-10% or range adjustable

Input Resistance 100 ohms maximum

The trip set point shall be set via a front mounted calibrated dial or slider which is linear in operation. A label stating the measured variable in SI engineering units per unit of adjustment shall be mounted adjacent to the Monitor Relay.

2.8 FIELD MOUNTED CONTROL AND INSTRUMENTATION EQUIPMENT

This clause indicates the minimum technical requirements for field mounted control and instrumentation equipment.

The contractor shall determine the specific equipment required for this installation.

2.8.1 GENERAL

All equipment shall be suitable for the ambient conditions applicable to the installation. Equipment shall be supplied complete with suitable mounting brackets which shall be fabricated from 316 stainless steel. Mounting bolts for the equipment shall be 316 stainless steel where outdoors, in filter

galleries, in the pits, mounted above water or exposed to chemical solutions. In other locations mounting bolts may be zinc coated and painted with twin-pack high zinc content epoxy paint.

Where equipment uses a tapping into a container or a line containing liquid an isolating cock shall be provided at the tapping. Screwed connections shall be BSP and flanged connections to AS 4087.

All equipment shall be designed for screwed conduit entry for electrical connections and all entries shall be sealed with a gasket.

External equipment shall be provided with stainless steel sun shields.

Programming tools/equipment shall be supplied for any instrument, if required, to permit programming and amendment on site.

2.8.2 LEVEL SENSING RELAYS AND PROBES

Shall have differential action with sensors operating at extra low voltage AC. Sensor shall be either stainless steel rods or cable supported single or multipoint sensors. Sensor mounting brackets shall be 316 stainless steel and where cable supported sensors are used the cable shall be clamped between two plates in position. The sensing relay shall have adjustable sensitivity with a latched output between top and bottom sensors.

Minimum contact rating shall be 5 Ampere 240 V AC11.

2.8.3 DIFFERENTIAL AND GAUGE PRESSURE TRANSMITTERS

Transmitters shall be capable of converting a pressure input to a proportional 4 – 20 mA DC output signal. Integral indicators shall be fitted, scaled 0-100%.

Pressure span shall be continuously adjustable over the full range of the instrument. Internal damping with positive over-range protection to full pressure rating, adjustment for suppression and elevation with external zero adjustment shall be provided.

Body rating shall be compatible with the process. The diaphragm material shall be 316 stainless steel.

Differential pressure (DP) transmitters shall be supplied complete with integrally mounted three (3) valve manifold and universal type mounting bracket suitable for horizontal or vertical 50 mm pipe, these shall be all of stainless steel.

Accuracy $\pm 1\%$ of span

Repeatability $\pm 0.1\%$ of span

Indicator $\pm 2\%$ of span

Enclosure rating IP 66D

Differential Pressure pipe tapings shall be located on the side of pipe midway between top and bottom. The DP cell shall be mounted below the tapping. The tapping tube shall slope downwards away from the pipe to the DP cell. All units and the associated pipe work shall be installed in a manner to prevent freezing.

If a separate device is required for adjustment, checking and programming, then this device is to be provided with the unit.

2.8.4 FLOW SWITCHES AND SOLENOID VALVES

Flow detection in pipelines with reflux valves shall be via a cam operated limit switch in accordance with this specification. Where a reflux valve is not present the flow switches shall be of the deflection

paddle type suitable for detection of flow, no-flow and/or reverse flow. Materials of construction shall be stainless steel paddle and steel body with screwed BSP pipe connections.

The flow switch shall be non-indicating, snap-acting with internal adjustable range setting and differential adjustment. It shall have a degree of protection of IP56 with screwed conduit entry.

Electrical switch shall be a single pole changeover contact rated 5 amp, 240 V, AC-2.

Solenoid valves shall operate on 24V AC. Coils shall be encapsulated and complete with connection box suitable for screwed conduit entry. The entire electrical enclosure shall afford a degree at protection of IP56. All solenoid valves shall be pilot operated with a manual override switch which will allow local manual operation if coil failure occurs.

2.8.5 ULTRASONIC LEVEL TRANSMITTERS

Shall comprise a sending and receiving detector head and a converter unit.

The converter shall be fitted with field accessible zero, span and range adjustments, two (2) field adjustable differential relay output contacts, a three (3) digit local indicator representing percentage level of the liquid and a 4 - 20 mA and DC current output proportional to the level of the liquid. The received signal shall be software conditioned to eliminate extraneous signals.

Accuracy	±1% of span
Repeatability	± 0.5% of span
Converter Enclosure Rating	IP 56
Detector Head Enclosure Rating	IP 66D
Converter Power Supply	240 +10% V, 50 Hz

2.8.6 PRESSURE SWITCHES

Shall comprise a force balance spring activated adjustable differential action type fitted with a switching single pole changeover contact rated 5 amp, 240 volt, AC-11.

Minimum Switching Differential	5% of span
Indoor Enclosure Protection Rating	IP 56
Outdoor Enclosure Protection Rating	IP 66D
Rating	10A AC11
Sensing Element	Stainless Steel

2.8.7 FLOAT SWITCHES

Float switches shall be Flygt ENH10 or equal operating at extra low voltage.

Alternatively, the contractor may use float switches utilising a Stainless Steel float and rod/cord arrangement which actuates a micro-switch at the desired levels. The contact rating shall be 5A 240 V AC min.

2.8.8 PRESSURE BASED LEVEL SENSORS

These sensors shall comprise a probe sensor which shall be immersed within the container of liquid of which the level shall be measured. The probe shall be suspended by means of an integrally attached submersible cable. The probe cable shall either be attached to any required pressure relief tube or include such a tube. The signal output shall be ranged such that the highest liquid level of the measuring range generates 20 mA and the lowest level of the range generates 4 mA. Either capacitive or piezo-electric probes are acceptable. The system shall be complete with all field termination and pressure relief junction enclosures.

Accuracy $\leq 0.5\%$ of the used measuring distance

Long Time Drift of the zero point $\leq 0.5\%$ over three months

Hysteresis and Reproducibility $\leq 0.5\%$ of the used measuring distance

Average Temperature influence over the whole range $\leq 2.5\%/100K$
related to 20°C

2.8.9 CURRENT REPEATERS

Current repeaters shall be fully solid state, capable of receiving a 4 - 20 mA DC signal and shall be provided for current isolation and as a source of power for repeating a current signal where the total loop loading is greater than the output power of the transmitter. The current repeater shall have a minimum power gain of 5:1. Where specified the repeater shall be provided to perform reversing of the sign of the signal where required.

Accuracy $\pm 0.5\%$ of span

Repeatability $\pm 0.5\%$ of span

Sensitivity $\pm 0.5\%$ of span

2.8.10 FIELD TERMINALS

Field terminals shall comprise 0.6/1 kV rated, rail-mounted, tunnel, polyamide insulated type suitable for a conductor clamping cross section range of 0.75 - 4 mm².

End pieces etc. shall be provided where necessary and suitable segregation shall be provided between extra low and low voltage terminals.

Terminals shall be provided with a means to allow marking tags to be clipped onto each side of the terminal insulating body for cable identification.

Terminals shall be enclosed in Klippon type K range boxes or similar Aluminium enclosures.

2.9 BUILDING SERVICES

2.9.1 GENERAL

Provide lighting and power services for the DAF Plant. 240V/415V AC power supply for these services shall be obtained from the Distribution Board(s). Provide layout and circuit diagrams of proposed internal and external lighting and power socket outlets for review by the Principal prior to construction.

Building services equipment including lamp and lamp holders, switches and socket outlets shall meet the requirements of MEW E101.

2.9.2 LIGHTING

Lighting shall be provided in accordance with AS 1680 and AS 2293. All fluorescent fittings shall be fitted with 36 watt switch start circuitry. Use energy saving light bulbs wherever possible and practical.

All light switches shall be surface mounted weatherproof industrial type with a degree of protection of IP66.

Lighting shall comply with the following:

Area	Minimum Illumination Level -LUX	Type of Light Fitting
Other external equipment	50	D or E
External access, roads/paths	50	D or E

Type of Fitting	Requirements
A	2 x 36 W fluorescent fitting with wrap around hinged prismatic diffusers.
B	Totally enclosed 2 x 36 W fluorescent fitting with Prismatic diffuser and moulded fibreglass reinforced polyester body with neoprene sealed. Degree of protection IP65 min.
C	Totally enclosed high pressure sodium flood light with aluminium die cast body.
D	Totally enclosed low pressure sodium with UV stabilised polycarbonate diffuser and aluminium or moulded fibreglass reinforced polyester body. Degree of protection IP56 minimum.
E	As per (D) or min. 50W high pressure sodium vapour floodlights.

External floodlighting, where required, shall be provided in the form of 150W / 250W metal halide lamps. The lights shall be mounted on tapered steel poles of approved design, or off the building where building is over 10 metres high.

External area at the DAF unit shall have illumination by means of low pressure type lighting fittings, local to the operating equipment, (e.g. motors, valves, gauges, etc.). Outdoor access paths to areas such as lagoons shall be illuminated to 10-20 Lux.

Suitable arrangements shall be made for changing of the light globes.

Security lighting shall be controlled by a photoelectric cell with manual (by operator) switch override. The override switch shall be labelled ON/OFF/PHOTO CELL.

Emergency light circuit shall be provided with a selector switch labelled AUTO/TEST/DISCHARGE for 3 monthly battery discharges, complete with label stating same.

2.9.3 240V AC (SINGLE-PHASE) SOCKET OUTLETS (GPO)

240V AC Socket Outlets (GPO's) shall be provided at appropriate locations.

GPO's in all other areas shall be surface mounted industrial type with a minimum degree of protection of IP56.

Each Socket Outlet (GPO) shall have a separate switch for switching ON/OFF. The minimum requirement for GPO's is shown in the following table: -

ROOM	GPO
------	-----

Pumps Building / Room	2 Single GPO in each pump room
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2.9.4 INSTALLATION OF BUILDING SERVICES

Installation of building services equipment shall meet the requirements of MEW E101.

Wiring for the building services may be single insulated cable in conduit concealed in roof spaces, cavities or concrete slabs or fixed to wall surfaces. Wiring run in accessible roof spaces may be PVC/PVC cable without further enclosure.

Building services for chemical rooms, machinery rooms etc. may be run on the cable tray/ladder. However, all wiring to the socket outlets or lights shall be in conduit once they leave the tray/ladder. All wiring below two metres above the floor shall be enclosed in HD-UPVC conduit.

2.10 ELECTRICAL MOTORS

Electrical Motors shall comply with the requirements of MEW E101.

2.11 EMERGENCY STOP SWITCHES

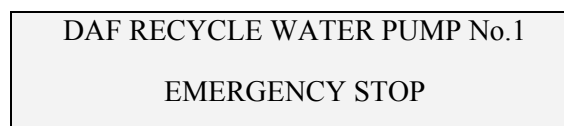
Each motor shall be provided with an Emergency Stop Switch as a means for emergency switching of that motor to remove an unexpected danger or to reduce danger to personnel. The arrangement of the emergency switching shall be such that its operation does not introduce a further danger or interfere adversely with the complete operation necessary to remove danger.

All emergency stop switches shall, as a minimum, comply with the requirements of AS/NZS 3000, AS 4024.1, and current NSW OH&S regulations, in addition to any other regulatory or legislative requirement.

Emergency Stops Switches shall be used for personnel safety, and shall be designed to be incapable of malfunction. Each Emergency Stop Switch shall include a 'mushroom head' type a red pushbutton on a yellow background, and shall be pull to reset and non-locking type. The Emergency Stop Switch shall be mounted within 1 metre (approximately) of the motor and generally as shown on the installation drawing (Standard Drawing No. E510) included and shall be readily and conveniently accessible. Note that "Emergency Stop Switch" has been shown as "Lock Off Stop" on the standard drawing E510.

Emergency Stop Switches shall be wired to motor starter circuitry, and connected in the motor starter contactor circuit so that when the button is depressed the motor will stop. When equipment is operating in 'automatic', under the control of the SCADA system and if the Emergency STOP station is operated, then it shall be necessary to also reset the drive from the SCADA before the drive can be restarted.

Provide a large emergency stop label comprising black letters on a red background with the title of the equipment it isolates, e.g.



2.12 UNINTERRUPTED POWER SUPPLY (UPS) SYSTEM

2.12.1 GENERAL

Provide reliable Uninterrupted Power Supply (UPS) with four (4) hour full-load battery backup and associated circuitry to supply 240V AC power to PLC Control Panel, HMI, Instruments, etc.

The UPS shall be permanently on-line and not rely on switching from mains to inverter supply.

The UPS system shall have following features: -

- Minimum full load capability shall be suitable maximum load plus 25% spare capacity.
- Input voltage range 195-280 Volts.
- Regulation of output voltage to $240\text{ V} \pm 4\%$.
- Full load battery back up for four (4) hours.
- The frequency of the generated supply shall be within $+ 0.05\%$ and under transient conditions shall not deviate by more than $+ 1\%$.
- Built in surge protection against lightning spikes, switching transients and power line noise.
- Less than 1% total harmonic distortion.
- Protection against peak impulse current on $8/20\text{ }\mu\text{s}$ waveform of minimum 6 kA peak.
- Both differential and common mode protection.

2.12.2 UPS BATTERIES AND BATTERY ENCLOSURE

UPS batteries shall be dry type (preferred) or sealed cells, and shall be maintenance free. Batteries shall be provided within a free-standing and ventilated enclosure.

Supply and installation of UPS batteries and battery enclosures shall meet the requirements of AS 3011.2 and AS 2676.2.

2.12.3 UPS MAINTENANCE BY-PASS SWITCH

Provide a make-before-break automatic bypass switch for when the UPS fails and a manual make-before-break bypass switch for maintenance purposes. The manual bypass switch shall be separate from the UPS and suitable for panel/wall mounting adjacent to the UPS. When the manual switch is in the 'Bypass' position, there shall be no hazardous voltages present anywhere inside the UPS cabinet.

2.12.4 SIGNALS FOR MONITORING VIA PLC/HMI SYSTEM

Provide sufficient status and alarm inputs, and associated wiring to enable monitoring by the PLC/HMI system. As a minimum provide: -

- UPS Mains Power Failure
- UPS Fault/Failure;
- UPS Battery Low;
- UPS Battery Charger Failure;
- UPS by-passed for maintenance.

All alarms should be volt free alarm contacts and connections are to be such that the non-alarm state of the input shall be the closed condition, thus providing a loss of power or broken wire indication, as the PLC/HMI/SCADA will declare an alarm when input goes open.

2.13 INSTALLATION REQUIREMENTS

2.13.1 GENERAL REQUIREMENTS

All installation including cables, cable supports, fixings, etc. shall meet the requirements of MEW E101. The Contractor shall obtain written permission from the Principal for any variation to the MEW E101 requirements.

Supply and installation of all supports, brackets, plates etc. for the mounting and positioning of all electrical equipment, where required for satisfactory operation is part of this Contract.

Unless specifically stated otherwise all brackets and fixings shall be 316 stainless steel.

Equipment shall be mounted on fixed structures. Where no fixed structure exists, the Contractor shall supply and install an approved structure for the mounting of the equipment.

For Conduits, in lieu of the requirements of AS/NZS 3000, the following space factors shall not be exceeded except for conduit systems without bends or sets where the space factors in AS/NZS 3000 shall apply :-

- For one cable in conduit – 40%;
- For two cables in conduit – 25%; and
- For three or more cables in conduit – 33%.

Explosive tools shall not be used on the installation.

2.13.2 6.12.3 PAINTING, COLOUR CODING AND LABELLING

All painting, colour coding and labeling shall meet the requirements of MEW E101.

2.14 PLC SYSTEM

2.14.1 PROGRAMMABLE LOGIC CONTROLLER (PLC)

This clause indicates the minimum technical requirements for PLC's.

2.14.2 NUMBER AND FUNCTION OF PLC's

The contractor shall determine the number of PLC's and their function within the requirements of DAF pre-treatment system.

2.14.3 TECHNICAL REQUIREMENTS

2.14.3.1 GENERAL

All programmable Logic Controllers (PLC's) shall be from the one manufacturer and range. The PLC shall be suitable for operating in the temperature range -5 to 50 °C and power supply of 240V ± 10% or 24V DC as appropriate. The dielectric strength shall be 1500V AC between any input/output and the outer casing, 50 Hz for one (1) minute with a minimum insulation resistance of 1 mega ohm at 500V DC.

2.14.3.2 CENTRAL PROCESSING UNIT (CPU)

The CPU shall contain the memory, the hardware and software for processing the logic of the inputs/outputs, and the hardware and software for the programming interface. The programming system shall be by ladder diagram. The memory capacity shall be determined by the Contractor during the design stage, however minimum memory capacity shall be suitable for 500 addresses. In addition, each CPU shall have at least 25% spare memory capacity for future use.

The CPU module shall have *RUN/MONITOR/PROGRAM* selectable on the programming console. Status lights shall indicate that the PLC has power, is in the run mode and if an alarm or error has been detected. The CPU shall be complete with EEPROM for the program.

Upon loss of power supply and subsequent power restoration, the PLC must be able to automatically re-start the control process to which it is dedicated.

2.14.3.3 INPUT/OUTPUT (I/O)

The input/outputs shall be separately mountable. Digital inputs shall be 24V DC opto-isolated. Analogue inputs shall be 4 - 20 mA opto-isolated. Outputs shall be volt-free relay contacts with minimum contact rating of 2A at 24 Volts.

Each input and output shall be clearly identified with a traffolyte label and shall have a LED indicating lights which will illuminate when the input/output is present.

Spare I/O shall be provided. Provide 1 spare I/O for every 15 I/O used with a minimum of 16 spare inputs and 8 spare outputs.

2.14.3.4 PROGRAMMER

The PLC shall be capable of being programmed using an IBM compatible PC, with the use of ladder diagram.

The PLC program development software that shall be provided shall include the following capabilities:

- Online programming (program can be altered while the PLC is running the program);
- Off-line programming including features for editing input/output points circuit descriptors, etc;
- Monitoring of data;
- Mnemonic display; and
- On-line forcing of digital bits and data values.

The programs shall be stored on CD's which shall be labelled and dated. Two CDs shall be provided for each PLC. All access codes shall be provided to Council.

The programs shall be the work-as-executed programs as documented in the Maintenance Manuals.

2.14.3.5 PLC SOFTWARE AND DOCUMENTATION

The writing, implementing, program entry, debugging and documentation of the software for the PLC forms part of this contract.

The program shall be listed both mnemonically and in ladder diagram generally in accordance with the typical drawing included in this specification. Manufacturers programming manuals shall be provided in the maintenance manuals. Each contact, output, etc. shall be labelled.

2.15 LIGHTNING PROTECTION SYSTEM

The lightning protection system shall provide protection for structures, buildings and their occupants against the effects of direct lightning strikes. The preferred lightning protection system shall be ERITECH System 3000, or approved equivalent.

The lightning protection system shall comprise, as a minimum, of: -

- i) The Dynasphere Air Terminal.

The dynasphere air terminal shall be non-radioactive terminal manufactured from high quality, non-corrosive material, and shall provide a sphere of protection for the entire site.

Provide computer-generated sphere-of-coverage diagrams.

The sphere shall be mounted on a suitable support and mast, firmly attached to the structure.

ii) The Down Conductor.

The down conductor shall be purpose-designed shielded down-conductor, and shall safely convey the lightning energy discharge to earth while ensuring no side flashing and/or structure electrification shall occur.

iii) The Lightning Event Counter.

The Lightning Event Counter shall automatically register the lightning strikes.

iv) The Earthing System

The earth system shall be of low dynamic impedance.

Any and all Earth rods shall be housed in inspection pits clearly labelled “Lightning Protection Earth”. The lightning protection system shall be bonded to all services as described in AS1768.

Earthing rods and services bonding materials shall be selected in order to minimise corrosion. Resistivity and pH measurements of the soil shall be taken. Earth electrodes and services bonds shall be guaranteed against corrosion for a period of thirty (30) years.

Any tape conductors shall be copper and held in position by copper saddles or clips at a spacing of not more than 1000mm. All bolts, nuts, washers and screws shall be stainless steel.

Removable test links shall be installed in every down conductor. Down conductors shall be bonded to the earthing system by a short length of flexible copper conductor and permanent exothermic welds.

