TENDER NO. 46/2025	LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA	
Approved by Supply Chain Manager	Version: 00	

CONTRACT DOCUMENT

FOR THE

UPGRADING OF MCGREGOR WTW

VOLUME 1: RETURNABLE DOCUMENT

NOTE:

- The Form of Offer and Acceptance (C1.1) is on **page 103** of this document
- Table 1: Preference Schedule (B-BBEE contribution) is on **page 74** of this document

NOVEMBER 2025

Name of Tenderer	
Address (Physical)	
Contact Person	
Contact Number	
Email Address	
Amount (15% VAT Included)	
B-BBEE Status	
Duration (weeks)	

ISSUED BY:

LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

THE MUNICIPAL MANAGER
LANGEBERG MUNICIPALITY
28 MAIN ROAD
ASHTON
6715
Tel: (023) 615 8000

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

TENDER 46/2025

Tenders are hereby requested for the **UPGRADING OF MCGREGOR WTW,** as specified in the bid document. Completed Bids, in sealed envelopes, clearly marked **TENDER 46/2025 UPGRADING OF MCGREGOR WTW,** should be placed in the tender box, at the Langeberg Municipal Office, 28 Main Road, Ashton, not later than **12:00 on 12 December 2025** when the Bids will be opened in public. Late, faxed or e-mailed tenders will not be considered.

Tenderers must be registered with the CIDB in a class of construction works and have a grading designation equal to or higher than that determined in accordance with the sum tendered or a value determined in accordance with regulation 25 (7A) of the Construction Industry Development Regulations, 2004. It is estimated that tenderers will need a grading designation of 7CE OR HIGHER,

COMPULSORY CLARIFICATION MEETING:
A COMPULSORY CLARIFICATION MEETING WILL BE HELD ON 17 NOVEMBER 2025 AT 11H00, AT THE McGREGOR MUNICIPAL OFFICES, 24 VOORTREKKER Rd, McGREGOR. NO LATE COMERS WILL BE ADMITTED AFTER 11H05.

PLEASE NOTE:
The official Bid document must be fully completed in black ink, all pages must be returned and the document should preferably be stapled or bound. Supporting documents must be submitted separately and must be stapled or bound. The Langeberg Municipality may appoint “reserve bidders” and award the bid to the second – or third ranked bidder during the adjudication stage if the highest-scoring bidder fails to perform during contract execution.

The lowest, or any tender, will not necessarily be accepted and council reserves the right to accept any tender. Tenders will be evaluated according to the Council’s Supply Chain Management Policy and the 80/20 Preference Point system. The Supply Chain Management Policy can be viewed at Municipal Offices or www.langeberg.gov.za

A minimum functional assessment score of 70 points will apply to this contract

Bid documents are available from **6 November 2025**, on the Langeberg Municipal website: www.langeberg.gov.za
Please refer written enquiries to MR N ALBERTYN nalbertyn@langeberg.gov.za

DP LUBBE
MUNICIPAL MANAGER
Private Bag X2,
Ashton, 6715

LANGEBERG MUNICIPALITY

TENDER 46/2025

UPGRADING OF MCGREGOR WTW

General Tender Information

TENDER ADVERTISED	:	6 November 2025
ESTIMATED CIDB CONTRACTOR GRADING DESIGNATION	:	7CE or higher
SITE VISIT/CLARIFICATION MEETING	:	17 November 2025 at 11h00
VENUE FOR SITE VISIT/ COMPULSORY CLARIFICATION MEETING	:	McGregor Municipal Offices, 24 Voortrekker Rd, McGregor.
CLOSING DATE	:	12 December 2025
CLOSING TIME	:	12h00
TENDER BOX & ADDRESS	:	The Bid Box, at the Entrance of Municipal Office, 28 Main Road, Ashton, LANGEBERG Municipality.
	:	The Tender Document (which includes the Form of Offer and Acceptance) completed in all respects, plus any additional supporting documents required, must be submitted in a sealed envelope with the name and address of the tenderer, the tender No. and title and the closing date indicated on the envelope. The sealed envelope must be inserted into the appropriate official tender box before closing time at 12h00. If the tender offer is too large to fit into the abovementioned box or the box is full, please enquire at the reception for alternative instructions. The onus remains with the tenderer to ensure that the tender is placed in either the original box or as alternatively instructed.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADEMARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS "OR EQUIVALENT"

PART A (MBD1)
INVITATION TO BID

THE FOLLOWING PARTICULARS MUST BE FURNISHED (FAILURE TO DO SO WILL RESULT IN YOUR OFFER BEING DISQUALIFIED)

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE LANGEBERG MUNICIPALITY					
BID NUMBER:	46/2025	**CLOSING DATE**:	12 December 2025	**CLOSING TIME:**	12h00
DESCRIPTION:	UPGRADING OF MCGREGOR WTW				
THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM.					

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT:
ENTRANCE OF THE MUNICIPAL OFFICES 28 Main Road Ashton 6715

SUPPLIER INFORMATION			
NAME OF BIDDER			
POSTAL ADDRESS			
STREET ADDRESS			
TELEPHONE CODE & NUMBER			
CELL PHONE NUMBER			
FACSIMILE CODE & NUMBER			
E-MAIL ADDRESS			
VAT REGISTRATION NUMBER			
TAX PIN		TAX REFERENCE NUMBER	
CSD No			
ORIGINAL AND VALID TAX CLEARANCE CERTIFICATE / TSC PIN SUBMITTED? YES☐ NO☐			
A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BEE. NOTE A CERTIFIED COPY OR ORIGINAL IS COMPULSORY			
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE SUBMITTED? (MBD 6.1) YES☐ NO☐ IF YES, WHO WAS THE CERTIFICATE ISSUED BY? (Tick applicable box) A VERIFICATION AGENCY ACCREDITED BY SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM (SANAS) ☐ or A SWORN AFFIDAVIT FOR EME'S AND QSE'S ☐			
RECENT MUNICIPAL ACCOUNT OF COMPANY (NOT OLDER THAN 90 DAYS) **MUST** BE ATTACHED			
RECENT MUNICIPAL ACCOUNTS OF ALL THE DIRECTORS/ SHAREHOLDERS **MUST** BE ATTACHED			
IF LEASING/RENTING/LODGING – ATTACHED LATEST VALID COPY OF AGREEMENT **IF NO PROPERTY REGISTERED IN YOUR NAME SUBMIT AN AFFIDAVIT CONFIRMING THIS.**			

BID PRICE OFFERED **NB: NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE** **(see definition on MBD 4 attached)**	
TOTAL BID PRICE (INCL 15% VAT)	

ANY ENQUIRIES REGARDING THE BIDDING PROCEDURE MAY BE DIRECTED TO:

LANGEBERG MUNICIPALITY
Contact Person: Mr N. Albertyn
Tel: 023 626 8200
Fax: 023 615 1563
E-mail: nalbertyn@langeberg.gov.za

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

YOURS FAITHFULLY,

DP LUBBE
MUNICIPAL MANAGER
MUNICIPAL OFFICES
PRIVATE BAG X2
ASHTON
6715

TEL: 023 626 8200

PART B (MBD 1)
TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:

1.1 BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
1.2 **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED – (NOT TO BE TYPED) OR ONLINE**
1.3 THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2022, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

2. TAX COMPLIANCE REQUIREMENTS

2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYERS PROFILE AND TAX STATUS.
2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA
2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PARAGRAPH 3 BELOW
2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED; EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

3.1	IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
3.2	DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
3.3	DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
3.4	DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
3.5	IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 ABOVE.

NB: FAILURE TO PROVIDE ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.
NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

CHECK LIST

This list is to assist all bidders to submit complete proposals. Bidders are to check the following points before the submission of their proposals:		
1	All pages of the document have been read by the contractor and initialled.	☐
2	Any discrepancy and/or misunderstanding is cleared with the relevant officials.	☐
3	All pages requiring information have been **completed in black ink.**	☐
4	The Schedule of Quantities has been checked for arithmetic correctness.	☐
5	Totals from each sub section of the Schedule of Quantities have been carried forward to the summary page and done so correctly.	☐
6	The total from the summary page has been carried forward to the Form of Offer.	☐
7	Surety details where applicable have been included in the proposal.	☐
8	All sections requiring information have been completed.	☐
9	Bidder ensured that all documents is properly completed and signed	☐
10	The contractor has complied with the proposal prerequisites.	☐
11	The document is submitted before 12h00 on the due date at the designated bid box of Langeberg Municipality.	☐

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

LANGEBERG MUNICIPALITY

TENDER NO. 46/2025

UPGRADING OF MCGREGOR WTW

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LANGEBERG MUNICIPALITY

TENDER NO. 46/2025

UPGRADING OF MCGREGOR WTW

T1.1 Tender Notice and Invitation to Tender

LANGEBERG MUNICIPALITY | UMASIPALA | MUNISIPALITEIT
Private Bag X2, Ashton, 6715
☎ (023) 615 8000 🖷 (023) 615 1563 @ nalbertyn@langeberg.gov.za
www.langeberg.gov.za

TENDER NOTICE AND INVITATION TO BID			
DEPARTMENT INFRASTRUCTURE			
ADVERTISED IN	MUNICIPAL WEBSITE, DIE BURGER		
BID NO:	46/2025	**PUBLISHED DATE:**	6 November 2025
Bids are hereby invited for (Tender Description)	UPGRADING OF MCGREGOR WTW		
Closing Time and Date	No later than 12H00	On the Date	12 December 2025
Compulsory Site Meeting	17 November 2025 at 11h00 in McGregor Municipal Offices, 24 Voortrekker Rd, McGregor.		**CIDB GRADING**: 7CE or higher
Bids will be opened immediately thereafter, in public at the Council Chambers of LANGEBERG Municipality, 28 Main Road, Ashton.			
AVAILABILITY OF BID DOCUMENTS			
Tender Documents will be downloadable only form www.langeberg.gov.za			
Date Available	6 November 2025		

BID RULES

a. Bids are to be completed in accordance with the conditions and bid rules contained in the bid document and supporting documents must be placed in a sealed envelope and externally endorsed WITH THE NAME AND ADDRESS OF THE TENDERER, THE TENDER NO. AND TITLE AND THE CLOSING DATE, and be deposited in the Bid Box, at the Supply Chain Management Unit, Langeberg Municipality, 28 Main Street, Ashton.

b. Bids may only be submitted on the bid documentation issued by the Municipality.

c. The Langeberg Municipality does not bind itself to accept the lowest or any tender and reserves the right to accept any tender, as it may deem expedient. Tenders will be evaluated according to the Council's Supply Chain Management Policy and the 80/20 Preference Point system. The Supply Chain Management Policy can be viewed at Municipal Offices or www.langeberg.gov.za

d. Tenderers who are not yet registered are required to register on the Central Supplier Database (CSD). Online registration to be completed on the CSD registration platform, website https://secure.csd.gov.za.

e. Pre-qualification criteria for preferential procurement is applicable to the tender.