2.16 ELECTRICAL ACTUATORS

2.16.1 COMPLIANCE WITH STANDARDS

The electric actuator including all components shall comply with the relevant Australian Standards and requirements of the Supply Authority.

2.16.2 MOUNTING TYPE AND ENCLOSURE

Mount electric actuators on the driven equipment as required and shall be of the type driven by an electric motor through a gear reduction unit with hand-wheel override, and shall incorporate torque and limit switch mechanisms and position indicator.

Incorporate the motor contactors and the all electrical controls to provide operation, fault and status monitoring via volt free contacts and remote actuation in the LV SCA, and shall be controlled and monitored by the PLC/HMI/SCADA system.

Control the modulating valves using a 4-20mA signal.

The electric actuator with gear reduction unit and electric motor shall be totally enclosed in robust cast iron housing. All access openings and inspection ports shall be gasketed and covers secured with setscrews. All external nuts, bolts, washers, studs and screws shall be type 316 stainless steel.

2.16.3 DEGREE OF PROTECTION PROVIDED BY ENCLOSURES

The degree of protection provided by enclosures for the electric actuator exposed to weather, including the motor and terminal box shall be not less than IP65 in accordance with AS 1939.

2.16.4 MOTOR

The motor shall be suitable for 3-phase 415V 50Hz power supply.

The motor shall operate the driven equipment through a robust gear reduction unit designed for the purpose.

2.16.5 GEAR REDUCTION UNIT

Mount the gear reduction unit directly on the driven equipment, via an adapter if necessary, so that all actuating forces are internal to the equipment.

The gear reduction unit shall be a sealed unit, lubricated for life with suitable grease.

Mechanical limit stops for the actuator shall be on the input side of the drive and not the output shaft.

Worm wheels and worms shall be of suitable materials proven in service. Wheels shall be cast iron or bronze and worms shall be of hardened alloy steel, ground to an accurate profile. The wheel shall be 360° rather than a segment to allow repositioning to allow for wear when necessary. Worm drives shall be self-locking.

All external fasteners shall be of suitable grade of stainless steel.

2.16.6 MOUNTING OF ACTUATORS

Mount actuator so that the hand-wheels are readily accessible by the operators. Hand-wheels shall have horizontal shafts and the shaft height shall be between 750mm and 1200mm from the walkway or access platform level.

2.16.7 HAND-WHEEL OVERRIDE

The hand-wheel override operation shall be mechanically independent of the motor drive. The manual drive shall disengage when the motor drive is started and shall automatically lock out when the motor drive is operating. The hand-wheel shall not rotate during power operations.

Provide a non-corrodible metal label, engraved to indicate the direction of operation of the hand-wheel to open or close the valve.

The maximum force required to operate the mechanical shall not exceed 160N at the hand-wheel rim.

2.16.8 BEARINGS

All bearings shall be ball or roller bearings rated in accordance with AS 2729 “Rolling Bearings - Dynamic Load Ratings and Rating Life - Calculation Method” with factors a1, a2 and a3 equal to one to give a B10 bearing life of 100,000 hours minimum.

Bearings shall be greased for life with suitable proven grease.

2.16.9 POSITION INDICATOR

Fit all actuators (or alternatively the driven device) with a position indicator, which shall provide a clear, positive and continuous indication of the position of the driven device.

The position indicator shall be readily observable by an operator standing on the floor or walkway near the device or actuator.

2.16.10 TRAVEL AND TORQUE LIMITS

Fit the actuators with travel limit switches and over-torque limit switches.

Travel limit switches shall be readily adjustable in the field without the necessity/need to use special tools. Travel limits shall be set by the Contractor to suit the equipment to which the actuator is fitted.

Over-torque limit switches shall be factory set to suit the application.

Operation of these limit switches shall stop the motion in the direction that operated them, but shall not inhibit the motion in the opposite direction.

2.17 EQUIPMENT TAG, SIGNS AND LABELS

Identify each item of electrical equipment, such as motors, instruments, push-button stations, isolating switches, switchboards, computers, etc., and assign a tag/asset number for each item. The equipment Tag/Asset numbers shall be based on the Council's asset numbering system. Assign equipment tag/asset number in consultation with the Principal.

Provide suitable link between equipment tag/asset numbers and maintenance schedule and/or database.

Provide appropriate label for each item including item description and tag number.

Provide all necessary equipment nameplates, and danger and warning signs.

All labels, nameplates and signs shall meet the requirements of the Council, MEW E101, NSW Work Cover Authority, the Occupational Health and Safety Act and relevant Australian Standards.

2.18 MAINTENANCE DATABASE AND SCHEDULES

Provide all necessary information for all equipment to incorporate into a maintenance system database, and provide maintenance schedules. Provide suitable link between equipment tag/asset numbers and maintenance schedule and/or database. The contents and formatting shall meet the requirements of the Council.

Provide suitable link between Maintenance Database/Schedule and Maintenance Manual.

The information for all equipment shall be consistent through out the plant and associated systems in regards to substance and format.

2.19 SPARE PARTS

Provide a list of recommended essential spare parts.

END OF SECTION 4 – ELECTRICAL

5 – CIVIL

1 General

Lachlan Shire Council has decided to construct a Dissolved Air Floatation (DAF) system as a part of augmenting the existing membrane filtration water treatment plant.

This section refers to the civil works only.

Department of Commerce has prepared a geotechnical investigation report for the existing sedimentation lagoons at the WTP site.

The Geotechnical Report – No. 07 – GL53A (October 2007) is available from the Principal for the contractor's information.

The following drawings form part of this specification:

1	Lagoon Survey (reference)	02/2009 - 01
2	Layout of Proposed Works	02/2009 - 02
3	Sludge Drying Beds – Arrangement Plan (WAE)	0202417 - 40
4	Sludge Drying Beds – Arrangement Section and Details (WAE)	0202417 - 41
5	Sludge Drying Beds – Concrete Details (WAE)	0202417 - 42
6	Concrete Details (WAE)	0202417 - 54

2 Description of Works – Optional Tender

2.1 Works

The Works covered by this Section comprise the design development, supply all materials, plant and labour required for the construction of the civil works as shown on the concept drawing and included in this part of the Specification. The design development shall be based on the preliminary design and documentation provided by the Process and Equipment Contractor.

This work is optional only. Tenderers however are encouraged to provide an optional price to undertake this work as well.

The Works are briefly described but not limited to the following:

2.1.1 Pipelines

Design and construction of the pipelines listed below including supply of all materials and labour.

- Pipeline, including connection, from the existing raw water rising main to the proposed DAF system;
- Pre-treated pipeline from the new DAF plant to the existing raw water rising main's spare tee located upstream of the existing magflow meter;
- Pipelines (scum and sludge discharge lines) from the new DAF plant to the new distribution pit as shown on the drawing;
- Inlet pipelines from distribution pit to sludge lagoons 1 and 2 inlet structure;
- Outlet pipelines from lagoons 1 and 2 outlet structures to collection pit;

- Pipeline from collection pit to the existing supernatant pump inlet pipeline; and
- Pipeline from the existing waste water tank to the inlet of the new DAF plant.

New chemical dosing pipelines from the existing chemical tanks to the rising main are not part of this contract.

2.1.2 Civil Works for the installation of DAF Plant

- Design, supply all materials and labour to construct reinforced concrete slab on an elevated platform to install the new DAF plant as per the equipment supplier's specification and requirements;
- Provide a suitable roof cladding supported on a steel portal frame to cover the DAF plant from the weather including guttering, the roof water discharged to the existing stormwater system and plant access from the natural ground. Provide an optional price for netting around the roof to prevent birds entering DAF area.

2.1.3 Distribution and Collection Pits

- Design and construct suitable reinforced concrete and or precast concrete pipe distribution and collection pits at the locations shown on the drawing.
- Pits to be founded on a firm stratum.

2.1.4 Inlet and Outlet Structures inside the Sludge Lagoons 1 and 2

- Design and construct suitable structures for inlets and outlets inside sludge lagoons 1 and 2 at the locations shown in the drawing to the specified design levels;
- Provide stop boards at the outlet structures to control the supernatant and sludge levels in the sludge lagoons 1 and 2;
- Design, supply and construct galvanised steel walkways with hand rails and self closing gates to access the outlet structures at the locations shown on the drawing and provide davits on the outlet structures for lifting/placing of the stop boards in order to control the depth of sludge in the lagoons during the drying mode; and
- Provide steps with hand rails from the natural ground at the toe of the embankment to the walkways.

2.1.5 Sludge Lagoons 1 and 2

- Remove the vegetation from lagoon internal batter slopes, crests and lagoon floors; and
- Stabilise the existing lagoon internal batter slopes and floor to a minimum depth of 400mm with 5% w/w lime and any in-situ clay available.
- A geotechnical assessment of the lagoons' has been carried out and the Geotechnical Report No. 07-GL53A (October 2007) is available for reference.

2.1.6 Miscellaneous Works

- Provide control valves including valve chambers for control and maintenance purposes at appropriate locations;
- Relocate, if required, the existing septic tanks and transpiration trenches to a location conducive to draining the existing wastewater, allowing vehicle access for periodic maintenance. The location should ensure that the septic system does

not pose environmental problems, or the transpiration trenches influence or destabilise existing structures;

- Extend, if required, the existing stormwater system around the proposed location of the new DAF system so that discharge occurs on the western downstream side;
- All other civil work required for the construction of the DAF plant and pipelines; and.
- Site restoration and disposal of rubbish, spoil, etc.

3 Setting Out the Works

The layout of the Works shown on the drawing is diagrammatic only. In no circumstances shall dimensions be scaled from the drawings.

The Contractor, including sub-contractors, shall check all relevant dimensions on site before proceeding with the Works under the Contract.

Provide all labour, materials and other assistance that the Principal may require at any time to check the setting out of the Works or to make progress measurements.

4 Limits of Contract

The civil works for WTP augmentation have been grouped into three parcels of works. These works are as follows:

- a) Construction of all new pipelines including associated components;
 - Construction of distribution/collection/inlet/outlet pits;
 - Connections to existing rising main (near the fence and near the existing magflow meter);
 - Connection of new backwash pipeline to existing backwash tank;
 - Connection of supernatant pipeline from collection pit to the existing pipeline between drying bed and supernatant pump pit; and
 - Concrete encasement of pipelines through lagoon embankments.
- b) Construction of slab for DAF plant installation, roofing and associated works;
- c) Lagoon remedial works.

Limits of contract for 3 separate portions of works identified for the Lake Cargelligo WTP Augmentation are following:

New pipelines

- shall terminate 2m from the edge of new DAF's base slab at inlet side, DAF pre-treated water outlet side and scum/defloat pipelines side
- Reconnections to existing pipelines and other related components shall be part of this contract

New DAF

- Civil works required for the installation of new DAF plant
- Connect all inlet and outlet pipes to the new DAF Plant to pipelines as nominated in contract

Lagoons 1 and 2

- Remedial works on lagoons

5 Project Specifics

The design of the following project items shall meet the relevant Australian Standards, all the specific performance criteria requirements listed below, and all other relevant general requirements within this specification.

5.1 Internal Access Road

The Contractor shall ensure that the existing internal access road is kept in trafficable condition at all times as this is being frequently used by others at the WTP.

5.2 DAF Plant

The work under this contract shall include all work required for the hydraulic design, structural design and construction of concrete slab to suit the DAF plant offered by the equipment contractor including roof to cover the plant from inclement weather and wind. This shall include but not limited to the following guidelines and parameters:

5.2.1 Outline of Works

- Loading - As per AS 1170.0 to AS 1170.4 and equipment supplier's requirements;
- Civil and structural design to AS 3735
- It is proposed to transfer pre-treated water and waste water to various points in the network.
In addition to this, a pipeline from the membrane/GAC backwash waste water transfer pump to DAF plant shall be required;
- Base concrete slab to support the DAF shall be designed and constructed to suit the technical requirements of the DAF equipment;
Excavation for the slab foundation shall be on the advice of a qualified geotechnical engineer;
- Roof and associated structural elements to cover the DAF plant;
Structural Steel and Metalwork – As per equipment's technical requirements and Clause 9;
- Concrete – Refer Clause 8, Concrete Works; and
- Quality Assurance Inspection and Test Plan.

5.3 Pipelines

The hydraulic and civil design as well as construction of pipelines (pressure/non-pressure) shall be as per relevant Australian Standards, DoC's Water Supply Investigation Manual and WS - SPEC 2000:

5.3.1 Outline of Works

The design of pipelines shall include but not limited to the following;

- Use buried pipelines as far as possible;
- PVC-M and DICL pipes with appropriate corrosion protection for buried pipelines;
- Pipes buried under the lagoon embankment must be DICL corrosion protected with cut-off collars and concrete surround;
- Rising main's pressure rating shall be not less than PN 12;
- Flow rates (maximum)

Rising main

-

Contractor to confirm

Pre-treated water line - 64.4L/s

Discharge pipelines from DAF to sludge lagoons 1 and 2 via distribution pit as per system requirements.

Discharge pipeline from outlet collection pit to existing supernatant pump inlet line as per the requirements of equipment's performance criteria.

- Minimum cover - 450mm (non-trafficable) and 600mm (trafficable);
- Concrete – Refer Clause 8, Concrete Works;
- Pressure rating of the pipes shall be in accordance with WS-SPEC 2000 requirements and in excess of pipelines test pressure;
- Provide air valves at high points and scour at low points; scour water discharged to natural water courses or as directed;
- Provide thrust blocks, anchor blocks or any other required support to keep the pipeline on the intended alignment;
- Above ground pipes and fittings shall be flanged and anchored appropriately to suit the site conditions;
- Provide flexible coupling or similar at valve connections, flow meters, distribution pit, collection pit, inlet and outlet structures;
- Provide lockable chambers/pits for buried valves and fittings (magflow meter, in-line mixer, chemical dosing points, control valves and air valves);
- Provide surface boxes for scour valves; and
- Testing of pipelines – Refer Clause 10.4.8.

5.4 Distribution and Collection Pits

The design and construction of the pits shall be in accordance with the relevant Australian Standards, OH&S requirements and to the following parameters:

5.4.1 Outline of Works

- Distribution and collection pits shall be from Hume Pipes Ltd or similar to conform AS 4058 – 2007.
- Distribution and collection pits sizes shall depend on the size of the control valves to be installed inside the pits and space clearances for personnel acceptable to OH&S requirements.

Top level of the distribution pit shall be 300mm above the hydraulic grade level at the pit to accommodate turbulence generated in the pit. The depth of the pit will depend on the foundation level.

Foundation level – A qualified geotechnical engineer shall be engaged by the Contractor to determine foundation requirements;

Ensure that designs minimise differential settlement, and design of components which may be affected, make allowance for this settlement.

- Concrete – Refer Clause 8, Concrete Works; and
- Control valves – Provide two gate valves inside distribution pit and another two valves inside collection pit.

5.5 Inlet Pits in Sludge Lagoons 1 and 2

The design and construction of the inlet pit shall be in accordance with the relevant Australian Standards, OH&S requirements and to the following parameters:

5.5.1 Outline of Works

- Inlet pits shall be from Hume Pipes Ltd or similar to conform AS 4058 – 2007 and shall be of suitable diameter to satisfy OH&S regulations with regards to people working in the confined spaces;
- It shall have notch opening at the top with a notch height of 250mm;

- Sludge discharge from DAF to sludge lagoons via distribution pit shall be by gravity;
- Foundation level – A qualified geotechnical engineer shall be engaged by the Contractor to determine foundation requirements;
Ensure that designs minimise differential settlement, and design of components which may be affected, make allowance for this settlement.
- Top level of the pit shall be designed to suit lagoon top and bottom water designs level including expected sludge level;
- Concrete – Refer Clause 8, Concrete Works; and
- Hydraulic conditions shall be satisfied without short circuiting.

5.6 Outlet Pits in Sludge Lagoons 1 and 2

The design and construction of the outlet pits shall be in accordance with the relevant Australian Standards, OH&S requirements and to the following parameters:

5.6.1 Outline of Works

- Outlet pits shall be of reinforced concrete with a square cross sectional pit area with provision for stop boards to control sludge levels in both sludge lagoons;
- It shall have rectangular opening for provisions for a number of stop boards to suit the opening. Sill level of the lowest stop board shall be kept just above the level of sludge deposited in the lagoon over a period of one year;
- The stop boards shall be made out of tallow wood or similar with provisions of hooks for lifting. Maximum height of stop boards to be 150mm;
Stop boards must ensure that minimum leakage occurs between stop boards, and stop boards and concrete when lagoons are in operational mode;
- Top level of the pit shall be designed to suit lagoon top and bottom water designs level including expected sludge level;
- Davits shall be required at both structures for lifting and placing the stop boards;
- Access walkways shall be required to both outlet pits;
- Pit foundation – as advised by a qualified geotechnical engineer;
- Concrete – Refer Clause 8, Concrete Works; and
- Hydraulic conditions shall be satisfied with regards to piping.

5.7 Sludge Lagoons 1 and 2

Two lagoons have been constructed by Council at the WTP site. Refer Drawing No. 02/2009–01 for Lagoon Survey work as executed drawing. The contractor shall verify the levels shown on the above drawing for crests and floors of both lagoons before starting the works.

These two lagoons require remedial works. The remedial works of the existing lagoons shall be in accordance with the relevant Australian Standards and to the following parameters:

5.7.1 Outline of Works

- Clear vegetation from lagoon internal batter slopes, crests and lagoon floors;
- Stabilise the existing lagoon internal batter slopes and floor to a minimum depth of 400mm with 5% w/w lime and any in-situ clay available;
- The existing profile of the embankments shall be reinstated
- Pipelines passing through lagoon's embankments shall be laid with concrete surround and cut-off collars to prevent short circuiting

5.8 Walkways

The walkways on top of these structures shall be designed so that all are located at a single uniform level to prevent any tripping hazards.

5.9 Roof Over DAF Plant

A metal clad roof on a steel portal frame shall be designed and constructed above the DAF plant to avoid any disruptions to the DAF process due to inclement weather and high wind.

The DAF roofing is to be metal roof sheeting and to conform to AS 1562.1 – 1992. Standard design pre-fabricated industrial shed structures, compliant with Australian Standards & fit for proposed use, will also be considered. Provide an optional price for suitable netting between the roof and the DAF plant to prevent entry of birds into the DAF area.

All access structures and protective railings shall comply with the Australian Standards and WorkCover requirements. The DAF plant shall be provided with an external stairway or a sloping ladder with a lockable door.

5.10 Foundation

A qualified geotechnical engineer shall be engaged by the Contractor to determine foundation requirements.

Ensure that designs minimise differential settlement, and design of components which may be affected, make allowance for this settlement.

5.11 Spacing of Support Brackets

Above ground pipework attached to internal and/or external walls shall be designed and constructed with fixed support brackets. Spacing of fixed support brackets shall be not more than 4,000 mm. Due to water pressure effects, additional brackets, clips or hangers shall be provided to prevent movement.

5.12 Anchorage Below and Above Ground

Thrust blocks shall restrain elastomeric ring joint pipework laid below ground (or installed above ground). Installed thrust blocks shall be designed and constructed at following places:

- At all bends or junctions;
- At the termination of piping;
- At valves installed in the piping;
- At the reducing fitting in the direction of the smaller pipe;
- At changes of direction in excess of 6°;
- At grades in excess of 1.5; and
- In accordance with the manufacturer's instructions.

The placement of thrust blocks to a piping system shall be determined in conjunction with a qualified geotechnical engineer. In general, thrust blocks shall be constructed of concrete with one side bearing against a firm vertical or horizontal face of the excavation as appropriate and designed so that the full hydrostatic forces in the piping are transmitted to the surrounding soil without the maximum safe bearing pressures of the soil and piping material being exceeded.

Thrust blocks shall not be installed so as to allow pressure to be transmitted to any other services.

An installation shall not be charged with water until all thrust blocks have been allowed sufficient time to gain their designed strength.

5.13 Levels and Dimensions

The levels provided in the drawings shall be verified and altered if necessary once the site levels are accurately established.

The following levels and dimensions must be adopted in the design:

- Existing Raw Water Feed Tank: Top Water Level RL 185.15m
- Sludge lagoon 1 and 2 : Top of Embankment -- RL 184.551m
- Free board for sludge lagoons: 300mm (Minimum)

The following levels and dimensions to be determined by the Contractor/designer:

- Foundation levels for DAF base slab, distribution pit, inlet pits, outlet pits and collection pits;
- Floor levels of the above;
- Sludge and water levels in the lagoons;
- Diameter of the pits;
- Invert levels of raw water/pre-treated water pipes from DAF, Invert levels sludge transfer pipeline between DAF and the existing supernatant pump inlet line.