Tenders shall be evaluated in terms of the latest Langeberg Municipality Supply Chain Management Policy and the Preferential Procurement Regulations.		**Bidders may claim preference points in terms of their B-BBEE status level of contribution.**	
Preferential Procurement Point System Applicable	80/20	**Local Content Requirement**	N/A
Compulsory site Meeting/ Information Session	Yes	**Validity Period**	120 days

TECHNICAL ENQUIRIES: Ms M Lyners monique@lyners.co.za		**BIDDING PROCEDURE REQUIREMENTS & ENQUIRIES:** Mr N. Albertyn nalbertyn@langeberg.gov.za	
Section	Consulting Engineers	**Section**	Supply Chain Management
Contact Person	Ms M Lyners	**Contact Person**	Mr S Ngcongolo -
Tel:	E-mail Enquiries Only	**Tel:**	E-mail Enquiries Only
E-mail	monique@lyners.co.za	**E-mail**	SNgcongolo@langeberg.gov.za

Authorised by:
DP LUBBE
MUNICIPAL MANAGER
NOTICE NR: T40/2023

Private Bag X2
ASHTON, 6715
TEL: 023 626 8000

T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of Government Gazette No. 42622 of 8 August 2019, Construction Industry Development Board (CIDB) Standard for Uniformity in Construction Procurement. (see www.cidb.org.za) which are reproduced without amendment or alteration for the convenience of tenderers as an Annex to this Tender Data.

The Standard Conditions of Tender make several references to the Tender Data for details that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of tender. Each item of data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

The following variations, amendments and additions to the Standard Conditions of Tender as set out in the Tender Data below shall apply to this tender:

Clause number	**Tender Data**
C.1	**General**
C.1.1	Actions
C.1.1.1	*Add the following:* **The parties agree that this tender, its evaluation and acceptance and any resulting contract shall also be subject to the Employer's Supply Chain Management Policy ('SCM Policy') that was applicable on the date the tender was advertised, save that if the Employer adopts a new SCM Policy which contemplates that any clause therein would apply to the contract emanating from this tender, such clause shall also be applicable to that contract. Please refer to this document contained on the Employer's website.** **Abuse of the supply chain management system is not permitted and may result in the tender being rejected, cancellation of the contract, restriction of the supplier, and/or the exercise by the Employer of any other rights and remedies available to it as described in the SCM Policy.** The Employer is the LANGEBERG MUNICIPALITY, represented by Ms M Lyners as the Employer's Agent.
C.1.2	Tender Documents *Add the following:* **The following documents form part of this contract:** **VOLUME 1:** The Tender Document issued by the employer (this document), in which is bound: **THE TENDER** **Part T1: Tendering Procedure** T1.1 Tender notice and invitation to tender T1.2 Tender data **Part T2: Returnable Documents** T2.1 List of returnable documents T2.2 Returnable schedules **THE CONTRACT** **Part C1: Agreement and contract data** C1.1 Form of Offer and Acceptance C1.2 Contract Data (data provided by the Contractor) – Part 1

C1.2 Contract Data (data provided by the Employer) – Part 2
C1.3 Form of Performance Guarantee
C1.4 Form of Advance Payment Guarantee
C1.5 Occupational Health and Safety Agreement
C1.6 Protection of the Environment Declaration
C1.7 Insurance Broker's Warranty

Part C2: Pricing Data
C2.1 Pricing Assumptions
C2.2 Bills of Quantities

Part C3: Scope of Work
C3.1 Description of the Works
C3.2 Engineering/Design
C3.3 Procurement
C3.4 Construction

Part C4: Site information
C4 Site information

Part C5: LANGEBERG Municipality Supply Chain Policy
C5 Supply Chain Policy

Part C6: Health and Safety Specifications
C6 Health and Safety Tender Specifications

Part C7: Drawings
C7 Drawings

Volume 1 is deemed the "Returnable Document" which must be returned to the Employer in terms of submitting a tender offer.

In addition to the above, the following further documents are part of the tender:

VOLUME 2: The international Federation of Consulting Engineers (FIDIC) Conditions of Contract for Plant & Design Build (Second Edition) 2017 reprinted 2022 with amendments (Yellow Book). This publication is available, and tenderers must obtain copies at their own cost from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.

VOLUME 3: The SANS Standardised Specifications for Civil Engineering Construction prepared by Standards South Africa. These publications are available, and tenderers must obtain copies at their own cost from Standards South Africa, Private Bag X191, PRETORIA, 0001.

Volumes 2 & 3 may also be inspected, by appointment, at the offices of the Employer's agent during normal office hours.

C.1.4 Communication and Engineer
Delete the first sentence of the clause and replace with the following:
Verbal or any other form of communication, from the Employer, its employees, agents or advisors during site visits/clarification meetings or at any other time prior to the award of the Contract, will not be regarded as binding on the Employer, unless communicated by the Employer in writing to suppliers by its Municipal Supply Chain Manager or his nominee.

The Employer's agent is:
Company: Neil Lyners & Associates (Pty) Ltd
Name: M Lyners
Address: South Gate Building, Ground Floor, Carl Cronje Drive, Tyger Waterfront, 7530
Tel: 072 433 7262/ 021 914 0300
E-mail: carel@lyners.co.za

C.1.5 Cancellation and Re-Invitation of Tenders

Remove C.1.5.1, C.1.5.2 & C.1.5.3 and replace with the following:

C.1.5.4.1 In the event that, in the application of the 80/20 preference point system as stipulated in the tender documents, all tenders received exceed the estimated Rand value of R50 000 000, the tender invitation must be cancelled.

C.1.5.4.2 In the event that, in the application of the 90/10 preference point system as stipulated in the tender documents, all tenders received are equal to, or below R50 000 000 the tender must be cancelled.

C.1.5.4.3 An organ of state which has cancelled a tender invitation as contemplated in sub-regulations (1) and (2) must re-invite tenders and must, in the tender documents stipulate the preference point system to be applied.

C.1.5.4.4 An organ of state may, prior to the award of a tender, cancel a tender if -

a) due to changed circumstances, there is no longer need for the goods or services tendered for; or

b) funds are no longer available to cover the total envisaged expenditure; or

c) no acceptable tenders are received.