5.14 Materials of Construction

DAF plant's base slab shall be designed and constructed in accordance with the following material requirements and equipment specifications:

- | | |
|-----------------------|----------------------|
| • Structure | Concrete |
| • Roofing | Metal sheet cladding |
| • Portal frame | Steel |
| • Walkways and ladder | Galvanised steel |

Materials and protective coatings adopted in the design must address the corrosive properties of the chemicals used around the plant.

5.15 Isolating Valves and Pits

The following isolating valves shall be provided as a minimum:

- At inlet pipeline;
- At each outlet pipeline;
- At scour pipeline.

6 Civil and Structural Design

6.1 Design Personnel

Use civil/structural engineers with qualifications acceptable for membership into the Institution of Engineers, Australia.

6.2 Design Standards

The civil and structural works shall be designed and analysed in accordance to relevant design standards including, but limited to, the following:

AS 1170.1:2002 Structural Design Actions Part 1: Permanent, imposed and other actions

AS 1170.2:2002 Structural Design Actions Part 2: Wind Actions

AS 3600:2001 Concrete Structures

AS 3700 Masonry Structures

AS 3735 Concrete Structures for Retaining Liquids

AS 4100:1998 Steel Structures

AS 4678 – 2002 Earth Retaining Structures

BCA Building Code of Australia

6.3 Design Considerations

6.3.1 Design Life

Design Life is defined for the purposes of this Contract as the period over which an asset must perform its intended function without replacement, refurbishment or significant maintenance.

The various assets must have the following minimum Design Life:

- | | |
|----------------------------------|----------|
| (i) Stormwater drainage elements | 50 years |
|----------------------------------|----------|

(ii)	Pipelines	50 years
(iii)	Rising/gravity main protective coatings in air	40 years
(iv)	Concrete water retaining structures	75 years

6.3.2 Freeboard

Provide a minimum freeboard of 300mm to all water retaining structures.

6.3.3 Construction Loads

The design shall allow, in addition to the requirements of AS 1170, construction loads that could jeopardise the structural integrity of the structures during construction.

Additional loads from plant and equipment, including vibration effects during operation, shall be taken into consideration in the design of the plinths and floors.

Construction loads due to new work on existing structures shall be kept within acceptable limits.

6.3.4 Water Retaining Structures

For structural designs of water retaining structures such as lagoons and tanks, assume that maximum water level may reach the top of the structure.

6.3.5 Pressure Pipelines

The design of pressure pipelines shall be conducted in accordance with the relevant standards and manuals. The design of pressure pipelines shall include, but not limited to, the following:

- Use buried pipelines, unless specified otherwise;
- Use PVC-M, ABS, or DICL with appropriate corrosion protection for buried pipelines and pressure ratings in excess of the pipeline test pressures;
- Provide air valves at high points and scour valves at low points;
- Provide flexible coupling or similar with each valve installation and at connections to structures for easy removal and installation;
- Provide thrust blocks, anchor blocks, support blocks and any other required support to maintain the pipeline in the permanent position;
- Provide valve chambers for air valves and surface boxes for scour valves;
- Direct scour valve outlets to suitable locations to prevent erosion;
- Design pipeline along the trace shown in the drawing wherever possible;
- Provide valve pits for all underground valves; and
- Comply with the minimum requirements as given in Section 4 in this specification.

7 Protection of Vegetation

Except for the vegetation in the area to be occupied by the Works, the vegetation on site including all trees, shrubs and ground cover shall be protected and not damaged unnecessarily, in accordance with Section 12 Environmental Management of this Sub-Section of the Specification.

The Contractor shall give the Principal seven (7) days notice of his intention to clear any section so that inspection may be made to ascertain whether any trees in the area adjacent to construction activity zones can be preserved without danger or interference to the work. Any such trees to be preserved shall be indicated to the Contractor who shall preserve them from damage.

No fires shall be lit adjacent to trees, materials stored or spoil stockpiled.

8 Earthworks and Foundation Preparation

8.1 General

8.1.1 Extent of Works

The works covered in this section include clearing, grubbing, stripping, excavation stockpiling, filling, compaction and disposal of earthwork material. Clearing may involve removal and disposal of trees.

8.1.2 Nature of Earthworks Materials

The Contractor is advised to have examined the site to gain a good understanding of the nature and type of earth materials encountered in excavation works.

The estimated quantity for general earthworks at any cutting includes all types of materials which may be encountered in the excavation.

The Contractor's responsibility for care of the Works shall include the protection of earthworks.

Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure stormwater run-off does not cause ponding, except where ponding forms part of a planned erosion and sediment control system.

8.1.3 Requirement

Prior to commencing earthworks, the Contractor shall carry out survey, setting out and pegging of the works area and provide erosion and sediment controls and other necessary measures. All pegs shall be maintained in their correct positions and colours. They shall be removed by the Contractor on completion of the contract.

Immediately after clearing operations and before excavation commences, all topsoil shall be stripped.

Prior to the commencement of clearing or excavation, the Contractor shall make all necessary enquires and investigations for the location and protection of existing services and properties from damage.

The excavation activities shall be acceptable to present day construction standards, the Work Cover Authority of NSW and shall comply with the requirements of the Occupational Health & Safety Act and the Construction Safety Act.

The Contractor shall maintain in a stable condition all excavations until the works have been constructed and backfilling operations completed.

8.2 Clearing of Work Areas

The areas to be occupied by the works should be cleared of all grass, rubbish and other objectionable matter within the full width to be occupied by the permanent works to at least 300mm below natural surface, or foundation level, whichever is the lowest. In areas where removal of topsoil is required for stockpiling, clearing activities shall be carried out in such a manner as to prevent, as far as possible, the loss of topsoil.

Areas shall not be cleared beyond the lines indicated on the drawing or as specified. The Contractor shall not cause any interference or damage to natural vegetation other than that specified or indicated by the Principals Authorised Person. Equipment shall be selected such that its movements and activities do not cause damage to surrounding vegetation, trees, buildings and structures. Protective fencing or marking shall be provided to individual trees selected by the Principals Authorised Person to prevent them being damaged.

All damage of every kind, including damage to fencing occurring during clearing operations shall be made good at the Contractor's expense.

8.3 Topsoil

Topsoil is defined as the surface or top layer of soil including fibre roots, vegetation and overlaying grass and is characterised by the presence of organic matter. Topsoil is reasonably free from subsoil, refuse, clay lumps and stones.

Removal of topsoil on any section of the Works shall only commence after erosion and sedimentation controls have been implemented and when clearing, grubbing and disposal of materials have been completed on that section of the Works. Immediately after clearing operations and before excavation commences, all topsoil throughout the length of the work shall be removed to a depth of 150mm and stockpiled separately clear of the work, for later use.

Stockpile shall not be compressed and the height of stockpiles shall not exceed 1.5m. The batter slope shall not exceed 2:1 and the slope shall be such that there will not be any ponding of water.

Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape to facilitate measuring. To minimise erosion, stockpile batters shall be track rolled or stabilised by other means acceptable to the Principals Authorised Person. The topsoil shall be maintained in such a manner that it is not contaminated by any other matter.

Each stockpile shall be protected from surface runoff by use of catch drains, silt fences and an adequate drainage system shall be provided to divert water away from the stockpile area. Stockpiles shall be trimmed and maintained in a neat and tidy condition. Excess topsoil shall be disposed off site in an appropriate manner.

8.4 Excavation

Following stripping of topsoil, excavation is designated as “all classes” and is defined as all excavation, irrespective of the type of material or its condition. The Contractor shall excavate to the lines, dimensions, levels and other requirements specified in the drawings or in the tender document.

The Contractor shall preserve in the soundest possible condition the material below and beyond the lines of all excavation. If material is excavated below or beyond the required excavation or foundation materials are loosened, the over-excavation or loosened material shall be filled with or replaced with approved material at the Contractor’s expense.

Where applicable the excavation may be carried out in two stages.

The Contractor shall excavate the first stage such that all material within 300mm of the final lines, grades and dimensions of the excavation remains undisturbed. The remainder shall be excavated to the required lines, grades and dimensions in the second stage immediately prior to placement of base materials such as concrete or fill material.

The use of two-stage excavation does not relieve the Contractor from the obligation to meet all specified tolerances for excavation and the fees shall be included in the tendered sum.

Explosives shall not be used in any excavation or demolition of existing structures without the prior approval from the Principals Authorised Person.

In areas of deep excavations heavy machineries shall not be brought near the excavated area unless essential for construction work. Necessary shoring shall be provided where required to prevent soil collapses.

No excavation shall be left open overnight unless it is securely fenced.

8.4.1 Excavated Material

The Contractor’s operations in the excavations shall be such that the works will have minimal soil disturbance. Where practicable, materials suitable for use in the Works shall be excavated separately from materials to be wasted. Excavated material shall be segregated by loads during the excavation and shall be placed in the designated final locations or shall be placed in stockpiles and later placed, or processed and placed, in the designated final locations, in accordance with the provisions of this specification.

Selected portion of the excavated material shall be re-used to backfilling.

8.4.2 Tolerances

HORIZONTAL TOLERANCES: The horizontal locations of any point on the surface of excavations shall not differ from the corresponding point given in the drawings, by more than $\pm 50\text{mm}$.

VERTICAL TOLERANCES: The heights of surfaces for excavations measured anywhere shall not vary from those given in the drawings, by $\pm 25\text{mm}$.

8.5 Filling

Selected excavated material may be used for backfilling. The selected material shall be free of tree stumps and roots and shall be capable of being compacted. The method used to demonstrate that the specified compaction has been achieved shall be detailed in the QUALITY PLAN.

Compaction shall be completed promptly to minimise the possibility of rain damage. When rain is likely or when work is not proposed to continue in a working area on the following day, precautions shall be taken to minimise ingress of any excess water into earthworks material.

At the time of compaction the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at the optimum moisture content. Material which becomes wetted up after placement shall not be compacted until it has dried out so that the moisture content is within this range. The drying process may be assisted by aeration or, where approved by the Principals Authorised Person, by the use of hydrated or quick lime at the Contractor's cost. Alternatively, The Contractor may transport the wet material to a stockpile site for drying out and later use as fill material. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. The added water shall be applied uniformly and thoroughly mixed with the material until a homogenous mixture is obtained.

8.6 Foundation

8.6.1 Foundation Preparation

Foundation shall be excavated to the levels recommended by an experienced geotechnical engineer to reach a satisfactory foundation material. The foundation surface shall then be prepared by one of the methods described hereunder or by another method.

The foundation prepared shall produce a firm and reasonably dust-free working surface at the required level. The foundation surface shall not ravel or break-up while the Contractor is placing steel reinforcement or making other preparation for concreting.

Methods of foundation preparation include, but are not limited to, the following:

- (1) By compaction of the natural foundation material with proof-rolling of the exposed subgrade by typically 6 to 8 passes of static roller of 7 tonne minimum operating weight. The method will only be approved if the natural foundation material is well graded with good natural binder.
- (2) By excavating to a minimum of 100mm below the required foundation levels and backfilling with a well-graded material with good natural binder and then compacting.
- (3) By excavating to a minimum of 100mm below the required foundation levels, removing and/or re-compacting all shattered, disturbed or loosened material to the satisfaction of the Principal, and then backfilling with Grade 20 concrete.
- (4) In case of rock foundation, trim the rock to the required levels and remove all shattered, disturbed or loosened material. Depressions or pockets in the rock shall then be filled to the required levels with Grade 20 concrete.

Refer nearest bore holes' geotechnical data for foundation requirements for distribution/collection pits and DAF Plant's platform slab.

8.6.2 Over-excavation

If excavation to more than 100mm below the required foundation level is directed to remove unsatisfactory material, the excavation shall be backfilled to within 100mm of the required foundation levels with approved selected materials. This backfilling may comprise material removed from the excavation or may comprise, in part or all, approved well graded material borrowed by the Contractor from sources arranged by the Contractor, and shall be prepared and compacted.

8.6.3 Backfill and Compaction – General Area

Foundation on fill shall be prepared by stripping and removing from the area all soil containing humus or vegetation matter, and then excavating as directed by the Principal to reach a satisfactory foundation material. Approved selected well graded fill shall be spread in horizontal layers not exceeding 200mm loose measurement.

Compact the soils to the following minimum standard dry density ratios (AS 1289.5.4.1) for cohesive materials and density indexes (AS 1289.6.1) for cohesionless soil:

		Minimum Compaction	
		AS 1289.5.4.1	AS 1289.6.1
(1)	General filling of the site	95% standard	60%
(2)	Fill supporting structures		
	(i) greater than 0.5 m below foundations	98% standard	70%
	(ii) top 0.5 m	100% standard	80%
(3)	Embankments excluding lagoon	98% standard	70%
(4)	Excavated subgrade / foundation supporting structures	100% standard	80%
(5)	Roads		
	(a) less than 500 mm below surface of pavement	100% standard	80%
	(b) greater than 500 mm below surface of pavement	98% standard	70%

8.6.4 Fill and Compaction - Lagoon

Lagoons floors and embankments shall be prepared by removing eroded soil and all soil containing humus or vegetation matter. Stabilise lagoon embankment slopes and floors with in-situ clay material in the lagoon embankment slopes and 5% w/w lime stabilised to a depth of 400mm.

Compact the soils to the following minimum standard dry density ratios (AS 1289.5.4.1)

	Minimum Compaction
	AS 1289.5.4.1
Lagoon Embankments and Floors	98%

Use Hilt Density Ratio – Rapid Method (AS 1289.5.7.1) for compaction control.

Determine in-situ dry density by sand replacement method (AS 1289.5.3.1).

Record all tests performed, including defined location details for each in-situ test.

8.7 Inspection and Testing

Note that the subgrade condition of the adjacent areas may differ significantly from the information shown at the discrete boreholes. Locations of boreholes are shown in the Geotechnical Investigation for Tender Document Report 07-GL53A, October 2007. It is the Contractor's responsibility to assess the subsurface conditions.

Engage a geotechnical engineer for on-site assessment of the earthworks during construction.

Obtain from geotechnical engineer a signed statement to the effect that the construction and soil testing program is in accordance with the Specification.

Have the following inspected and certified by a qualified and practising geotechnical engineer/engineering geologist as complying with the specification:

- Foundation preparation
- Presence of PASS or ASS

- Suitability of material for embankment fill
- Earthworks compaction

Provide certification evidence with each progress claim.

The person appointed to carry out the compaction density testing shall be responsible for determining the locations and test frequencies, unless instructed otherwise by the Principal.

Minimum compaction testing frequency shall be:

Fill under each structure (if supported on fill): one (1) test minimum

8.7.1 Embankments and floors and sludge lagoons testing

Testing Phase	Requirement	Testing Required	Testing Frequency
Initial testing	Clearing the vegetation on the lagoon embankments and floors. Remove the existing embankment fill material to a depth of 400mm minimum on the lagoon internal batter slopes, crests and floors	In-situ density Maximum dry density	After surface preparation of the lagoon at all sides of batter slopes, floors and the crest of the lagoons 1 test per 100m ³
Progressive testing	New material (clay liner) Placing of 200mm thick clay liner after being compacted	In-situ density Maximum dry density	After placing 200mm clay liner over lagoon's internal batter slopes, crests and floors 1 test per 100m ³
Progressive testing	Placing again another 200mm thick clay liner after being compacted	In-situ density Maximum dry density	After placing 200mm clay liner over lagoon's internal batter slopes, crests and floors 1 test per 100m ³

Do not proceed with work on the section tested until all tests have been satisfactorily completed and the results made available.

Rework any material failing to meet the criteria specified. Retest in accordance with the specification.

Use an independent NATA registered Testing Authority for the tests.

Record all tests performed, including location details and results for each in-situ test. Submit to Principal within 5 days of site testing.

Where a test or group of tests is carried out on an area which has been subjected to essentially the same preparation and compaction procedures, the whole of this area is considered to be represented by this test or group of tests. On this basis, if one or more tests indicate that compliance with the Specification has not been achieved, the whole of the area which has been submitted for testing is deemed not to comply, unless it can be demonstrated that the area in which the non-complying test was made can reasonably be separated from the whole.

8.8 Construction Tolerances

Construction shall be to the following tolerances:

- embankments : 50 mm
- embankment alignment : 50 mm horizontal
- top soil thickness : 0 to +50 mm.

8.9 Excavation Supports

The Contractor shall adequately support all excavation as the Works proceed. When withdrawing supports, where provided as required, the Contractor shall exercise every reasonable precaution by means of intermediate shoring, planking props and progressive backfilling to ensure the safety of the Works, buildings or the surfaces over and adjacent to the Works.

8.10 Over-Excavation General

Where material has been disturbed below and/or beyond the levels and limits, without approval of the Principal, the Contractor shall at the Contractor's own cost, make good in accordance with the Specification.

8.11 Trenching, Backfill and Compaction for Pipework

For requirements, refer to **SECTION TR13 WS-SPEC 2000**.

8.12 Disposal of Surplus OTR Material

Surplus material shall be disposed by tipping off site. Surplus material shall only be disposed of at a location that legally allows for the disposal of spoil.

9 Concrete Works – Project Specifics

9.1 Concrete Classes and Grades

Summary of concrete grades and classes to **SECTION SP44** and **SP45 of WS-SPEC 2000** and to the following:

SUPPLY TO THE REQUIREMENTS OF: CONCRETE MIX TYPE: CLASS AND GRADE:		Section SP44 G B N20 N25		Section SP45 RC S40
MATERIALS and MIX	Cement Type	-		SR
	Minimum Cementitious Material (kg/m ³)	-		380
	Maximum Cementitious Material (kg/m ³)	-	-	450
	Max Aggregate Size	-	15	25
	W/C Ratio Maximum	-	-	0.5
	Laboratory Trial Mix Required (Yes/No)	No	N O	Yes
STRENGTH GRADE	f 'c at 28 days (MPa)	20	25	40
OTHER	Nominal Slump (mm)	80	80	*

	Drying Shrinkage (strain x 10 ⁻⁶) at 3 weeks OR { 8 weeks }	-	-	500 { 600 }
	Air Content %	-	-	-
	Pumped Concrete Accepted Yes/No	Yes	Yes	Yes

- not specified * as determined by placement method (max 80, water based)

Select the appropriate class and grades of concrete for structures in accordance with AS 3600. Minimum grades for concrete to be used in this contract are given below.

Structure	Cement Type	Class and Grade	Minimum Characteristic Strength (MPa)
Reinforced concrete foundation slab for pits, concrete surround for lagoon embankment crossings, concrete slab for DAF plant, water retaining structures and lagoons	SR	RC S40	40
Structural concrete for thrust blocks, meter pits, valve chambers, anchor blocks	SR	N25	25
Non-structural concrete such as blinding layers, mass concrete	GP	N20	20

9.2 Reinforcement

Comply with the following for all reinforcing bars:

Grade D500N:	Reinforcement to resist flexure, direct tension, axial compression, shear and torsion
Grade D250N or R250N:	Other purposes

Comply with AS 3600, AS 1302, 1303, 1304 or AS/NZS 4671.

Provide sufficient cover to reinforcement as per AS3600 and AS3735 as appropriate subject to the following minimum requirement.

Structure	Location	Concrete Cover (mm)
Slab, concrete surround, distribution/inlet/outlet/ collection pits, valve pits and all other structural concrete	- Water face	50
	- Air face	40
	- Underground	65
	- Underground or Moderately Aggressive Soils	75 Soil Face
	- Highly Aggressive Soils or PASS	75 + 25 Sacrificial Concrete on Soil Face
Other non structural concrete	- Air face	25
	- Underground or Moderately Aggressive Soils	65
	- Highly Aggressive Soils	75 Soil Face

Refer to Geotechnical Investigation report for geotechnical data, locations and classification of soils.

Lap length of reinforcement shall be to AS 3600 and AS 3735 however shall not be less than 50 times the bar diameter.

9.3 Concrete Placement, Finish and Testing

Place concrete as per **TR10** and test as per **SP44** of **WS-SPEC 2000**.

Do not use curing compound or any admixtures without prior approval of the Principal.

Minimum period between adjacent pours shall be in accordance with the design for Grade 32 or higher concrete, however shall not be less than 7 days in any case.