C.1.6.2 Competitive negotiation procedure
Add the following between C.1.6.2 and C.1.6.2.1:
A competitive negotiation procedure will **not** be followed.

C.1.6.3 Proposal procedure using the two-stage system
Add the following between C.1.6.3 and C.1.6.3.1:
A two-stage system will **not** be followed.

Add the following Clauses (C.1.6.4, C1.7) after Clause C.1.6.3 and before clause C.2.

C.1.6.4 Objections, complaints, queries and disputes/ Appeals in terms of Section 62 of the Systems Act/ Access to court

C.1.6.4.1 Disputes, objections, complaints, and queries
In terms of Regulations 49 and 50 of the Local Government: Municipal Finance Management Act, 56 of 2003 – Municipal Supply Chain Management Regulations (Board Notice 868 of 2005):

a) Persons aggrieved by decisions or actions taken by the ***Langeberg Municipality*** in the implementation of its supply chain management system, may lodge within 14 days of the decision or action, a written objection or complaint or query or dispute against the decision or action.

C.1.6.4.2 Appeals

a) In terms of Section 62 of the Local Government: Municipal Systems Act, 32 of 2000 a person whose rights are affected by a decision taken by the ***Langeberg Municipality***, may appeal against that decision by giving written notice of the appeal and reasons to the Municipal Manager within 21 days of the date of the notification of the decision.
b) An appeal must contain the following:
   i) Must be in writing
   ii) It must set out the reasons for the appeal
   iii) It must state in which way the Appellant's rights were affected by the decision;
   iv) It must state the remedy sought; and
   v) It must be accompanied with a copy of the notification advising the person of the decision
c) The relevant ***Langeberg Municipality*** appeal authority must consider the appeal and **may confirm, vary or revoke** the decision that has been appealed, but no such revocation of a decision may detract from any rights that may have accrued as a result of the decision.

C.1.6.4.3 Right to approach the courts and rights in terms of Promotion of Administrative Justice Act, 3 of 2000 and Promotion of Access to Information Act, 2 of 2000

The sub-clauses above do not influence any affected person's rights to approach the High Court at any time or its rights in terms of the Promotion of Administrative Justice Act and Promotion of Access to Information Act.

C.1.6.4.4 All requests referring to sub clauses C.1.6.4.1; C.1.6.4.2 and C.1.6.4.3 must be submitted in writing to:
The Municipal Manager - Langeberg Municipal Offices
Via hand delivery at: Langeberg Municipality, 28 Main Street, Ashton
Via post at: Private Bag X2, Ashton, 6715
Via fax at: (023) 615 1563
Via email at: mm@langeberg.gov.za

C.1.7 National Treasury Web Based Central Supplier Database (CSD) Registration
Tenderers are required to be registered on the National Treasury Web Based Central Supplier Database (CSD) as a service provider. Tenderers must register as such upon being requested to do so in writing and within the period contained in such a request, failing which no orders can be raised or payments processed from the resulting contract. In the case of Joint Venture partnerships this requirement will apply individually to each party of the Joint Venture.

Tenderers who wish to register on the National Treasury Web Based Central Supplier Database (CSD) may do so via the web address **https://secure.csd.gov.za**.

It is each tenderer's responsibility to keep all the information on the National Treasury Web Based Central Supplier Database (CSD) updated.

C.2 Tenderer's obligations

C.2.1.1 *Delete the content of this clause and replace with the following:*
Tenderers must submit a tender offer that complies in all aspects to the conditions as detailed in this document. Only those tenders that comply in all aspects with the tender conditions, specifications, pricing instructions and contract conditions will be declared responsive.

Add the following clauses after C.2.1.2 and before C2.2:

C.2.1.3 Only those tender submissions from which it can be established that a clear and unambiguous offer has been made to Employer, by whom the offer has been made and what the offer constitutes, will be declared responsive.

C.2.1.4 Only those tenders that satisfy the following criteria will be declared responsive:

C.2.1.4.1 Construction Industry Development Board (CIDB) Registration
Only those tenderers who are registered with the CIDB, or capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered, or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations, for a CE or GB class of construction work, are eligible to have their tenders evaluated. Tenderers must obtain such active status upon being requested to do so in writing and within the period contained in such a request, failing which their tenders will be declared non-responsive.

Joint Ventures are eligible to submit tenders provided that:

a) every member of the joint venture is registered with an active status with the CIDB;
b) the lead partner has a contractor grading designation of not lower than one level below the required grading designation in the 7CE or higher class of construction work; and
c) the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a CE class of construction work or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations.

Contractor grading designations and associated parameters as follows:

Contractor Grading Designation	Tender Value Range designation	Maximum value of contract that a contractor is considered capable of performing (R)
1 (class of construction works)	1	500 000
2 (class of construction works)	2	1 000 000
3 (class of construction works)	3	3 000 000
4 (class of construction works)	4	6 000 000
5 (class of construction works)	5	10 000 000
6 (class of construction works)	6	20 000 000
7 (class of construction works)	7	60 000 000
8 (class of construction works)	8	200 000 000
9 (class of construction works)	9	No Limit

For more details on classes of construction work refer to the CIDB website.

C.2.1.4.2 Compliance with requirements of LANGEBERG MUNICIPALITY SCM Policy and procedures

Only those tenders that are compliant with the requirements below will be declared responsive:

a) A completed **Compulsory Enterprise Questionnaire** to be provided (applicable schedule to be completed);
b) A completed **Certificate of Authority for Companies/Partnerships/Joint Ventures/Consortiums** to be provided authorising the tender to be made and the signatory to sign the tender on the partnership /joint venture/consortium's behalf (applicable schedule to be completed);
c) A copy of the partnership / joint venture / consortium agreement to be provided;
d) A completed **Declaration of Interest – State Employees** to be provided and which does not indicate any non-compliance with the legal requirements relating to state employees (applicable schedule to be completed);
e) A completed **Declaration – Conflict of Interest** and **Declaration of Bidder's past Supply Chain Management Practices** to be provided and which does not indicate any conflict or past practises that renders the tender non-responsive based on the conditions contained thereon (applicable schedules to be completed);
f) A completed **Certificate of Independent Bid Determination** to be provided and which does not indicate any non-compliance with the requirements of the schedule (applicable schedule to be completed);
g) The tenderer (including any of its directors or members), has not been restricted in terms of abuse of the Supply Chain Management Policy;
h) The tenderer's tax matters with SARS are in order, or the tenderer is a foreign supplier that is not required to be registered for tax compliance with SARS;
i) The tenderer is not an advisor or consultant contracted with the Employer whose prior or current obligations creates any conflict of interest or unfair advantage;
j) The tenderer is not a person, advisor, corporate entity or a director of such corporate entity, involved with the bid specification committee;
k) A completed Authorisation for the Deduction of Outstanding Amounts Owed to the Langeberg Municipality to be provided and which does not indicate any details that renders the tender non-responsive based on the conditions contained thereon (applicable schedules to be completed);
l) The tenderer (including any of its directors or members), has not been found guilty of contravening the Competition Act 89 of 1998, as amended from time to time;
m) The tenderer (including any of its directors or members), has not been found guilty on any other basis listed in the SCM Policy.

C.2.1.4.3 Minimum score for functionality based on a pre-qualification inspection

Please note that points scored for Quality (functionality) will not have an influence on the total tender evaluation points and will therefore not affect the ranking of the tenderers, it will only be regarded as a pre-qualification. The minimum points required to be eligible to tender is 70 out of a 100.

THE CRITERIA to be applied in evaluating the proposal is set out in the table below:

Calculate the points for functionality according to the following formula:

$$P_s = S_o/M_s \times A_p$$

Where P_s = Percentage scored for functionality by bid under consideration
S_o = Total score of bid/proposal under consideration
M_s = Maximum possible score = 500
A_p = percentage allocated for functionality = 100

Total points by bidder on functionality:

i) $P_{s(Criterion\ 1)}$ = (Indicator allocated/scored out of 5) x weight
ii) $P_{s(Criterion\ 2)}$ = (Indicator allocated/scored out of 5) x weight
$P_{s(TOTAL)}$ = $[(P_{s(Criterion\ 1)} + P_{s(Criterion\ 2)}) / 5] \times 100$

Criteria can be amended to suit project complexity or omitted if not applicable.

Criterion	Weight
1) Relevant Experience (Returnable Schedule 14)	50%
2) Construction manager Experience (Returnable Schedule 15)	50%
Total	**100%**

EVALUATION CRITERION 1

Tenderers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

A detailed list of successfully completed projects must be completed in/attached to **Schedule 14**.

Projects of a similar scope and nature is regarded as:

- Water treatment works of up to 600kl/day capacity
- Wastewater treatment works of up to 600kl/day capacity

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will not be contacted for clarification.

1. RELEVANT EXPERIENCE	
INDICATOR	**Evaluation Criteria for Relevant Experience:** (number of similar projects completed by the contractor in the last 10 years)
0	The tenderer has completed zero projects in the last 10 years
1	The tenderer has completed only 1 project in the last 10 years
2	The tenderer has completed exactly 2 projects in the last 10 years
3	The tenderer has completed exactly 3 projects in the last 10 years
4	The tenderer has completed exactly 4 projects in the last 10 years
5	The tenderer has completed 5 or more projects in the last 10 years

EVALUATION CRITERION 2

Detailed, project specific CV's to be included in **Schedule 15** of the Returnable Documents. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

Projects of a similar scope and nature is regarded as:

- Water treatment works of up to 600kl/day capacity
- Wastewater treatment works of up to 600kl/day capacity

If, during construction, the contractor wishes to replace the construction manager, the contractor will apply in writing to the Engineer as per clause 6.8 of FIDIC. Only similarly experienced and competent construction managers will be considered.

2. CONSTRUCTION MANAGER	
INDICATOR	**Evaluation Criteria for Construction manager:** (number of similar projects completed by the Construction manager in the last 10 years)
0	The Construction manager has completed zero projects in the last 10 years
1	The Construction manager has completed only 1 project in the last 10 years
2	The Construction manager has completed exactly 2 projects in the last 10 years
3	The Construction manager has completed exactly 3 or more projects in the last 10 years
4	The Construction manager has completed exactly 4 or more projects in the last 10 years
5	The Construction manager has completed 5 or more projects in the last 10 years

The functionality proposal will be evaluated individually on score sheets, by a representative evaluation panel according to the evaluation criteria indicated above. All service providers who scored less than 70 out of 100 points for functionality will not be considered further. At least 3 evaluators will evaluate the quality schedules separately.

NB: Points scored for Quality (functionality) will not have an influence on the total tender evaluation points.

Where the entity tendering is a Joint Venture the tender must be accompanied by a statement describing exactly what aspects of the work will be undertaken by each party to the joint venture (appended to Schedule 3, Part T2.2: Returnable Schedules).

C.2.1.4.4.3 A copy of the authorisation letter must be submitted together with the bid document at the closing date and time of the bid.

C.2.1.4.5 Compulsory clarification meeting

Tenderers are required to attend a compulsory clarification meeting at which they may familiarise themselves with aspects of the proposed work, services or supply and pose questions.
Details of the meeting(s) are stated in the General Tender Information.
Only those tenders submitted by tenderers whose attendance at this meeting have been recorded, will be declared responsive.