Provide surface finish as below.

Structure	Finish (Classification as per Cl 6.7, 6.8 of TR10)
- Exposed concrete	F3
- Unexposed concrete (underground or covered)	F1

9.4 Curing and Protection

Protect fresh concrete from premature drying and excessively hot or cold temperatures. Maintain the concrete at a reasonably constant temperature with minimum moisture loss during the curing period.

Carry out curing as per **SECTION TR10, WS-SPEC 2000**.

Use moist curing for all liquid retaining structures.

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.

Concrete is liable to be rejected if surfaces are damaged. Rectification may be attempted only if prior approval is given.

9.5 Concrete Repairs

9.5.1 General

Following the removal of formwork, open out all air voids. Repair all air voids, bolt holes and honeycombing using a suitable epoxy mortar applied strictly in accordance with manufacturer's instructions. Use epoxy mortar as nominated in **SECTION TR10, WS-SPEC 2000**.

Repairs by bagging and cement mortar will not be permitted. Honeycombed concrete shall not be accepted for any structural concrete work. Any cosmetic repairs shall be capable of adequately protecting reinforcing steel for the life of the structure.

9.5.2 Form Ties

Terminate embedded form ties at least 20 mm from the formed face of the concrete. Ties shall be such that the end fasteners can be removed without causing spalling of the face of the concrete. Fill recesses so caused with dry-pack mortar. Keep form ties 30 mm clear of reinforcement. Do not use formwork to support reinforcement.

9.6 Construction Joints

Prepare surfaces of construction joints to requirements of **SECTION TR10, CLAUSE 6.5** of **WS SPEC 2000**, prior to placement of concrete.

Joint surfaces against which concrete are to be poured shall be completely free of foreign matter prior to concrete placement.

Provide a two-part polyurethane sealer on water faces of construction joints.

9.7 Blockouts and Cored Holes

Wire brush all pipework and metalwork to be cast into the concrete to remove all traces of dust, grease, rust and paint prior to the placement of concrete. Additionally for ductile iron pipework power tool clean the manufacturer's external pipe coating from section to be cast or grouted into concrete.

Scabble and treat with an epoxy compound blockouts and cored holes to be grouted. Use the epoxy nominated in Section TR10 strictly in accordance with the manufacturer's instructions and/or recommendations.

Firmly hold in the correct position pipework and metalwork to be built into concrete while the concrete is placed. Coat surfaces of pipework and metalwork, after removal of all dust, grease, rust, paint, etc, with a bonding compound compatible with the grout. Use a self-expanding grout.

In fixing penstocks to concrete, set the frame in one plane by adjusting the backing nuts. Fill the space between wall and frame solid with non-shrink grout or hard setting butyl mastic (not in strip form).

Connect pipes to water retaining structures with a puddle/thrust flange.

9.8 Machinery Bases and Grouting

Steel float the mounting surface of the base to true and level planes.

Prepare structural concrete on which bases are to be erected by scabbling and cleaning off.

Tie bases to structural concrete with vertical reinforcement. Where starter bars have not been provided, removed sufficient of structural concrete to permit the base reinforcement to hook around the main reinforcement.

Consider the additional loading of plants and equipment in the design and construction of plinths. Depending on the design, plinth for heavy plants may rest independently to the building floor with a movement joint.

The machinery base/plinth shall be to the supplier's specifications and requirements.

9.9 Topping and Benching

Minimum thickness of benching to be 25 mm. Use same cement content of topping mix to that of structural concrete being topped or benched. Apply epoxy as nominated in Section TR10 on prepared concrete surface prior to placing. Mix design and placing shall be such to ensure the topping or benching is dense, uniform and the surface free from blemishes.

9.10 Electrical Underground and Built-in Conduits

Supply and place electrical conduits of heavy duty PVC pipes, coloured orange according to AS 2053 non-metallic conduits and fittings. All conduits shall be fitted with draw wires and caps. Long radius bends shall be used. Provide cable pits.

Conduits shall be located generally as shown on the electrical drawings for the equipment. Within buildings, small diameter conduits in non-congested areas may only be built into concrete slabs with the approval of the Principal's Representative. Large diameter and congested conduits shall be located under concrete slabs.

Bedding material for HD PVC pipes shall be selected from granular material free from large or sharp particles and shall be compacted to the required level by hand tamping in layers. Use clean sand, or grey crusher dust (5mm minus).

Electrical pits are to have proprietary female end sockets cast into their sides. The conduits are to be glued into the sockets during their installation to prevent seepage of groundwater into the pits.

All electrical pits are to be provided with a 100mm diameter class 12 PVC gravity drain leading out of them into the nearest low lying spot. Provide a flap valve on the outlet, and provide a stainless steel grid over the exit point inside the pit to prevent vermin entry.

10 Structural Steel and Metalwork

10.1 Extent of Work

The work shall consist of the design, supply and fabrication of all structural steelwork for roof, walkways, handrails, gratings, access covers etc. to cover the DAF plant offered and to construct two walkways to access lagoon outlet pits as shown on the Drawing No. 02/2009 – 02 and includes fabrication, corrosion protection, delivery to the site, storage and erection.

The work shall also include erection of all the steelwork and includes off-loading, high strength bolting, making steel to steel connections, connection to anchor bolts, permanent grouting and repairs to corrosion protection.

10.2 Standards Governing the Work

Structural steelwork and metalwork shall conform to the current relevant standards as follows:

Steel

AS 1163	Structural steel hollow sections
AS 3678	Structural steel - hot rolled plates, floor plates and slabs
AS 3679	Structural steel

Electrodes

AS 1553	Covered electrodes for welding
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Bolts

AS 1110	ISO metric hexagon precision bolts and screws
AS 1111	ISO metric hexagon commercial bolts and screws
AS 1112	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
AS 1237	Flat metal washers for general engineering purposes
AS 1252	High structural steel bolts with associated nuts and washers for structural engineering
AS 1214	Hot-dipped galvanised coatings on threaded fasteners

Workmanship

AS 1554	Structural steel welding
AS 4100	Steel structures
AS 1665	Welding of aluminium structures

Galvanising and Painting

AS 1627	Metal finishing - preparation and pre-treating of surfaces
AS 3750	Paints for steel structures
AS 4680	Hot-dipped galvanised coatings on fabricated ferrous articles.

10.3 Materials

10.3.1 Type of Steel

Type of Steel	Grade
Universal beams and columns, parallel flange channels, large angles to AS/NZS 3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS 3679.1	250
Welded sections to AS/NZS3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS3678	250
Hollow sections to AS 1163:	
- Circulation sections less than 265mm outside diameter	250
- Sections other than the above	350
Cold formed purlins and girts to AS 1397	G450 Z350

Steel rails to AS 1085.1	(one grade only)
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10.3.2 Aluminium

Use aluminium shapes and appurtenant materials from aluminium alloys known commercially as 5083 and 6061-T6.

10.4 Workmanship

10.4.1 General

Neatly machine, saw or flame cut all edges of plates and members. Grind smooth all sharp, sheared and flame cut edges to a minimum radius of 3mm.

Metalwork shall be fabricated and assembled in the workshop wherever practicable.

Remove all sharp corners and edges marred, cut or roughened in handling or erection by grinding or other approved means.

Do not heat stainless steel for purposes of bending, shaping or straightening.

Completed members shall be free from twists, bends and open joints. Sharp kinks or bends shall be cause for rejection.

Items to be assembled and erected on site shall be pre-assembled in the workshop and match marked. During assembly and erection, they shall not be strained, twisted, bent or opened to bring them to their true positions.

Proprietary items shall be used and marked in accordance with the manufacturer's recommendations.

10.4.2 Finish

Give attention to finish of metalwork where exposed to view. Grind smooth welds of metalwork exposed to view.

10.4.3 Site Cutting, Drilling and Welding

Do not cut, burn, drill or weld on site unless shown on the drawings or approved by the Principal's Representative.

10.5 Welding

10.5.1 Requirements

For weld categories use Category GP welds to AS/NZS 1554.1.

Use supervisors and welders who have suitable training and practical experience in the execution of this type of work.

Completed work shall be free from distortions and true to dimensions. Make due allowance for dimensional changes during welding.

All welds shall show a good even contour, a good penetration and fusion with the parent metal, and be without cracks, undercuts, overlaps, excessive slag inclusions and excessive porosity. Cut out unacceptable welds and re-weld.

10.6 Bolts, Nuts, Washers and Jointing Material

10.6.1 General

All exposed boltheads and nuts shall be hexagonal. Bolt lengths shall be such that when fitted with a nut and tightened down, the threaded portion shall fill the nut and protrude from the face thereof by not more than half of the bolt diameter.

Place at least one washer under the bolt head or nut, whichever shall be rotated. Use taper washers where the part under the bolt head or nut is not perpendicular to the centreline of the bolt.

Provide single bolts used as a structural connection with a lock nut.

Smear threads of all bolts and nuts with graphite grease before assembly.

Do not use burred, damaged, corroded or otherwise unserviceable bolts and nuts.

10.6.2 Buried Bolts

Any buried bolt fittings shall be stainless steel bolts wrapped in denso tape or an approved equivalent.

10.6.3 Bolts in Shear

No threaded portion of the bolts in shear shall be within the shear plane of the parts being joined.

10.6.4 Steel Bolts

Use hot-dip galvanised bolts, nuts and washers unless otherwise specified.

10.6.5 Stainless Steel Bolts

Bolt all aluminium members with stainless steel bolts. All stainless steel bolts shall be Grade 316. Use Grade 304 stainless steel nuts and washers and a lubricant to avoid 'seizing'.

10.6.6 Masonry Anchors

Allowable types of fastenings are:

- cast in-situ bolts;
- chemical anchors in drilled holes; and
- expansion sleeve type anchors.

Install chemical and expanding sleeve anchors to manufacturer's instructions and/or recommendations.

Abandon and relocate drilled hole for chemical and expanding sleeved anchors if steel reinforcement is encountered. Thoroughly clean and fill abandoned drill holes with epoxy grout.

Stiffen or strengthen base plates and adjacent steelwork, as required, if relocating the masonry anchors necessitates alteration to steelwork base plates.

10.7 Tolerances

Structural members consisting primarily of a single rolled section shall, after fabrication, unless otherwise specified, conform to the appropriate tolerances as prescribed in Clause 14.4 of AS 4100.

Completed members shall be free from twists, bends and open joints. Sharp kinks or bends shall be cause for rejection.

Tolerances in length shall conform to AS 4100 Clause 14.4.4. The above tolerances shall not result in a cumulative error over the whole or any part of the building.

10.8 Marking

Every separate member shall be plainly marked to show position and direction as necessary for easy identification and correct placing.

Loose pieces for connections shall be attached to their respective members.

Bolts, where not in holes, shall be metal tagged, each type and size in a separate container.

Connections which are to be made by High Strength Bolts shall be given a 75mm wide distinctive flash of colour clear of holes for easy identification. Colour to be wiped and cleaned subsequent to bolting.

The extent and size of all fillet welds which are to be made in the field shall be given a distinctive flash of colour.

10.9 Bedding and Grouting

Set up metalwork which is supported on concrete, masonry or like material on packing or wedges to facilitate alignment and permit subsequent grouting. Use either solid steel or cement mortar blocks of

similar strength to the permanent grout for permanent packing. Remove all other packing before completion of grouting. All grouting shall comply with AS 4100.

10.10 Transport, Storage and Erection

Load, transport and unload structural members without causing excessive stress, deformity or damage.

Carefully place, support and store all materials and structural members off the ground.

Handle members carefully during erection so that the members are not injured or distorted. All connections shall be rigid and tight.

Use drifting only to bring parts into position, not to match unfair holes.

Securely fasten and temporarily brace all structures to keep stable during erection. Temporary bracing shall be sufficient to withstand heavy winds, storms and construction loads.

10.11 Steel and Aluminium Flooring and Covers

10.11.1 General

Manufacture metal flooring from steel or aluminium grating or floor plate. Metal flooring shall be non-slip.

Metal flooring unless otherwise shown shall be easily removable for maintenance and sit flush in metal frames. Manufacture covers to suit the “as constructed” shapes. Provide locating nibs for multiple covers.

Fix in place with manufacturer’s fixing clips gratings supported on structural members. Maximum weight of each removable panel shall comply with WorkCover’s recommendations/requirements.

No covers shall rock after installation. Provide intermediate support members for fixing of flooring panels, if required.

Provide appropriate cut outs in covers to accommodate equipment passing through the covers. Reinforce and provide protection to openings to render safe.

Provide band bars around all cut outs and around the perimeter of all grating panels.

Fabricate and lay out grating such that all longitudinal bars of panels in a continuous area of grating are in line and parallel.

Metal flooring shall be removable without the need to remove handrails or other adjacent structures.

10.11.2 Flooring and Covers near Liquids

Floor panels or covers placed over or adjacent to liquid surfaces shall be made of aluminium.

10.12 Cast Iron Covers, Grates and Frames

Use “Gatic” covers, grates and frames, or equal, manufactured from grey cast iron to AS1830 Grade 12. Select the class appropriate for the expected loading to be imposed. Use covers with a ribbed plate design. Assemble the frames from separate sections bolted and adequately sealed at the joints. Design cover keyholes to positively locate and prevent accidental rotation of the lifting keys. Fit keyholes with plastic or other plugs to prevent the entry of dirt into the keyholes.

Machine horizontal and vertical seating surfaces on both the cover, grate and frame so that the maximum gap between cover and frame at any point does not exceed 0.25mm.

Install covers, grates and frames in accordance with the manufacturer's recommendations.

Fill rebates with minimum Grade N20 concrete.

10.13 Handrailing

Provide hand railing with uniform appearance from either hot-dip galvanised steel or aluminium

Weld handrails and knee rails to the stanchions. Do not use riveted connections. Provide kick plates to handrail system throughout the work.

Where chains are used, use chains with link thickness of 10mm minimum diameter. Supply split line hook at one end, all of hot dip galvanised steel.

Handrailing shall be designed as per AS 1657.

10.14 Ladders, Walkways, Stairways and Platforms

Provide safe and permanent access to all parts of the DAF and other structures identified in this contract without the need of external devices or equipment such as “cherry pickers”.

Do not use vertical rung ladders. Provide stairways as per AS 1657 for access to all structures.

Provide corrosion protection of metalwork as required.

10.15 Corrosion Protection of Steel and Metalwork

10.15.1 General

Protect steel generally by hot-dip galvanising except:

- where a decorative finish is required
- where items are too long to be hot-dip galvanised
- steelwork in aggressive environments, submerged or in contact with water or subject to splash or spray.

10.15.2 Hot-dip Galvanising

Hot-dip galvanise all fabricated steel components (except stainless steel) after fabrication.

Prior to galvanising, clean the surfaces of all dirt, weld spatter, grease, slag, oil, paint or other deleterious matter. Chemically de-scale the steel surfaces or abrasive blast clean to Class 3 standard.

The zinc coating shall consist of a uniform layer of commercially pure zinc free of abrasions, cracks, chemical spots or other imperfections. The zinc coating shall adhere firmly to the surfaces of the steel.

Comply with **TR20** of **WS-SPEC 2000** and AS 4680. Minimum thickness of galvanising shall be:

- 600g/m² for steelwork 5 mm thick or over
- 450g/m² for steelwork less than 5 mm thick.

10.15.3 Defective Galvanised Coatings

Rectify defective coating and repair damaged coatings as follows:

- Re-galvanise where the average zinc coating thickness is less than the minimum as specified.

For the purpose of this paragraph "average zinc coating thickness" shall be the average of not less than 10 determinations over a test area of 1m².

- Where the zinc coating has been damaged, repair the damaged surface by application of a zinc rich epoxy primer or an organic zinc rich paint to a minimum total dry film thickness of 100µm. Alternatively, use an approved low melting point zinc repair, such as BOC Common weld Galvanising Bar, applied as recommended by its manufacturer.

10.15.4 Ventilation Holes

Drill ventilation holes to all enclosed hollow sections to be galvanised. Locate holes at points most suitable for draining off.

Seal holes after galvanising with lead plugs.

10.15.5 Aluminium

Avoid direct contact between aluminium and dissimilar metals with PTFE gaskets, high strength phenolic washers, 2 coats of approved zinc chromate paint or a heavy duty polyethylene tape.

Where bolts are used for attachment of aluminium members to steel, the bolts shall be provided with PTFE bushes and washers to ensure complete isolation.

Apply two heavy coats of an alkali resistant bituminous paint to aluminium surfaces if they are placed in contact with wood, concrete or masonry. Apply the paint as received from the manufacturer without the addition of any thinner.

10.15.6 Protection other than Hot-dip Galvanising

Items too long to be galvanised may be protected in accordance with **CLAUSE 6.2** of **TR 20, WS-SPEC 2000** subject to client approval of the finished appearance of the item and adjoining items. A consistent appearance for the structure will be required and may result in galvanisable items also being protected in accordance with **CLAUSE 6.2** of **TR20, WS-SPEC 2000**.

Where a decorative finish is required or for steelwork in aggressive situations, protection shall be provided in accordance with **TR20** of **WS-SPEC 2000**.

10.16 Dissimilar Metals

The Contractor shall prevent direct contact between incompatible metals by suitable means, including but not necessarily limited to separation layers, sleeves, or gaskets or plastic film, bituminous felt, mastic, paint coatings and the like. Separation materials shall not be visible on exposed surfaces.

10.17 Erection

Safety provisions, erection cranes, equipment, scaffolding and staging shall meet the requirements of WorkCover or other controlling authorities.

The Contractor shall adopt an erection procedure such that all members can be placed and fixed in position without distortion.

The Contractor shall erect, fix, adjust and maintain all members in their intended vertical and lateral alignment and level. Members which do not meet the tolerances specified in Clause 14.4 of AS4100 shall be liable to rejection.

During erection, the steelwork shall be made safe against the wind and all erection stresses and loading conditions, including those due to erection equipment. Permanent bolting or welding shall not be carried out until correct alignment, and camber if any, has been obtained in each member of the structure.

Additional members used to facilitate erection shall be affixed in a manner which does not weaken or deface permanent steelwork.

10.17.1 Bedding and Grouting

Where steelwork is supported by concrete, masonry or like material, it shall be set up on packing or wedges to facilitate alignment and permit subsequent grouting. Such packs, if permanent, shall be either of solid steel or grout of similar strength to the permanent grout. All other packs shall be removed before completion of grouting.

All grouting shall conform to materials and methods in AS4100 Section 15.5.

10.18 Epoxy Coating

Provide epoxy coated steel products as per **TR20** of **WS-SPEC 2000**. Protective coating shall be applied in accordance with the procedures and requirements of **TR20, WS-SPEC 2000**.

10.19 Shop Drawings

Submit copies of shop drawings to the Principal's Representative for approval. Do not commence fabrication until approvals have been obtained. Shop drawings shall show the following information:

- Relevant details of each assembly, component and connection.
- Information relative to fabrication, surface treatment, transport and erection.

Particular: include the following information:

- Identification
- Steel type and grade

- Dimensions of items
- Required camber, where applicable
- Fabrication methods including, where applicable, hot or cold forming and post weld heat treatment
- Location, type and size of welds or bolts
- Weld categories and bolting categories
- orientation of members
- surface preparation methods and coating system
- Procedures necessary for shop and site assembly, and erection
- Temporary works such as lifting lugs, support points, temporary cleats and bracing which are required for transport and erection of the structural steelwork
- Required fixings for adjoining building elements.

11 Pipes and Fittings

11.1 Requirements

The following nominated materials and classes are suitable for this project.

Pipes and Fittings:

- Socketed PVC-M pipes and fittings to minimum PN 12 Series 2;
- Socketed Ductile Iron pipes to minimum PN 20;
- Flanged Ductile Iron fittings to minimum Class 16;
- Spiral wound stainless steel.
- Flanges to pipework, pumps, valves and other equipment shall:
 - be to AS 4087, Class 16 (minimum);
 - be full face; and
 - have 3 mm thick insertion rubber gaskets.

Pipelines shall:

- Be checked for alignment and mating of flanges and connections before being mated, and
- Not be sprung into position or introduce loadings into the flanges and connections due to misalignment.

Install packer flanges where there is a misalignment.

11.2 Pipes and Fittings

11.2.1 General

Select class of pipes and fittings able to withstand the maximum water hammer heads generated during pump start-up, failure, etc, or the nominated minimum class, whichever is the greater. Minimum classes of pipes and fittings are given in the following sections.