C.2.1.4.6 Good standing with Bargaining Council

Only those tenders submitted by tenderers who are in good standing with the **Bargaining Council for the Civil Engineering Industry (BCCEI)** at the time of the tender award will be declared responsive. Tenderers must attach such proof to the schedule titled **Declaration in Respect of Compliance with Labour Legislation** or obtain such upon being requested to do so in writing and within the period contained in such a request, failing which their tenders will be declared non-responsive.

C.2.1.4.7 Good standing with SARS/Tax Clearance

Bidders are required to submit their unique personal identification number (pin) issued by SARS to enable the organ of state to view the taxpayer's profile and tax status. Application for the tax compliance status (TCS) certificate or pin may also be made via e-filing. In order to use this provision, taxpayers will need to register with SARS as e-filers through the website www.SARS.gov.za. Bidders may also submit a printed TCS certificate together with the bid (valid and original). In Bids where Consortia/Joint Venture/Sub-contractors are involved each party must submit a separate and Original Valid Tax Clearance Certificate.

C.2.3 Check documents

Delete the clause content and replace with the following:
The Tenderer should check the tender documents on receipt for completeness, missing or duplicated pages, indistinct figures or writing and any obvious errors. The Tenderer must notify the Employer's agent at once of any such problems identified

C.2.7 Clarification meeting

Add the following after the second sentence:
The arrangements for the site visit/clarification meeting are as stated on the General Tender Information page and in the Responsiveness Criteria (if applicable). Failure to provide proof of attendance of this clarification meeting will result in disqualification of the tender. The applicable schedule in the returnable documents must be signed by employer **or** employer's agent as proof of attendance or the signed (signed by attending tenderers) attendance register should be attached to this schedule.

Tenderers should be represented at the clarification meeting by a person who is suitably qualified and experienced to comprehend the implications of the work involved. The employer or employer's agent cannot be held liable for any information discussed during the Clarification Meeting not correctly carried forward to the authorised person signing the tender document.

C.2.8 Seek Clarification

Add the following after the first sentence:
The tenderer warrants that it has:

a) inspected the Specifications and read and fully understood the Conditions of Contract.
b) read and fully understood the whole text of the Specifications and Price Schedule and thoroughly acquainted itself with the nature of the goods proposed and generally of all matters which may influence the Contract.
c) visited the site(s) where delivery of the proposed works will take place, carefully examined existing conditions, the means of access to the site(s), the conditions under which the delivery is to be made, and acquainted itself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and construction equipment to and from the site(s) and made the necessary provisions for any additional costs involved thereby.
d) requested the Employer to clarify the requirements contained in the Specifications and Price Schedule, the exact meaning or interpretation of which is not clearly intelligible to the tenderer.
e) received any notices to the tender documents which have been issued in accordance with the Employer's SCM Policy.

The Employer will therefore not be liable for the payment of any extra costs resulting from any claim submitted by the tenderer arising from any alleged ambiguity or uncertainty contained in the tender document.

C.2.11 Alterations to documents

Delete the first sentence and replace with the following:
Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer in writing, or necessary to correct errors made by the tenderer.

C.2.12 Alternative tender offers

C.2.12.1 *Add the following to C.2.12.1 at the end of the first sentence:*
If a tenderer wishes to submit an alternative tender offer, he shall do so as a separate offer on a separate set of tender documents. The alternative tender offer shall be submitted in a separate sealed envelope on a separate Form of Offer, both clearly marked "Alternative Tender" in order to distinguish it from the main tender offer.

While it is not necessary to duplicate all parts of the main tender offer, the alternative tender offer shall be supported by the following documents as applicable:

a) the schedule that compares the alternative(s) offered with the requirements of the issued tender documents
b) preliminary designs, calculations, drawings and all other pertinent technical information and characteristics must be submitted with the alternative tender offer, in order to enable the Employer to evaluate the efficacy of the alternatives proposed
c) revised Bills of Quantities, or parts thereof, highlighting the changes made, together with a revised Summary, the total of which has been carried to the Form of Offer
d) details of any proposed amendments to the Pricing Assumptions

An alternative of the highest ranked acceptable main tender offer that is priced higher than the main tender offer may be recommended for award, provided that the ranking of the alternative tender -offer is higher than the ranking of the next ranked acceptable main tender offer.

The Employer's costs in confirming the acceptability of the alternative offer will be, *inter alia*, considered in considering the alternative offer.

The Employer will not be bound to consider alternative tenders and shall have sole discretion in this regard.

If the alternative is accepted, the Contractor shall accept full responsibility that the alternative offer complies in all respects with the Employer's standards and requirements.

C.2.13 Submitting a tender offer

Add the following to C.2.13.1 at the end of the first sentence:

C.2.13.1 Where the tendering entity is a joint venture it is recommended that the standard CIDB Joint Venture Agreement be used.

Delete the following word from C.2.13.2 and add the following sentence after the first sentence:

C.2.13.2 Delete "either electronically (if they were issued in electronic format) or". No electronic submissions will not be accepted unless specifically requested by the Employer in writing.

Add the following to C.2.13.3:

C.2.13.3 Parts of each tender offer communicated on paper shall be submitted as an original, plus 0 (nil) copies.

Add the following after the first sentence of C.2.13.4:

C.2.13.4 The tender shall be signed by a person duly authorised to do so. Tenders submitted by joint ventures of two or more firms shall be accompanied by the document of formation of the joint venture, authenticated by a notary public or other official deputed to witness sworn statements, in which is defined precisely the conditions under which the joint venture will function, its period of duration, the persons authorised to represent and obligate it, the participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning.

Delete the clause and replace with the following.

C.2.13.5 The tender submission details are all described on the General Tender Information page.

The Employer's address for delivery of tender offers and identification details to be shown on each tender offer package are:

Location of tender box:	Langeberg Municipal Office
Physical address:	Langeberg Municipality, Main Street 28, Ashton
Identification details:	Tender number: 46/2025
Title of tender:	UPGRADING OF MCGREGOR WTW

Sealed tenders with the name and address of the tenderer, the tender No. and title and the closing date indicated on the envelope, must be placed in the appropriate official tender box at the abovementioned address.

Add the following to C.2.13.6:

C.2.13.6 A two-envelope procedure will **not** be followed (C.3.5).

Add the following new Clauses after C.2.13.9 and before C.2.14:

C.2.13.10 By signing the offer part of C1.1 Form of Offer and Acceptance the tenderer declares that all information provided in the tender submission is true and correct.

C.2.13.11 The Employer shall not formally issue tender documents in electronic format and shall only issue tender documents in hardcopy. An electronic version of the issued tender documents, or elements thereof, may be made available to the tenderer at the Employer's discretion, upon written request in terms of this clause, subject to the following:

a) No Electronic copies of the issued tender documents including BOQ, or parts thereof, will be provided to tenderers.
b) The Employer shall not accept tenders submitted in electronic format. Only those tenders that have been completed on the issued hard copy tender document shall be considered.
c) Where Addenda have been issued which amend the Bills of Quantities, then the printed Bills of Quantities shall take these into account. The pages of the issued Bills of Quantities should not be removed from the tender document.
d) The Employer accepts no responsibility or liability arising from any reliance on or use of the electronic version provided in terms of this clause. Tenderers are alerted to the fact that electronic versions of the tender documents may not reflect any notices or addenda that amend the tender document.
e) Any non-compliance with these provisions, including effecting any unauthorised alterations to the tender documents as contemplated in C.2.11, shall render the tender non-responsive. The Employer reserves the right to take any action against such tenderer allowed in law including, in circumstances where the tender had already been awarded, the right to cancel the contract.

C.2.15 Closing time

Add the following to C.2.15.1 after the first sentence:

C.2.15.1 The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.

C.2.16 Tender offer validity

Add the following to C.2.16.1 after the first sentence:

C.2.16.1 The tender offer validity period is **120 days**.

C.2.16.2 Delete the clause and replace with the following:

Notwithstanding the period stated above, bids shall remain valid for acceptance for a period of twelve (12) months after the expiry of the original validity period, unless the Municipality is notified in writing of anything to the contrary by the bidder. The validity of bids may be further extended by a period of not more than six months subject to mutual agreement and administrative processes and upon approval by the Municipal Manager.

C.2.17 Clarification of tender offer after submission

Add the following to C.2.17 at the end of the third sentence:

A tender will be rejected as non-responsive if the tenderer fails to provide any clarification or supporting documents requested by the Employer within the time for submission stated in the Employer's written request for such clarification or documents.

C.2.18 Provide other material

Delete the following word in C.2.18.1:

C.2.18.1 "notarized"

Add the following to C.2.18.1 at the end of the first paragraph:

Provide, on written request by the Employer, where the transaction value (tendered amount) inclusive of VAT **exceeds R 10 million**:

a) audited annual financial statement for the past 3 years, or for the period since establishment if established during the past 3 years, if required by law to prepare annual financial statements for auditing;
b) a certificate signed by the tenderer certifying that the tenderer has no undisputed commitments for municipal services towards a municipality or other service provider in respect of which payment is overdue for more than 30 days;
c) particulars of any contracts awarded to the tenderer by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract;
d) a statement indicating whether any portion of the goods or services are expected to be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality or municipal entity is expected to be transferred out of the Republic.

Each party to a Consortium/Joint Venture shall submit separate certificates/statements in the above regard.

Add the following Clauses after C.2.18.2 and before Clause C.2.19:

C.2.18.3 Tenderers shall fully cooperate with the Employer's external service provider appointed to perform a due diligence review and risk assessment upon receipt of such written instruction from the Employer.

Failure to fully cooperate could result in a tender being declared as non-responsive.

C.2.18.4 Compliance with Occupational Health and Safety Act, 85 of 1993

Tenderers are to note the requirements of the Occupational Health and Safety Act, 85 of 1993 and the Construction Regulations, 2014 issued in terms of Section 43 of the Act. The Tenderer shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

In this regard the Tenderer shall submit with his tender or upon request, appended to Schedule 21: Health and Safety Plan in T2.2: Returnable Schedules, a draft Health and Safety Plan in respect of the Works in sufficient detail to demonstrate the necessary competencies and resources to perform the construction work all in accordance with the Act, Regulations and Health and Safety Specification in Part C6 in the Scope of Work.

Such Health and Safety Plan shall cover inter-alia the following details:

(1) Management Structure, Site Supervision and Responsible Persons including a succession plan.

(2) Contractor's induction training programme for employees, sub-contractors, and visitors to the Site.
(3) Health and safety precautions and procedures to be adhered to, to ensure compliance with the Act, Regulations and Safety Specifications.
(4) Regular monitoring procedures to be performed.
(5) Regular liaison, consultation, and review meetings with all parties.
(6) Site security, welfare facilities and first aid.
(7) Site rules and fire and emergency procedures.

Tenderers are to note that the Contractor is required to ensure that all sub-contractors or others engaged in the performance of the contract also comply with the above requirements.

The Contractor shall prepare and maintain a Health and Safety File in respect of the project, which shall always be available for inspection on Site and handed over to the Employer on Final Completion of the project.

The Contractor is required to submit to the Employer the Occupational Health and Safety Agreement (included in C1.5 of the Contract Document) and a letter of good standing from the Compensation Commissioner, or a licensed compensation insurer, within 14 days after the Commencement Date of the Contract.