11.2.2 Ductile Iron Pipes and Fittings

DI PIPES AND FITTINGS: To Section SP2 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2280 Appendix A)		PROJECT REQUIREMENTS (* See Practices Table of Sections SP2 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)		Potable water, pressure
Pipes	- Nominal size(s)	Designer to specify
	- Class(es)	PN20 (minimum)
	- Jointing	Socketed or flanged
	- Coating and lining	Cement lined, polyethylene sleeved
Fittings	- Nominal size(s)	Designer to specify
	- Class(es)	Class 16 (minimum)
	- Type(s) and jointing	Socketed or flanged
	- Coating and lining	Cement lined, polyethylene sleeved
For PVC pipelines, Series 1 (metric) or Series 2 (cast iron OD)		Series 2
Flanged joint bolting selection (excl valves)		SS316
Flange gaskets, O-rings and lubricant		Required
Elastomeric seal material and lubricant		*EPDM
Bactericidal lubricant		Required
Polyethylene sleeving		Required
Adhesive tape, straps and buckles		Required
Hydrostatic testing of fittings		Required
Acceptable Product Verification Report		Manufacturers without Product Cert. To supply
Certificate of Compliance, to Section SP2		Manufacturer to supply

All ductile iron pipes and fittings to have internal cement lining. The cement shall be free of the external coating material.

For tapers and tees the thickness of the cement lining shall be uniform over the entire internal surface of the tapers and tees. For tapers the thickness of the cement lining shall be that for a pipe of nominal size equal to the larger end of the taper. For tees the thickness shall be that specified for the main body of the tee.

The cement lining shall not interfere with the operation of valves, etc.

Polyethylene sleeves shall be required for buried pipe in aggressive soil.

Tappings of Ductile Iron Pipes

Direct tapping of the pipe is only permitted where the diameter of the tapping is less than one sixth the nominated diameter of the pipe. Use tapping bands where the diameter of the tapping is equal to or greater than one sixth the pipe's nominal diameter. Take measures to prevent corrosion by galvanic action for tapings with dissimilar metals. Such measures shall include the application of suitable coatings or wrapping tapes to the metal surfaces and insertion of insulation material between the dissimilar metals (eg. plastic washers and sleeves for bolts). Use tapping bands for pipes other than ductile iron.

11.2.3 PVC Pipes

PVC PIPES AND FITTINGS: To Section SP4 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS (*See Practices Table of Sections SP4 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)		Potable, pressure, non-pressure (drainage)
Series 1 (metric) or Series 2 (cast iron OD)		Series 2
Pipes	- Nominal size(s)	Designer to specify
	- Class(es)	- Minimum Class 12 for pressure pipes - Minimum Class 9 for drainage pipes
	- Type (pressure)	- DICL for 100 mm and larger - PVC Class 15 for less than 100m
Fittings	- Nominal size(s)	Designer to specify
	- Class(es)	- PVC fittings to Class 15 minimum - DICL fittings minimum Class 16
	- Types	PVC, DICL
Elastomeric seal material and lubricant		Required as per AS 1646
Bactericidal lubricant		Required for clear water main
Acceptable Product Verification Report		Manufacturers without Product Cert. to supply
Certification of Compliance, to Section SP4		Manufacturer to supply

When storing PVC pipes ensure that the pipes are protected from exposure to direct sunlight. Protect any pipes proposed to be stored in the open from sunlight by covering with hessian fabric or sisal paper or other approved material, but not black polyethylene sheets.

PVC can be badly affected by contact with hydrocarbons. Storage or installation should specifically avoid areas where these compounds may be present.

11.2.4 Elastomeric Seals

ELASTOMERIC SEALS: To Section SP15 and the following:

INFORMATION TO BE SUPPLIED (See AS1646 - Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Section SP15)
Elastomers – Material, type, hardness and profile	To pipe and fitting manufacturer's details
Root inhibitor	Not required
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP15	Manufacturer to supply

12 Valves

12.1 General

All valves tendered shall be suitable for the function intended and shall be in accordance with the following requirements.

All valves shall be supplied in accordance with appropriate Australian Standard or to requirements of the WS SPEC – 2000 if an Australian Standard does not exist.

Full details and material list shall be submitted with the tender for valves.

- | | |
|----------------------|--|
| Buried Water Service | - Gate Valve to AS 2638, Part 1 and Part 2 with resilient seats and nylon coated up to 300mm and metal seated above 300mm. |
| Scour Valves | - Valves used as scour valves are to be metal seated sluice valves, but the seating rings are to be screwed or pegged. |
| Non-return Valves | - For backflow prevention |

All sluice valves for buried service shall be supplied complete with a cast steel spindle cap.

The valves shall be suitable for installation between pipe flanges in accordance with AS 4087.

Regardless of the actual operating pressure, the valves supplied and installed shall have the minimum pressure rating of PN12.

All valves shall be work tested and supplied complete with test certificates.

12.2 Specific Requirements for valves

12.2.1 Sluice Valves Metal Seated

Valves shall be supplied in accordance with AS 2368.1 and the following:

Item	Project Requirements
Valve size(s), class(es) and flange class(es)	Contractor required to size valves
Materials:	
- Body and bonnet	DI AS 1831 500/7
- Seal retainer	Gunmetal / AS 1565 C83600
- Wedge	DI AS 1831 500/7
- Seating rings	Required
- Stem	Stainless steel ASTM A276 / SS 316 or 431
- Seat (body)	GM AS 1565/83600
- Seat (wedge)	GM AS 1565/83600
- Spindle Nut	GM AS 1565/83600
Direction of closing	clockwise
Flanged joint bolting selection (fasteners)	Stainless steel 316
Coatings	thermal bonded in accordance with WS SPEC SP30
Additional testing	Required*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets	Required
Bactericidal lubricant	Required
Type Test Results	If no Aust. Std., manufacturer to supply

Item	Project Requirements
Certificate of Compliance, to Section SP20 where applicable	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section WS SPEC SP20	Required

* Testing of the valves shall be carried out in accordance with the testing procedures of AS 2638 Part 1 and shall include a sensitivity test.

12.2.2 Sluice Valve - Resilient Seated

Valves shall be supplied in accordance with AS 2368.2 and the following:

ITEM	PROJECT REQUIREMENTS
Valve size(s), class(es) and flange class(es)	Contractor required to size valves
Materials: - Body and bonnet - Seal retainer - Wedge core (wedge encapsulation rubber AS 1646) - Stem - Gear box housing	DI AS 1831 500/7 Gunmetal / AS 1565 C83600 DI AS 1831 500/7 Stainless steel ASTM A276 / SS 316 or 431 Not required
Closure direction	clockwise
Flanged joint bolting selection (fasteners)	Stainless steel 316
Coatings	thermal bonded in accordance with WS SPEC SP30
Additional testing	Required*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	Rubber AS 1646
Bactericidal lubricant	Required
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP21	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section WS SPEC SP21	Required

Buried service valve shall have cast or forged steel guards fitted to the top of the spindles for operation with a valve key.

12.2.3 Non-Return Valves

Non-return valve materials shall be in accordance with the following:

Item	Project Requirements
Valve size(s) and class(es)	To suit requirements
Materials:	
Body	DI AS 1831 400-12 minimum
Disc	DI AS 1831 400-12 minimum or GM 1565 C83600
Disc seal	O-ring in disc
Body Seat	Stainless Steel (type to be nominated)
Bolting	Stainless Steel ASTM A276 SS316
Disc Shaft	ASTM276 316 or 431
Bearings	Bronze ASTM C95800
Flanged Type	AS 4087 Class 16
Flanged joint bolting selection (fasteners)	Stainless Steel 316
Coating	Thermal bonded epoxy, internal and external
Additional testing	Required
Acceptable Product Verification Report	Manufacturers without product certification to supply
Bactericidal lubricant	Required
Type Test Results	If no Australian Standard, manufacturer to supply
Certificate of Compliance, to Section SP25	Manufacturer to supply
Test Certificate covering hydrostatic testing of body and disc seating	In accordance with AS 4794

13 Construction of Pipelines

13.1.1 General

*Pipelines shall be constructed in accordance with **SECTION TR13** of the **WS-SPEC 2000**.*

Detail of trench filling material and requirements for pipelines construction to be in accordance with **FIGURE TR13.1 & TR14.1** in **SECTION TR13** of the **WS-SPEC 2000**.

The Principal may require the pipelines to be constructed in locations other than as shown on the drawing, for example, if an obstacle cannot be removed.

Topsoil shall be stored at a maximum height of 600 mm.

Thrust blocks and/or concrete encasements for restraining the unbalanced forces shall be provided in all pipelines within the limits of the contract and/or connect to existing pipework.

13.1.2 Existing Services Interfering with the Works

All the existing services are not shown on the Drawing No. 02/2009 - 02.

Where existing services are indicated on the drawings the information is approximate only and shall not be taken as complete.

Advise prior to commencement of excavation, the nature and extent of the existing services and the measures to be taken to ensure their continued use.

If any new structures are to be constructed above the existing pipes in service which are not shown on the conceptual drawing provided with this specification, the Principal shall be informed immediately. The identified pipelines shall be taken out of service at the earliest convenient time prior to constructing new structures above them.

If any damage is caused to an existing pipeline in service the Principal shall be informed immediately and the damage shall be rectified by the contractor at no additional cost to the principal.

13.1.3 Liaison with Other Authorities

Where the pipeline crosses road or construction of the line involves in any way, any other feature under the control of another Authority, the work shall be carried out in accordance with the requirements of the Authority for such work. It shall be the Contractor's responsibility to notify the Authority of his intention to construct, to obtain any approval required, and to complete works and provide any written notification so required.

13.1.4 Laying and Jointing Pipes and Fittings

Except where otherwise specified laying and jointing of pipes and fittings shall be carried out in accordance with the Manufacturer's instructions.

Before being laid in the trenches all pipes and fittings shall be cleaned and examined and, if required by the Principal, the Contractor shall suspend each or anyone in a sling to enable the Principal to sound and examine them.

Take care to ensure that the correct class and wall thickness are always used, particularly where pipes or fittings of various classes or wall thicknesses are used on the same work.

Provide and use drag scrapers or "detectors" to ensure that the interior of the pipeline is clean and free from obstructions. Timber or plugs shall be provided and used to prevent any material from entering sections of the pipeline, which are left uncompleted overnight.

Take all precautions necessary to prevent floating of pipes in flooded trenches.

Place of separation membrane such as Bidim U34, Terram 1000 UV or equivalents for pipelines construction in extremely wet conditions. Costs for place Bidim U34, Terram 1000 UV or equivalents for construction of pipeline shall be included in the items of Tender Schedule.

Use all pipes delivered and cut pipes as needed or directed to suit closing lengths, to remove damaged parts, or to remove sockets if necessary when jointing to a socketed fitting.

In the case of pipelines with flexible joints, deflecting at joints after they have been made shall form gradual changes in grade or alignment. The manufacturer's recommendations in respect of maximum deflection for each joint shall be complied with provided that no joint shall be angled to such an extent as to impair its effectiveness and tightness.

Bolts, nuts and washers for flanged joints, shall comply with Clause **MATERIALS** on **SECTION TR13** of the **WS-SPEC 2000**.

13.1.5 Horizontal and Vertical Thrust Blocks

At all bends and at other parts of the pipeline including sluice valves, tapers and tees, where unbalance forces occur, thrust blocks shall be constructed.

All thrust blocks shall be capable of withstanding the full test pressure as specified in **HYDROSTATIC PRESSURE TESTING** of this section.

Notwithstanding anything contained in **SECTION TR13**, such blocks shall be of concrete Grade 25, reinforced, and cast against undisturbed soil.

An option to construct restrained joints instead of concrete thrust blocks is acceptable.

13.1.6 Chambers/Surface Boxes

Provide suitable chambers with covers for buried valves, in-line mixer, magflow meter and chemical dosing point.

Surface boxes can be provided for buried valves at less sensitive locations to conform to the requirements of WSA 03-2002 and Department of Commerce.

13.1.7 Marker Tape (Detectable Tape)

Marker Tape (Detectable Tape) to be installed for PVC pipeline(s) with green colour and in accordance with AS/NZS 2648.1 and clause **MARKER TAPE** specified in **SECTION TR13** of the **WS-SPEC 2000**.

Location of Marker Tape (Detectable Tape) shall be constructed in accordance with **DRAWING WAT-1201** of the **WSA 03 - 2002**.

13.1.8 Marker Posts and Indicator Plates

Marker posts and indicator plates shall be in accordance with **DRAWING WAT-1300** of the **WSA 03-2002**.

13.1.9 Hydrostatic Testing of Pipelines

Hydrostatically test all pipelines in accordance with AS/NZS 2566.2. Test pressure shall be the maximum water hammer head or 1.5 times the working pressure whichever is the greater.

Use potable water for testing pipelines.

Pressure test all pipelines to detect and repair excessive leakage and defects in the pipeline including joints, thrust and anchor blocks.

Carry out testing before the commencement of roadworks and pits.

Test only when conditions will permit the detection of any leaks.

Test pipelines in sections as soon as practicable after each section has been laid, jointed and backfilled, provided that some or all of the pipe joints shall be left uncovered until the whole of the section has been successfully pressure tested.

A section is a length of pipeline which can be effectively isolated for testing.

14 Building Works

14.1 Roof

14.1.1 Performance Criteria

Minimum Requirements

Provide a roofing system and associated work which:

- remains intact and waterproof under the local or regional ambient climatic conditions;
- provides adequate means of dealing with vapour pressure, condensation, corrosion and thermal movement;
- supports the imposed loads and roof access without impairment of performance;
- satisfies other specified performance requirements.

Design rainfall intensity: 100 year ARI or 250mm/h whichever is greater

Roof access: For normal roof maintenance

14.1.2 Tests for Metal roofing

General tests: Type-test the roof sheeting and fastenings to AS 1562.1 for resistance to concentrated load and to wind pressure.

Cyclonic area tests: For installations in cyclonic regions AS 1170.2 or AS/NZS 1170.2, type-test the roof sheeting and fastenings to AS 1562.1 clause 5.6.

14.1.3 Materials and Components

General: Keep the roofing and rainwater system free of debris and loose material during construction, and leave them clean and unobstructed on completion. Repair damage to the roofing and rainwater system.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

14.1.4 Sheet Metal Roofing

Type: Provide a proprietary system of Preformed continuous ribbed pre-finished zinc/aluminium steel sheet roofing system complete with all necessary fasteners, accessories, trims and flashings all in accordance with AS 1562.1. AS 2180 & AS 3566.

Proprietary item:	Lysaght
Product finish:	Custom Orb Colorbond
Material:	Zincalume Steel
Profile:	Trapezoidal
Thickness (base metal) (mm):	0.48mm
Grade:	AS 1397 - G550 (550 MPa minimum yield strength).
Finish:	Prepainted and organic film/metal laminate products: To AS/NZS 2728
Colour:	To be advised
Fixing:	Roofs: Crest fixing Walls: Valley fixing. Type: Self –drilling and tapping screws to AS 3566 class 3, to the types and sizes indicated in the roof sheeting manufacturer's technical data sheets.
Accessories:	Spacing (mm): Roofs: Every alternate crest/ 4 per sheet Provide material with the same finish as roofing sheets. Preformed continuous corrugated

14.2 Roof Installation

14.2.1 General

Installation to:

- HB 39 Code of Common Practice for Steel Roofing.
- ASTM D200 Classification System for Rubber Products in Automotive Products.
- Manufacturers Roofing and Walling Installation Manual/s.

14.2.2 Barge capping

Finish off along verge lines with purpose-made barge capping.

14.2.3 End laps

General: Where end laps are unavoidable, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap.

Length of lap (mm): To manufacturer's recommendation.

14.2.4 Metal separation

Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either

- applying an anti-corrosion, low moisture transmission coating to contact surfaces; or
- inserting a separation layer.

14.2.5 Screws and fasteners

Screws and Fasteners - Standard Colorbond® grade roof sheeting: Self-drilling and tapping screws to AS 3566 class 3 and are to be of the types and sizes indicated in the roof manufactures printed technical data sheets.

14.2.6 Thermal insulation

Supply and install in the roof thermal insulation consisting of 100mm thick fibreglass insulation blankets supported by chicken wire.

Insulations shall be installed in accordance with the manufacturer's recommendations.

14.2.7 Gutters, gutter brackets, downpipes and drain pipes

Quad gutters shall be zinc aluminium (colour to be advised) coated material 120mm wide, with 100 x 75mm downpipes as required, complete with brackets. Each downpipe shall be fabricated with mitred bends as required. Each downpipe shall be well entered into downpipe outlet in gutter.

Position the outlet of the downpipes to discharge water into nearby vegetation at non erosive velocities.

14.2.8 Quality of work

Care, storage, handling, cutting and installation all in accordance with the relevant Australian Standards and the roof manufacturers printed technical data sheets.

14.2.9 Colour Schedule

Paint all steelwork surfaces, except Colorbond surfaces.

Obtain colour schedule from the Principal at least 10 working days before commencement of painting of the finish coats.

14.2.10 Finishes schedule

External

Roof	–	Custom Orb Colorbond
Flashings, gutters, downpipes	–	matching finish to colorbond roof

Internal

Floors	–	Steel trowelled concrete
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15 Access Road

Contractor shall be responsible for maintaining the existing access roads within the WTP site to pre-existing condition as these are constantly used by WTP personnel.

16 Standard Specifications

16.1 WS-SPEC 2000, Water Services Specification

This project specification references the current issue of WS-SPEC 2000, including any Addendum, but neither is included herein. WS-SPEC 2000 is available from Standards Australia, Customer Services Centre, GPO Box 5420, Sydney NSW 2001, telephone: 1300 654 646 and e-mail: sales@standards.com.au. The addenda are available as a free download from the website www.standards.com.au, noting that the keywords “water services specification” must be used, as WS-SPEC 2000 is not recognized.

The following water services specifications form part of this specification.

Section SP2 - Ductile iron pipes and fittings

Section SP4 - PVC pipes and fittings

Section SP6 - Polyethylene pipes and fittings

Section SP8 - Pre-cast concrete pipes

Section SP15 - Elastomeric seals

Section SP19 - Couplings mechanical non-restrained

Section SP20 - Sluice valves metal seated

Section SP21 - Sluice valves resilient seated

Section SP23 - Knife gate valves

Section SP27 - Air valves

Section SP30 - Protective coatings for valves

Section SP44 - Concrete supply standard class

Section SP45 - Concrete supply special class

Section TR1 – General requirements

Section TR 2 – Site preparation and restoration

Section TR 7 - Earthworks

Section TR 10 - Concrete placement

Section TR12 – Pipeline Excavation

Section TR13 – Pipeline installation pressure

Section TR 14 - Pipeline installation non-pressure

Section TR 14 - Protective coatings

16.2 Agency Standards

16.2.1 Standards Australia

Australian, British and International Standards cited in this Specification are available from Standards Australia (SA).

16.2.2 Water Services Association of Australia

Water Supply Code of Australia WSA 03-2002 Version 2.3 is available from Water Supply Association of Australia Inc.

17 Stormwater Drainage

17.1 General

The existing stormwater system shall be extended around the proposed site of the DAF system and discharge downstream of the location. Stormwater from roof, and other impervious surfaces shall be collected in system of pipes and pits and connected to the extended site stormwater system.

Encasement

General: If cover for pipes is less than 600mm, encase the pipeline with concrete at least 150 mm above and below the pipe, and 150 mm each side or the width of the trench, whichever is the greater.

Concrete: Grade N20 to AS 1379.

17.1.1 Pits/Trench Drains

Excavation & Foundation Preparation

Carry out excavation or filling works for the foundation in accordance with others sections of this specification. Backfill over excavation or loosened material with compacted earth backfill for soil foundations and concrete backfill for rock foundations. Unless otherwise specified or directed, backfill concrete placed in the foundations or adjacent to concrete structures shall be Class N20. All such work shall be at the Contractor's expense.

Whether the foundation is on original ground or on a fill, ensure a minimum bearing capacity of 120KPa.

Blinding concrete layer

Place a layer of 75mm thick Grade N20 blinding concrete on prepared foundation areas as soon as possible after and within 72 hours of excavation and foundation preparation. Plant and equipment shall not work or travel on the blinding layer.

Finish to exposed surfaces

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Corners: Cove or splay internal corners.

Metal access covers and grates

Standard: To AS 3996.

Grate type: Kerb inlet pits: Removable Heavy duty cast iron or galvanized iron gratings
 Other pits: Galvanised grates (eg. "Webforge" or equivalent)

Loading: To withstand against T44 wheel loading

Cover levels: As follows unless specified in drawings:

- In paved areas: Flush with the paving surface.
- In landscaped areas: 25 mm above finished surface.
- Gratings taking surface water runoff: Locate to receive runoff without ponding.

18 Miscellaneous

18.1 Temporary Fence and Gate

Provide temporary fencing with gate/s around the project area.

18.2 Safety Signs

- Text: "DANGER - AUTHORISED PERSONNEL ONLY"
- Colour: Standard red and black lettering on white background.

- Size: 450 mm long x 300 mm high.
- Material: Galvanised sheet metal.
- Spacing: Displayed at 25 metre centres at 1800 mm height.

18.3 Removal

Maintain temporary fence, gate/s and signs, and remove on completion of project.

END OF SECTION – CIVIL WORKS

6 - TESTING, DEMONSTRATION AND COMMISSIONING

1 OVERVIEW

Testing is defined as tests by the Contractor prior to demonstration of the DAF pre-treatment system to the Superintendent. Testing includes both works testing and site testing as applicable.

Demonstration is the testing of the entire DAF pre-treatment system by the Contractor in the presence of the Superintendent's specialist personnel prior to Commissioning.

Commissioning is a three (3) day operating period by the Contractor of the DAF pre-treatment system and includes operator training.

Provide all equipment, materials, labour, services, advice, instructions and other facilities necessary to test, demonstrate and commission, and make the Water Treatment Plant comply with, and operate in accordance with the Specification.

At least two weeks before testing is due to commence, furnish to the Superintendent in writing a detailed program for the testing of all equipment covered in this Contract.

At the end of the testing forward a report to the Superintendent confirming that all items on the program have been satisfactorily tested. This checklist shall be available to the Superintendent prior to the commencement of the demonstration by the Contractor.

2 WORKS TESTING

2.1 OVERVIEW

Test all components of the DAF pre-treatment system including electrical switchboards and control panels, pumps etc. prior to dispatch to the site, the Contractor shall carry out works testing on all of the supplied equipment. This may involve using water and chemicals where practical.

The Superintendent's Representative may witness the testing process. The Contractor shall advise two weeks prior to the works testing the date and place of the work testing.

Works testing at the manufacturers works shall be carried out for the following:

2.2 FLOW MEASURING EQUIPMENT

Testing and Calibration

Carry out testing and calibration of flow measuring equipment for recording or controlling (both water and air) at the Supplier's works prior to delivery to site.

Calibration Certificate

Provide a Calibration Certificate for each primary element on completion of all tests. For orifice plates, supply calculations and carry out checks of machining and tolerances.

2.3 PUMP SET TESTS

The following tests shall be carried out on the recycle water pumps as required at the manufacturer's works:

Casing Hydrostatic Test

Certified

Pump Performance Test	Certified
Performance Test Procedure	To AS2417 Part 3 Class B
Submit a pump test certificate at the completion of each pump.	

2.4 BUTTERFLY, GATE, NON-RETURN, KNIFE GATE VALVES

Hydrostatic and Performance Tests

Hydrostatic and performance test all butterfly, gate, non-return and knife gate valves, of nominal size of 100 mm or larger, at the manufacturer's works. Submit a document certifying that the valve performance is in accordance with this Specification for each valve.

Carry out tests as follows:

Gate Valves

In accordance with the test procedures of AS 2638 or AS 3579.

Non Return Valves

In accordance with the test procedures of AS 3578. This procedure is also to be used for the tilting disc type. Test the function of limit switches.

Knife Gate

In accordance with the procedures set out for Gate Valves.

Butterfly Valves

Hydrostatically test the valve bodies as follows:

- (i) Hydrostatic test pressure as scheduled shall be slowly and uniformly applied and held for 30 seconds. The valve body will then be inspected at this pressure.
- (ii) Following satisfactory completion of the above test the valve shall undergo differential pressure test for leaks as follows:

On the upstream side of the valve, slowly and uniformly increase hydrostatic pressure to the disc or gate strength pressure as scheduled and held for 30 seconds.

Performance

After satisfactory completion of the above tests, the valve shall be subject to performance testing as follows:

- (a) Manual Valves

Open and close valves to check the ease of operation and position indicator.

- (b) Pneumatic Actuated Valves

During the test, only clean and dry compressed air shall be used. Check the operation of the limit switches where they are fitted.

- (c) Electric Actuated Valves

Check all functions of electrical actuators, including limit switch operation, protection devices, position indicators, controls, etc.

Repair any defects disclosed by the hydrostatic pressure tests. Re-test all repaired sections tested hydrostatically.

Furnish all labour, materials, equipment and data, including test heads, bolts and/or stud bolts and nuts required for making the test.

Test Pressures - Hydrostatic

Filter Valves

Body test pressures	-	1800 kPa or double the working pressure, whichever is greater.
Bubble tight sealing	-	1000 kPa.

Gate Valves

Body test pressure	-	2400 kPa.
Gate strength test	-	2400 kPa.
Drop tight sealing	-	1200 kPa and 200 kPa.

Knife Gate Valves

Body test pressure	-	1400 kPa.
Sealing	-	700 kPa.

Non Return Valves

As for gate valves.

Butterfly Valves, Pumping Machinery

As for gate valves.

Pumping Machinery

Double the shut off head.

2.5 SWITCHBOARDS AND CONTROL PANELS

All switchboards and control panels shall be tested at the Manufacturer's Works. The Contractor shall not deliver switchboards or accessories to site until all tests have been satisfactorily completed and all defects detected during such tests have been rectified. Submit test certificates to the Superintendent prior to dispatch from works.

The final test may be made following completion of all work on the switchboard. During this final test, carry out tests as specified in AS 3439 as applicable, as well as simulating site conditions of all operating modes, control functions and instrumentation loops. Provide test certificate.

The test would include the following:

- (a) Circuit continuity, termination checks and component installation checks.
- (b) Fuse and circuit breaker ratings check.
- (c) Functional check of all components, including logic testing of hard wired, programmable circuitry and colour graphics.
- (d) Routine tests as defined including di-electric test.

Provide input simulation and output status indication.

For the purposes of functional testing, temporarily wire all inputs to labelled switches and/or analogue signal generators as appropriate would be required. Temporarily wire all outputs to labelled indicating lights.

All switchboards shall be tested to AS 3439. Submit test certificates to the Superintendent prior to dispatch from works.

2.6 CONTROL AND INSTRUMENTATION SYSTEM

Elements of the control and instrumentation system shall be tested by the Contractor at the Manufacturer's Works in a similar manner to the switchboards. Simulate the operation of the entire Central Control System at the works by the Contractor and carry out all improvements and optimisation of the system operation.

Supply and connect all necessary input and output devices to simulate all external circuit conditions and signals. All inputs shall be temporarily wired to a labelled set of switches and/or function generators as appropriate.

Temporarily wire all outputs to a labelled set of indicating lights. Temporary labelling may comprise marked masking tape clearly indicating the function of each and every simulation device. Carry out all preliminary tests necessary to ensure system is connected correctly.

2.7 ELECTRIC MOTORS

Test Certificates

Each motor shall be routine tested by the motor manufacturer at his works in accordance with AS 1359, Part 60. Submit for approval type test certificates for each motor type and size, together with the routine test certificates.

Protective Devices

All protective devices, eg. thermistors, seal failure, shall be connected during testing.

3 SITE TESTING

Following the installation of the DAF pre-treatment system and all ancillary items which have been installed, the DAF system shall be checked and tested as a complete operating unit using raw water, backwash water return and delivering pre-treated water to the plant.

3.1 EQUIPMENT AND CIRCUIT TESTING

Test all equipment to ensure that the equipment supplied is operational and conforms to the Specification.

At completion of installation work and prior to energisation of all medium and low voltage circuits, continuity and insulation testing, using a 1000V Megger, shall be made as follows by the Contractor:

- (a) Power circuits shall be checked, phase to phase, phase to neutral and phase to earth (as appropriate). Control circuits shall be checked core to core and core to earth. Circuits must show a minimum insulation resistance of 10 Megaohms. Reading obtained shall be recorded and included in the Operation and Maintenance Manual.
- (b) Switchboards control panels etc., shall be re-tested to ensure the control functions are as per the Specification. This testing shall demonstrate the operation conditions.

Where instrument loops are such that the measured variable cannot be altered, the appropriate variations shall be simulated using pressure and/or current injection. The value of the earth resistance of the local earth station(s) shall be measured and recorded in the Operation & Maintenance Manual.

3.2 PREPARATION FOR TESTING

Undertake any necessary work by way of temporary connections, connection of instruments, cleaning of vessels, tanks, pipelines and equipment, safety measures and other preparations for carrying out testing in a workmanlike and expeditious manner before commencement of testing and made good or cleared away after completion of testing.

Bench scale test equipment such as pH meter, photometer, jar/paddle floc tester and turbidimeter are available on site and are not required to be supplied.

3.3 COMPLETION OF TESTING

At the end of the Contractor's site testing program, prepare a report and submit to the Superintendent confirming that all items have been satisfactorily tested. This report shall be fully comprehensive and provide details to prove that all equipment and controls are in accordance with the specified requirements.

4 DEMONSTRATION

Upon receipt of the satisfactory site test report from the Contractor, the Superintendent will arrange within five (5) working days for a specialist team from Sydney to travel to the site. The Contractor shall demonstrate to the team the satisfactory compliance of the equipment to all clauses of the specification.

In the event that all equipment cannot be demonstrated to operate satisfactorily and in accordance with the Contract during a period nominated in the construction program, then the Contractor shall reimburse the Superintendent the cost of having the specialist team on site. This cost shall be based on \$1,800 per person per day.

Work during the demonstration shall include but not be restricted to the following (apply items only relevant to this plant):

- Inspecting the installation and testing of all equipment to ensure compliance with Specification/Contract drawings.
- Verifying the accuracy of metering pump/feeder settings versus flow/feed rates.
- Dosing operation for all chemicals, and continuous operation of the system while dosing.
- Auto/manual of the start-up/shut-down procedures for all chemical dosing.
- Status/alarm signal and indications.
- Safety equipment/requirements.
- Noise levels.
- Pre-treated water quality.
- DAF system capacity.
- Correct response to failure and restoration of power.

- Correct response to simulation/introductions of faults and failures.
- Water tightness of water retaining pipes and structures.
- Stairway, walkway and platform to WorkCover Authority requirements.
- Pipework arrangements.
- Correctness of operation and correctness for setting of parameters for each instrumentation loop.
- Correct operation of all field connected items.
- Checking of all interlocks and control logic, including operation of:
 - flow switches,
 - limit switches,
 - status and alarm indication and display.
- Correct operation including correct functioning when problems occur, e.g. power failure, valves fail to operate as they should.
- Correct operation of the logic of any PLC program in relation to overall Plant operation, including functioning of the DUTY/STANDBY system.
- Carry out any modifications or adjustments necessary to ensure compliance with the Specification.

5 COMMISSIONING

5.1 SCOPE

After successful completion of Demonstration to the Superintendent's specialist personnel, Commissioning of the WTP as a whole unit shall be carried out.

The Work required during Commissioning includes but shall not necessarily be limited to:

- (i) continuous operation; or stopping and starting as required by the water supply system;
- (ii) shut down of the system (normal and emergency);
- (iii) revisions to Drawings and Manuals as and if required;
- (iv) work and items associated with or incidental to the above.

5.2 DURATION OF COMMISSIONING

Commissioning shall be deemed to be complete when the whole of the Works has been run continually without any faults for a period of three (3) consecutive working days (excluding Public Holidays, Saturdays and Sundays). The Plant shall start and stop during this period according to town water demand. If during this period, any of the following occur, then the three (3) day test shall be recommenced for a further three (3) days after the necessary rectification work has been completed:

- (i) Any major process or equipment failure to operate as specified;

- (ii) Any defect that prevents the DAF or associated equipment from operating within the requirements of the contract, or achieving the required lifespan specified in the contract; and
- (iii) Water quality does not meet the requirements set out in Sub-section 1 - General.

5.3 STANDBY EQUIPMENT

During the commissioning period, both duty and standby equipment shall be tested. Any failure of equipment shall be rectified or the faulty equipment replaced.

5.4 OPERATION OF PLANT

The plant shall be run by Council personnel (referred to in Clause 7.1 of this Sub-section 7) under the supervision of the Contractor during the five days specified above.

5.5 CONTRACTOR'S PERSONNEL

During the period of Demonstration and Commissioning, the Contractor shall have on site technical personnel who are specialist in the operation of the plant and the various equipment.

5.6 COMPLIANCE TESTS

The following tests and measurements shall be carried out by the Contractor in the presence of Council's operator or representative(s) from the Superintendent during the commissioning to prove compliance or otherwise with this Specification and the Performance Guarantee:

- i) Measurement of pre-treated water quality parameters. Tests shall be undertaken at approximately equal time intervals over the daily operating period.
- ii) Measurement of net system output on a daily basis,
- iii) Measurement of consumption of each chemical on a daily basis.
- iv) Measurement of power consumption on a daily basis.
- v) Measurement of backwash wastes quantity on a daily basis.
- vi) Noise measurement.

During the commissioning and Defects Liability Period, Lachlan Shire Council will sample the pre-treated water and undertake tests of the water quality parameters listed in Sub-section 1, as appropriate. The Superintendent may direct the Contractor, at the Contractor's cost, to take relevant water samples and undertake specific tests using a NATA registered laboratory, if Lachlan Shire Council have any doubts over the quality of the water produced by the plant.

6 OPERATION AND MAINTENANCE MANUALS AND TOOLS

6.1 SUBMISSION OF OPERATION AND MAINTENANCE MANUALS

Supply to the Superintendent for information only a draft copy of the Operation and Maintenance Manual at least two (2) weeks prior to commencement of demonstration. At the end of the commissioning period, submit to the Superintendent a revised version of the Manual for review. This version shall incorporate all the changes to the equipment, controls and electrics that have been made during the demonstration and commissioning periods. A copy with the Superintendent's comments will be returned to the Contractor for correction. Incorporate all the corrections and return three (3) complete sets of the manuals to the Superintendent. These copies shall be suitably bound in durable

hard covers and labelled. Practical completion for Separable Portion 3 will not be granted until the final manuals are received by the Superintendent.

6.2 OPERATION AND MAINTENANCE INSTRUCTIONS

The Operating Instructions shall be sufficiently comprehensive to enable the equipment installed under this Contract to be operated in an efficient manner. The Maintenance Instructions shall be in sufficient detail to enable the overhaul and replacement of all parts of these new equipment, except for specialised equipment, to be carried out readily by Lachlan Shire Council's staff.

All the Instructions supplied shall have detailed indexes that will enable specific items to be quickly and accurately located.

Where Manufacturers' standard manuals are supplied for any equipment, relevant parts of these manuals shall be clearly marked.

6.3 OPERATION AND MAINTENANCE MANUALS

The Manuals shall include:

- a) A concise description of the process, mechanical, and electrical equipment provided under this Contract together with performance specifications and mode of operations and controls.
- b) Work-as-Executed Drawings comprising:
 - (i) general arrangement(s)
 - (ii) sectional arrangement(s)
 - (ii) parts list(s)
 - (iv) performance curve(s)
- c) Procedures to be followed for equipment start-up, operations and shut-down.
- d) Procedures to be followed for installation, testing, maintenance and fault finding. Fault finding procedures should be in the form of a chart listing "fault", "possible cause" and "remedy".
- e) Instructions for dismantling, re-assembly, repair and adjustment.
- f) Lubrication chart for the equipment provided in this Contract (Chart to list out items for weekly, monthly, bi-monthly, three monthly, six monthly lubrication).
- g) List of all equipment in the Plant together with manufacturer's name, manufacturer's nearest representative, and contact details.
- i) A comprehensive index of manufacturer's manuals supplied, referenced by equipment type and number as well as manufacturer's name.
- j) A comprehensive routine maintenance schedule for the entire plant (List of items for daily, weekly, monthly, bi-monthly, three weekly, six monthly checking).
- k) Complete details of earthing systems as installed.
- l) Sufficient additional information to enable any parts of any equipment to be ordered from the manufacturer and a list of spare parts to be kept in store.
- m) Procedures in sufficient details for setting of all chemical dosages in the plant.

- n) Calibration charts for the dosing of all chemicals by their respective feeders and control valves.
- o) Chemical Safety Data Sheets.
- p) A daily log sheet for logging the additional operational parameters of the water treatment plant.
- q) An index and brief description of the components within each instrument/control loop providing brochure reference, supplier name and phone number.
- r) Programmable Logic controller users manuals.

6.4 TOOLS AND LUBRICANTS

Provide any special tools or accessories necessary for the satisfactory operation and maintenance of the equipment shall be provided for items that can be maintained by the operator.

Provide a supply of the recommended lubricants sufficient for a period of one year's running. This does not relieve the Contractor of the responsibility of ensuring that all grease lubricators and oil reservoirs have been filled and a grease-gun applied to all nipples before starting up the system.

Provide a detailed schedule, in duplicate, of the tools supplied (one copy to be retained by the Superintendent after checking the goods).

7 INSTRUCTION OF OPERATORS ---

7.1 OPERATOR TRAINING

By arrangement with the Superintendent, run a training course on-site to instruct up to four Council personnel nominated by the Superintendent on all equipment supplied and installed and on operation of the DAF system. During this course, provide a fully informed Engineer, plus any Technicians required, for the instruction of these personnel. The course shall include instructions on operation, calibration, setting, testing and maintenance of all equipment and instruction on operation of all safety equipment.

The course shall cover, but not be limited to, the following:

- Description of the process.
- Setting up, calibration, testing, maintenance and cleaning of all equipment provided under this Contract.
- Instrumentation and controls of the plant including the switchboard, status and alarm panel.
- Manual (if applicable) and automatic plant operation, including plant start up and shut down procedures.
- Safety procedures for the use of equipment and chemicals provided under this Contract.
- Fault-finding procedures.
- Knowledge of the operation of the PLC, the Ladder diagram, making changes to program on the operation adjustable items such as timer settings, etc.
- Explanation on the use of the Operation and Maintenance Manual and As-Ex- Drawings.
- Explanation on the daily log sheet.

- Explanation on chemical dosages calculation.

7.2 INSTRUCTION MATERIAL

Visual aids and demonstration equipment or materials as required or appropriate shall be provided by the Contractor.

7.3 DURATION OF TRAINING

The training course shall run for a minimum of three (3) days. This shall be concurrent with commissioning of the Plant.

Provide to the Superintendent a program of the training course one week prior to the commencement of the course.

7.4 TRAINING AFTER COMMISSIONING OF THE PLANT

Other than that specified in Clause 'Duration of Training', of this Sub-section, the Contractor shall provide a price for an additional 2 days training of Council operators on site within 6 months of commissioning of the plant. If this is accepted the exact date would be nominated by Lachlan Shire Council.

The Contractor will be given four week advance notice.

The Contractor shall carry out the training course again as detailed in Clause – Operator Training, of this Sub-section.

8 INSPECTIONS IN THE DEFECTS LIABILITY PERIOD

Include for an inspection by experienced personnel familiar with the contract and operation of this plant accompanied by the Superintendent during the eleventh (11) month of the Defects Liability Period.

During the inspection, performance check of the WTP and water quality/quantity compliance tests shall be carried out by the Contractor in the presence of specialist personnel of the Superintendent.

Rectify all defects identified by the Superintendent prior to the end of Defects Liability Period.

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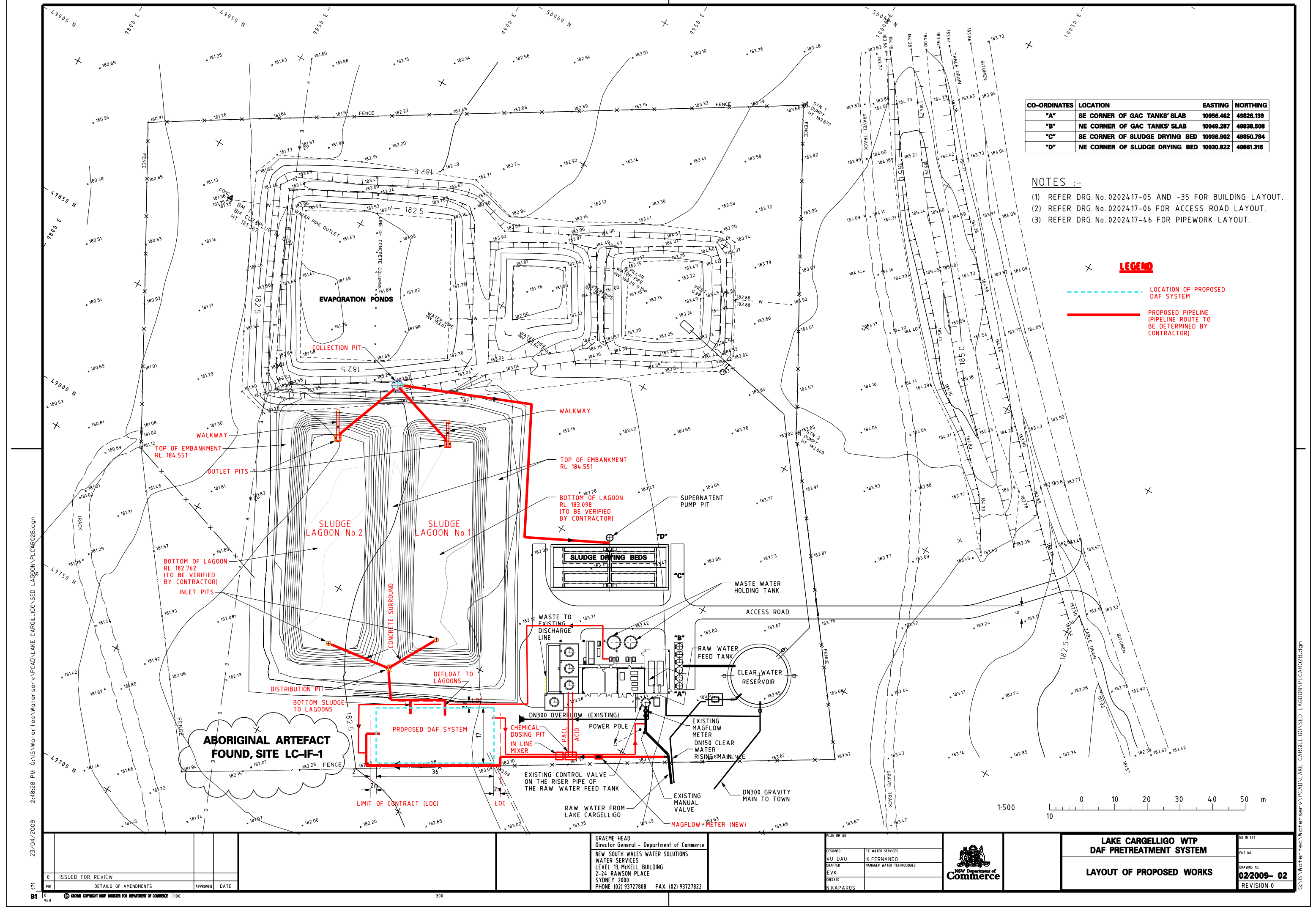
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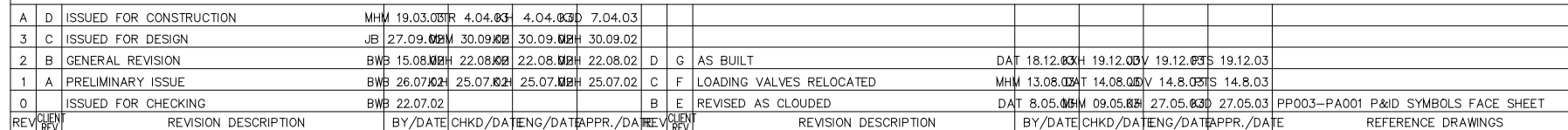
CO-ORDINATES	LOCATION	EASTING	NORTHING
"A"	SE CORNER OF GAC TANKS' SLAB	10056.462	49626.139
"B"	NE CORNER OF GAC TANKS' SLAB	10049.287	49638.508
"C"	SE CORNER OF SLUDGE DRYING BED	10036.902	49650.784
"D"	NE CORNER OF SLUDGE DRYING BED	10030.622	49661.315



NOTES :-

- (1) REFER DRG. No. 0202417-05 AND -35 FOR BUILDING LAYOUT.
- (2) REFER DRG. No. 0202417-06 FOR ACCESS ROAD LAYOUT.
- (3) REFER DRG. No. 0202417-46 FOR PIPEWORK LAYOUT.

LEGEND

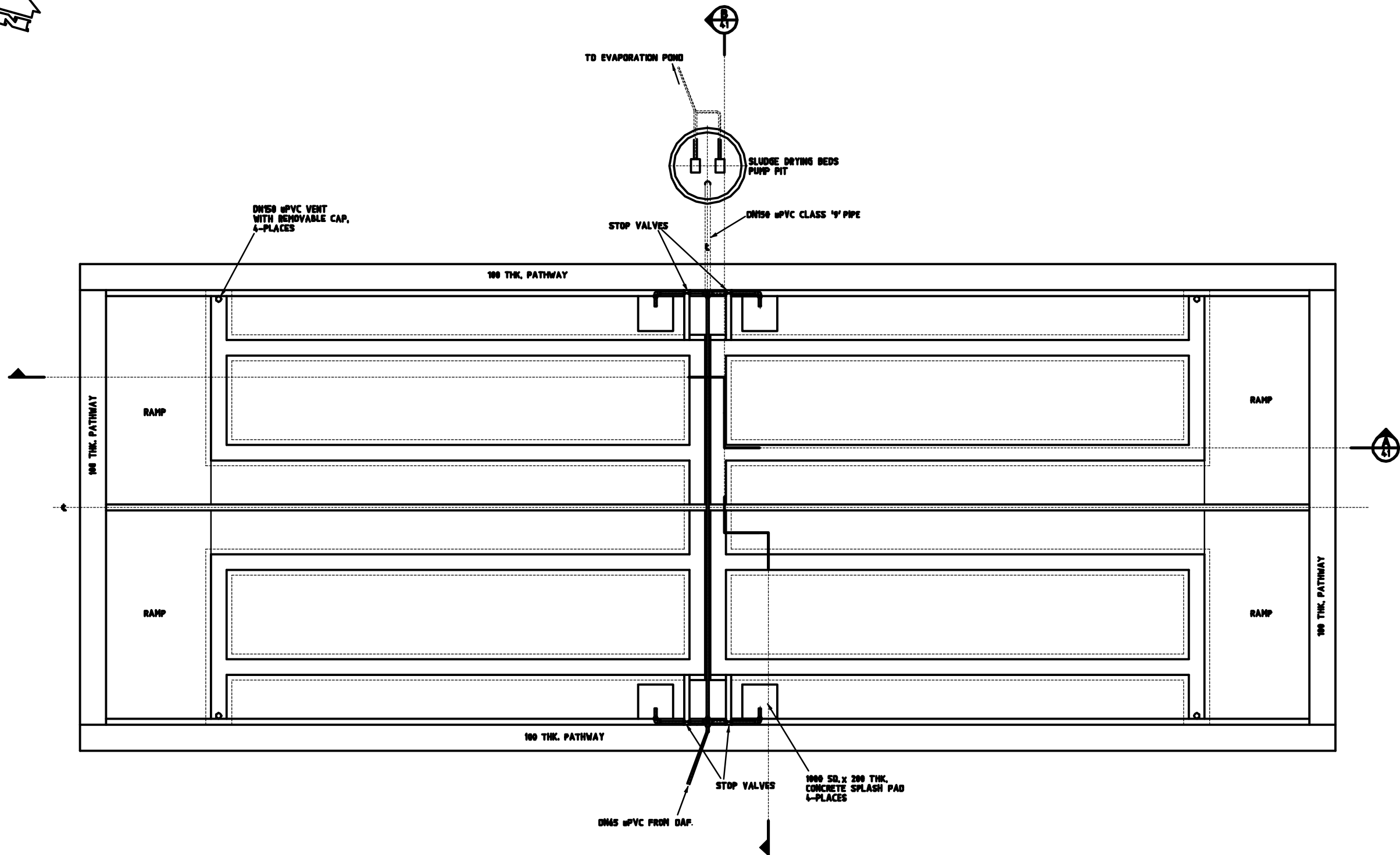
- LOCATION OF PROPOSED DAF SYSTEM
- PROPOSED PIPELINE (PIPELINE ROUTE TO BE DETERMINED BY CONTRACTOR)



 QUALITY ENDORSED COMPANY	LINEAR DIMENSIONS... <table><tr><td>0-25mm</td><td>0.5mm</td></tr><tr><td>25-2500mm</td><td>1.5mm</td></tr><tr><td>2500-10000mm</td><td>3.0mm</td></tr><tr><td>OVER 10000mm</td><td>5.0mm</td></tr></table>	0-25mm	0.5mm	25-2500mm	1.5mm	2500-10000mm	3.0mm	OVER 10000mm	5.0mm	<ul style="list-style-type: none">● DO NOT SCALE THIS DRAWING● IF IN DOUBT, ASK● THIRD ANGLE PROJECTION	
	0-25mm	0.5mm									
25-2500mm	1.5mm										
2500-10000mm	3.0mm										
OVER 10000mm	5.0mm										
TOLERANCES ON SINGLE DIMENSIONS CHAIN OF DIMENSIONS SHALL BE ACCUMULATIVE I.E. ABOVE TOLERANCES APPLY TO OVERALL DIMENSIONS	THIS DRAWING IS THE PROPERTY OF THE UNDERTAKING AND MUST NOT BE REPRODUCED OR OTHERWISE USED WITHOUT THE EXPRESS AUTHORITY OF THE UNDERTAKING										

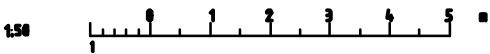
RELEASED FOR CONSTRUCTION N 27. DE PLOT SCALE: 1		DRG No. MPA003-PA002 ENGR./DATE KH 30.09.02		REV. D
DRAWN BY BWB 22.07.02 CAD FILE C:\P3\PA02		CHKD./DATE MHM 30.09.02 APPR./DATE MHM 30.09.02		REV. D
		CLIENT DRG No. 01 341 - 501 G		

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PLAN
SCALE 1:50

- NOTES:
1. FOR CONCRETE DETAILS REFER TO DRG. 0202417-42
 2. FOR ARRANGEMENT ELEVATIONS REFER TO DRG. 0202417-41.

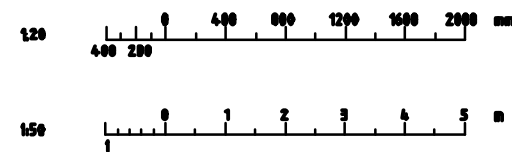
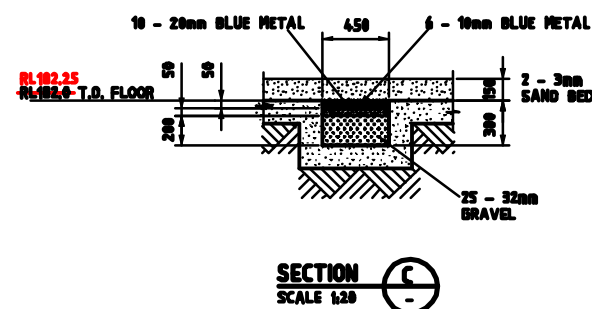
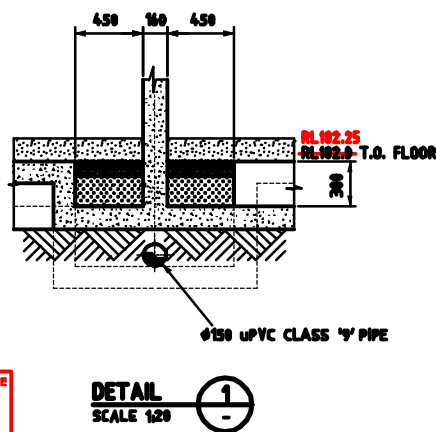
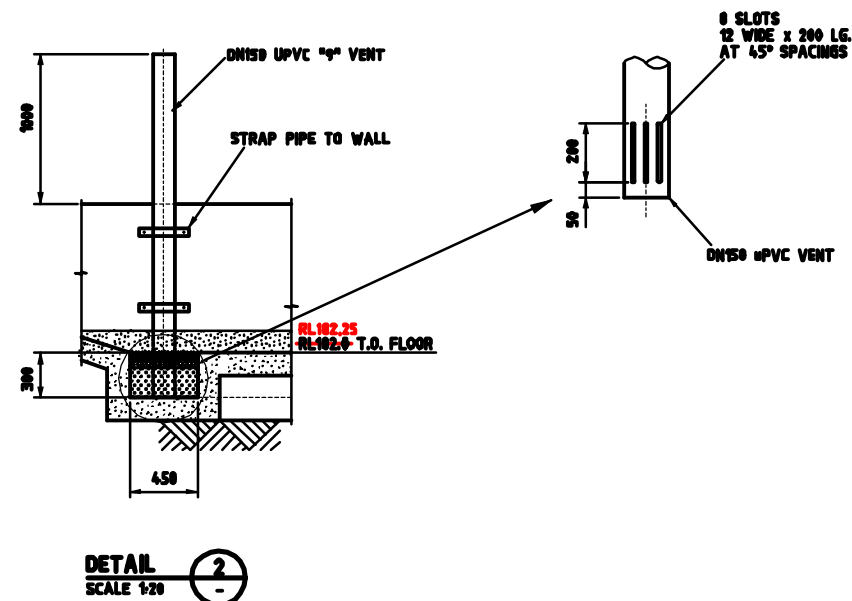
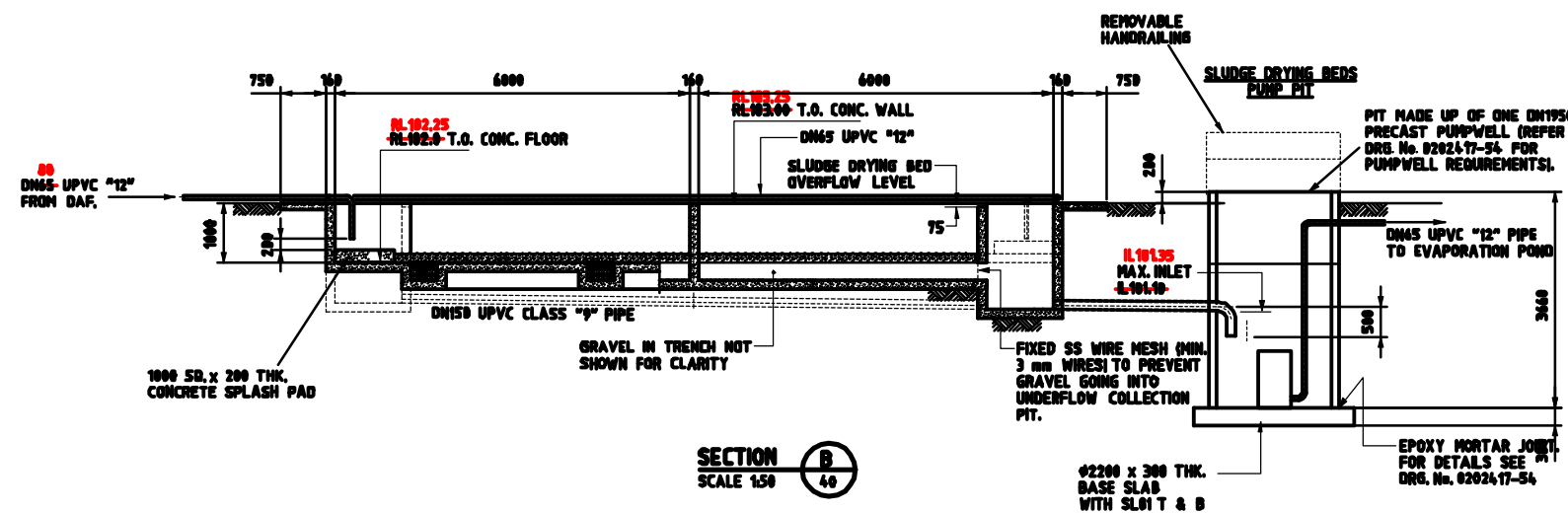
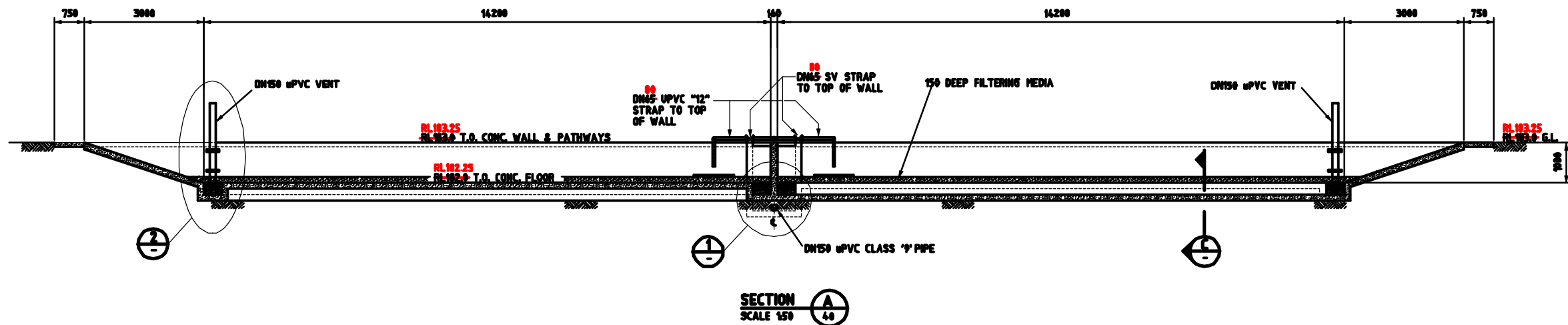


I CERTIFY THAT THE AMENDED DRAWINGS ARE
A TRUE AND ACCURATE RECORD OF THE
WORK AS CONSTRUCTED

FOR CREDERE BUILDING & CIVIL Pty Ltd

			DICK PERSON DIRECTOR GENERAL - DPWS INFRASTRUCTURE & ENVIRONMENTAL SERVICES WATER TECHNOLOGIES - WATER SERVICES LEVEL 12, HAYDON BUILDING 2-24 BAYSWAN PLACE SYDNEY 2000 PHONE (02) 93727027 FAX (02) 93727077			PLAN BY: M DESIGNED: J. WATER D. LIN DRAWN: J. ERLAKE CHECKED: J. ERLAKE A. KAPLAN			 DPWS DEPARTMENT OF INFRASTRUCTURE AND WATER SERVICES			LAKE CARGELLIGO / TULLIBIGEAL WATER SUPPLY			DATE SET FILE No.		
X			WORKS AS EXECUTED			C. MORRIS			23-11-12			LAKE CARGELLIGO WATER TREATMENT PLANT			DRAWING No. 0202417- 40		
HK			DETAILS OF AMENDMENTS			APPROVED			DATE			SLUDGE DRYING BEDS ARRANGEMENT PLAN			REVISION X		

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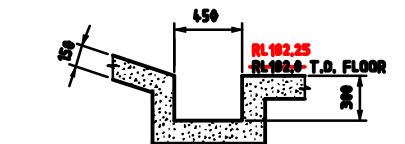
- NOTES:**
1. FOR CONCRETE DETAILS REFER TO DRG. 0202417-42
 2. FOR ARRANGEMENT PLAN REFER TO DRG. 0202417-49
 3. PROTECT ALL EXPOSED UPVC PIPES WITH 2 COATS OF AN APPROVED WHITE ACRYLIC PAINT.

I CERTIFY THAT THE AMENDED DRAWINGS ARE A TRUE AND ACCURATE RECORD OF THE WORK AS CONSTRUCTED

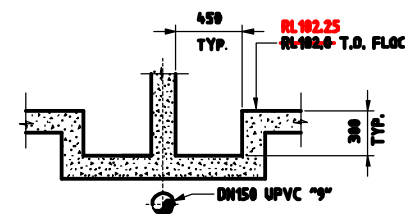
FOR CREDEBE BUILDING & CIVIL Pty Ltd

<p>WORKS AS EXECUTED</p> <p>MAX. IL INTO SLUDGE DRYING BEDS PUMP PIT AMENDED</p> <p>GENERAL AMENDMENTS</p> <p>DETAILS OF AMENDMENTS</p>	<p>CHAMBERS</p> <p>23-10-45</p> <p>21-09-03</p> <p>28-12-02</p>	<p>APPROVED</p> <p>DATE</p>			<p>Y. Bosson</p> <p>TECHNOLOGY CONTROLLER</p> <p>WATER TECHNOLOGIES</p>	<p>THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE NAMES APPEAR IN THE ADJACENT BLOCK</p>	<p>PLAN IN IT</p> <p>RENDER</p> <p>BY WATER</p> <p>BY WATER</p> <p>BY WATER</p> <p>BY WATER</p>	<p>LAKE CARGELLIGO / TULLIBIGAL WATER SUPPLY</p> <p>LAKE CARGELLIGO WATER TREATMENT PLANT</p> <p>SLUDGE DRYING BEDS</p> <p>ARRANGEMENT SECTIONS & DETAILS</p>	<p>LAKE CARGELLIGO / TULLIBIGAL WATER SUPPLY</p> <p>LAKE CARGELLIGO WATER TREATMENT PLANT</p> <p>SLUDGE DRYING BEDS</p> <p>ARRANGEMENT SECTIONS & DETAILS</p> <p>0202417-41</p> <p>REVISION 5 X</p>
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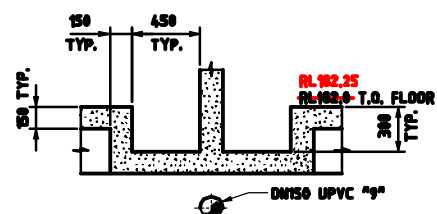
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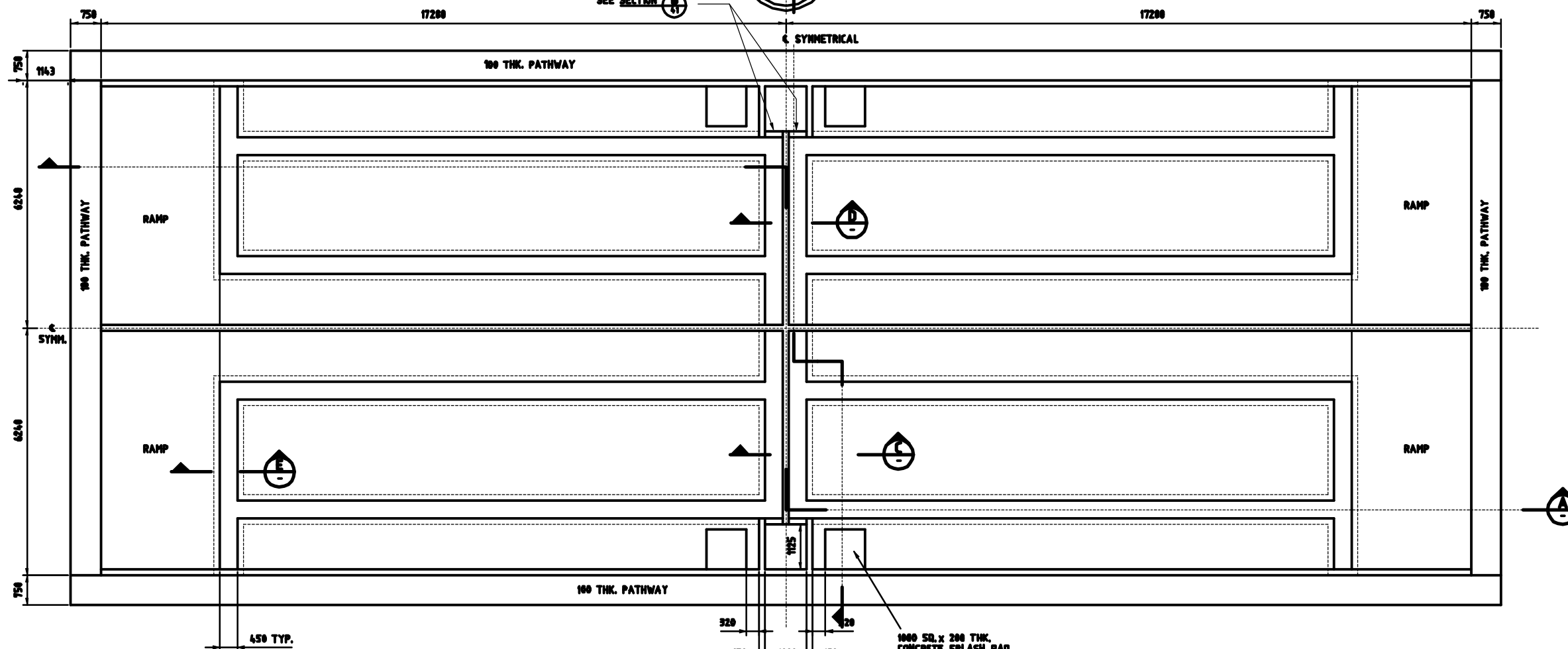
SECTION E
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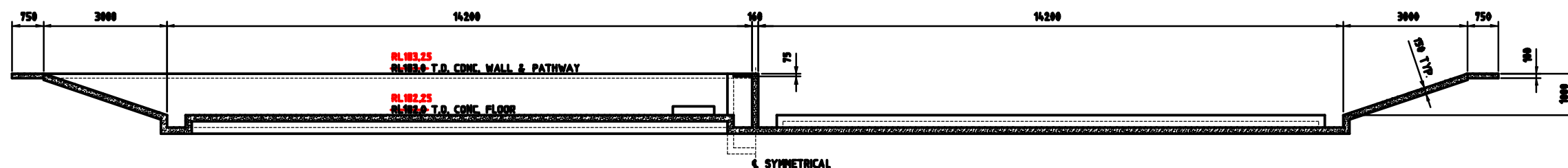
SECTION C
SCALE 1:20



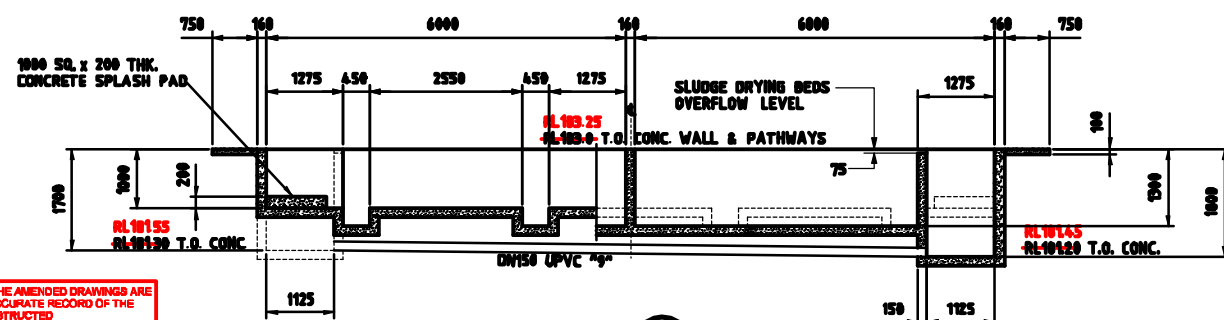
SECTION D
SCALE 1:20



PLAN ON SLUDGE DRYING BEDS
SCALE 1:50

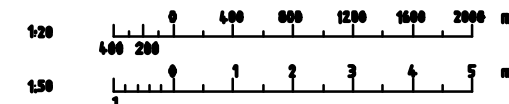


SECTION A
SCALE 1:50



SECTION B
SCALE 1:50

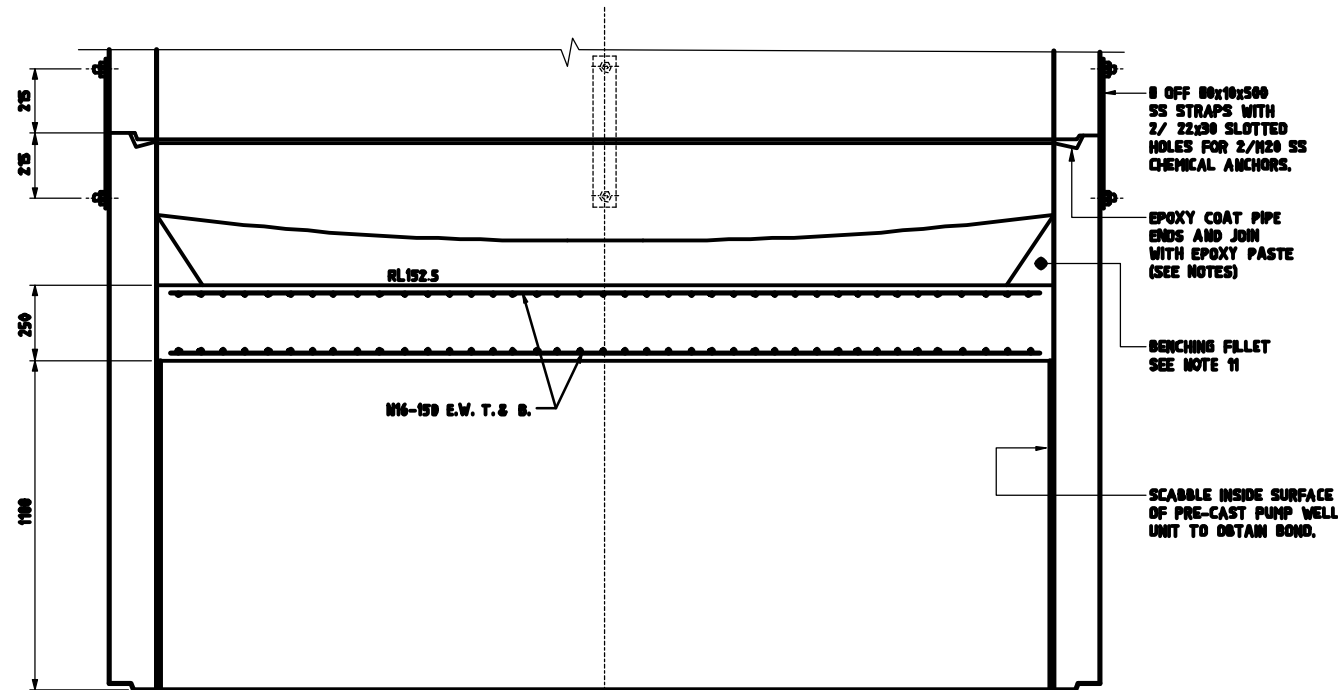
- NOTES:
1. FOR ARRANGEMENT PLAN REFER TO DRS. 0202417-40.
 2. FOR ARRANGEMENT SECTIONS REFER TO DRS. 0202417-41.
 3. REINFORCEMENT FOR WALLS, FLOORS & CHANNELS TO BE EL01 CP OR W12-200 EW CP.



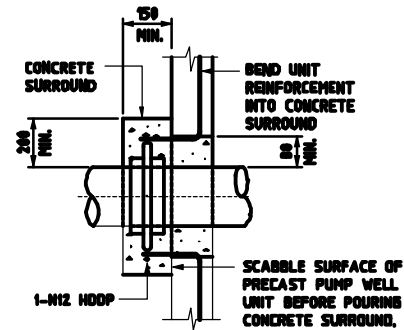
CERTIFY THAT THE AMENDED DRAWINGS ARE A TRUE AND ACCURATE RECORD OF THE WORK AS CONSTRUCTED
FOR CREDGERS BUILDING & CIVIL PTY LTD

WORKS AS EXECUTED		C:\MSOFT\23-11-03	THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE NAMES APPEAR IN THE ADJACENT BLOCK		PLAN IN 10		LAKE CARGELLIGO / TULLIBIGEAL WATER SUPPLY		In B SET	
GENERAL AMENDMENTS		23-11-03	Y. Bosson		RENDER S. LIN DRAWN S. LIN CHECKED S. LIN		LAKE CARGELLIGO WATER TREATMENT PLANT		DRAWING No. 0202417-42	
DETAILS OF AMENDMENTS		APPROVED	TECHNOLOGY CONTROLLER WATER TECHNOLOGIES		S. LIN		SLUDGE DRYING BEDS CONCRETE DETAILS		REVISION A X	

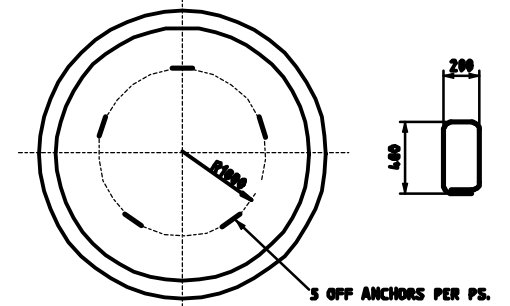
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BASE DETAILS
(PRECAST PUMP WELL SUNK AS A CAISSON)
N.T.S.



TYPICAL PIPE PENETRATION DETAIL
N.T.S.



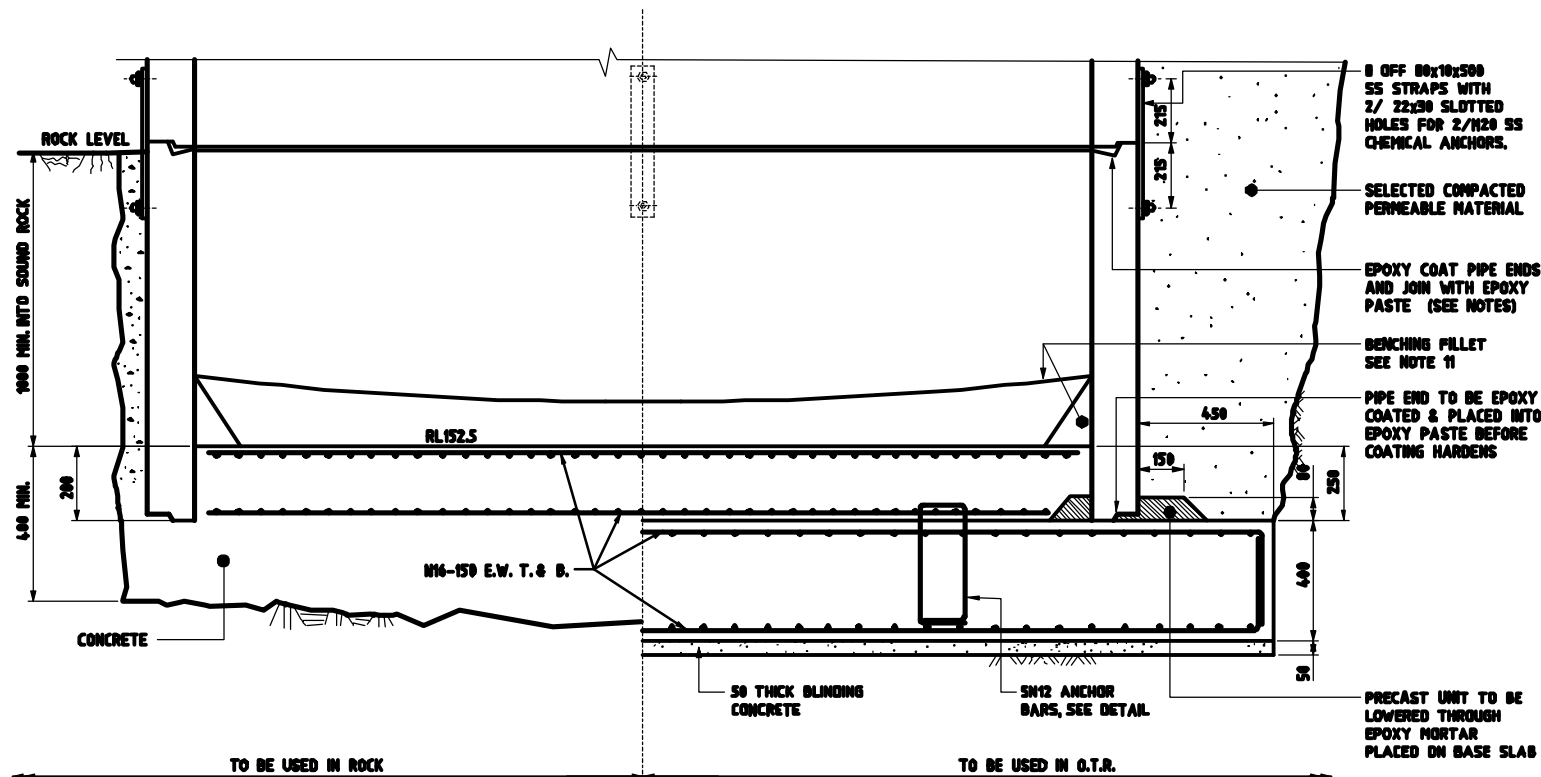
ANCHOR BAR LAYOUT & DETAIL
N.T.S.

NOTES

1. SELECTION AND INSTALLATION OF UNITS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
2. **CEMENT:**
TYPE "SR" CEMENT TO AS 3972.
3. **CONCRETE:**

ELEMENT	MIN. CEMENT CONTENT (kg/m ³)	MAX. W/C RATIO BY MASS	NOM. MAX. AGGREGATE (mm)	CONCRETE GRADE
REINFORCED CONCRETE	400	0.45	20	32 OR HIGHER
PRECAST CONCRETE	360	0.45	20	32 OR HIGHER
FILLET	240	0.45	20	—
PLUS CONCRETE	240	0.60	75	25
BLINDING CONCRETE	—	—	—	20

4. **REINFORCEMENT:**
 - a. PROVIDE MIN. 30mm INTERNAL AND 50mm EXTERNAL CLEAR COVERS TO REINFORCEMENT IN PRECAST PUMP WELL.
 - b. SUPPORTS FOR REINFORCING SHALL BE EITHER ANTI-CORROSIVE OR CAPPED WITH HARD PLASTIC SO THAT THE SUPPORT IS PROTECTED TO A DEPTH OF AT LEAST 10mm FROM THE FACE OF THE CONCRETE.
 - c. INTERNAL SURFACES OF PRECAST PUMP WELL TO HAVE F3 FINISH IN ACCORDANCE WITH SECTION "TRW" OF THE SPECIFICATION.
5. PIPES SHALL NOT PASS THROUGH JOINTS OF PRECAST PUMP WELL.
6. PREPARE ENDS OF PRECAST PUMP WELL TO THE EPOXY MANUFACTURER'S RECOMMENDATIONS PRIOR TO COATING WITH EPOXY.
7. LOWER THE EPOXY COATED PRECAST PUMP WELL ONTO BOTTOM PRECAST PUMP WELL BEFORE EPOXY COATING HARDENS.
8. PLACE THE EPOXY PASTE ON THE LOWER PRECAST PUMP WELL BEFORE LOWERING THE TOP PRECAST PUMP WELL ON TO IT.
9. DETERMINE THE EPOXY HARDENING TIME AND THE EPOXY PASTE CURING TIME FROM THE MANUFACTURER.
10. EPOXY SHALL BE A MOISTURE TOLERANT, SOLVENTLESS PASTE, WITH A 1:1 MIXING RATIO. ADDITION OF FILLERS IS NOT ACCEPTABLE.
11. CONFIRM IN WRITING THE PUMP DETAILS AND BENCHING REQUIREMENTS FROM THE SUPERINTENDANT BEFORE CONSTRUCTION.



ALTERNATIVE BASE DETAILS
(FOR OPEN CUT CONSTRUCTION)
N.T.S.

I CERTIFY THAT THE AMENDED DRAWINGS ARE A TRUE AND ACCURATE RECORD OF THE WORK AS CONSTRUCTED.
FOR CRENSHAW BUILDING & CIVIL PTY LTD

WORKS AS EXECUTED		APPROVED	DATE	23-11-23	DICK PERSHON DIRECTOR GENERAL - DPWS INFRASTRUCTURE & ENVIRONMENTAL SERVICES WATER TECHNOLOGIES - WATER SERVICES LEVEL 13, HAYDON BUILDING 2-24 BAYSON PLACE STONEY 2500 PHONE (02) 93727027 FAX (02) 93727077		PLAN IN 10 REVISION 1. L10 2. L10 3. L10 4. L10 5. L10		LAKE CARGELLIGO / TULLIBIGEAL WATER SUPPLY LAKE CARGELLIGO WATER TREATMENT PLANT CONCRETE DETAILS		DATE SET FILED DRAWING No. 0202417-54 REVISION 0 X
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