C.2.23 Certificates

Add the following after the first sentence:

The tenderer is required to submit the following:

C.2.23.1 Evidence of tax compliance

Tenderers shall be registered with the South African Revenue Service (SARS) and their tax affairs must be in order and they must be tax compliant subject to the requirements of clause C.2.1.4.2.h. In this regard, it is the responsibility of the Tenderer to submit evidence in the form of a valid Tax Clearance Certificate issued by SARS to the Employer at the Supplier Management Unit located within the Supplier Management / Registration Office 28 Main Street, Ashton. (Tel 023 656 8200) or included with this tender. The tenderer must also provide its Tax Compliance Status PIN number on the **Compulsory Enterprise Questionnaire**

Each party to a Consortium/Joint Venture shall submit a separate Tax Clearance Certificate.

Before making an award the Langeberg Municipality must verify the bidder's tax compliance status. Where the recommended bidder is not tax compliant, the bidder should be notified of the non-compliant status and be requested to submit to the Langeberg Municipality, within 7 working days, written proof from SARS that they have made arrangement to meet their outstanding tax obligations. The proof of tax compliance submitted by the bidder must be verified by the Langeberg Municipality via CSD or e-Filing. The Langeberg Municipality should reject a bid submitted by the bidder if such bidder fails to provide proof of tax compliance within the timeframe stated herein.

Only foreign suppliers who have answered "NO" to all the questions contained in the Questionnaire to Bidding Foreign Suppliers section on the **Details of Tenderer** pages of the tender submission, are not required to register for a tax compliance status with SARS.

C.2.23.2 Broad-Based Black Economic Empowerment Status Level Documentation

In order to qualify for preference points, it is the responsibility of the tenderer to submit documentary proof, either as certificates, sworn affidavits or any other requirement prescribed in terms of the B-BBEE Act, of its B-BBEE status level of contribution in accordance with the applicable Codes of good practise as issued by the Department of Trade and Industry, to the LANGEBERG MUNICIPALITY at the Supplier Management Unit located within the Supplier Management / Registration Office, 28 Main Street, Ashton.(Tel: 023 626 8200) or included with the tender submission.

Consortiums/Joint Ventures will qualify for preference points, provided that the **entity** submits the relevant certificate/scorecard in accordance with the applicable codes of good practise. Note that, in the case of unincorporated entities, a verified consolidated B-BBEE scorecard must be submitted in the form of a certificate with the tender.

Tenderers are further referred to the content of the **Preference Schedule** for the full terms and conditions applicable to the awarding of preference points.

The applicable code for this tender is the **Amended Codes for Measuring Broad-Based Black Economic Empowerment.**

The tenderer shall indicate in Section 25 of the **Preference Schedule** the Level of Contribution in respect of the enterprise status or structure of the tendering entity (the supplier).

Add the follow new clause after C.2.23.2

C.2.24 Proposed Deviations and Qualifications

Where the tenderer cannot tender in all respects in accordance with the provisions contained in the tender documents, all deviations therefrom shall be clearly and separately listed in the schedule titled **Proposed Deviations and Qualifications by Tenderer** in T2.2 Returnable Schedules, or in a tenderer's covering letter expressly referenced in this schedule.

The tenderer accept that the Employer will examine such deviations in terms of clause C.3.8.2 and shall not be bound to accept any such deviations or qualifications.

It must be clearly stated by the tenderer whether the sum tendered in the Tender Offer includes for all such deviations or qualifications listed or referred to in the schedule titled **Proposed Deviations and Qualifications by Tenderer** or not.

C.3 The Employer's undertakings

C.3.2 Issue Addenda

Delete the first sentence and replace with:

If necessary, issue addenda in writing that may amend or amplify the tender documents to each tenderer during the period from the date the tender documents are available until one week before the tender closing time stated in the Tender Data. The Employer reserves its rights to issue addenda less than one week before the tender closing time in exceptional circumstances.

Add the following to C.3.2 at the end of the paragraph:

Notwithstanding any requests for confirmation of receipt of` Addenda issued, the tenderer shall be deemed to have received such addenda if the employer can show proof of transmission thereof (or a notice in respect thereof) via electronic mail, facsimile, or registered post. It is therefore of great importance that the contact details provided during the compulsory clarification meeting is legible and contactable.

C3.4 Opening of tender submissions

Add the following to C.3.4.2 at the end of the paragraph:

The location for opening of the tender offers is the Tender Submission Office at the address as stated on the General Tender Information page.

C.3.8 Test for responsiveness

C.3.8.2 *Replace the final sentence of C.3.8.2 with the following:*

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the material deviation.

Add the following after clause C.3.8.2

C.3.8.3 The Employer reserves the right to accept a tender offer which does not, in the Employer's opinion, materially and/or substantially deviate from the terms, conditions, and specifications of the tender documents.

C.3.9 Arithmetical errors, omissions, and discrepancies

Add the following after clause C.3.9.4

C.3.9.5 In the event of tendered rates or lump sums being declared by the Employer to be unacceptable to it because they are not priced, either excessively low or high, or not in proper balance with other rates or lump sums, the Tenderer may be required to produce evidence and advance arguments in support of the tendered rates or lump sums objected to. If, after submission of such evidence and any further evidence requested, the Employer is still not satisfied with the tendered rates or lump sums objected to, it may request the tenderer to amend these rates and lump sums along the lines indicated by it.

The Tenderer will then have the option to alter and/or amend the rates and lump sums objected to and such other related amounts as are agreed on by the Employer, but this shall be done without altering the tender offer in accordance with this clause.

Should the Tenderer fail to amend his tender in a manner acceptable to and within the time stated by the Employer, the Employer may declare the tender as non-responsive.

C.3.10 Clarification of a tender offer

Delete the clause and replace with the following:

C3.10 The Employer may, after the closing date, request additional information or clarification from any tenderer, in writing on any matter affecting the evaluation of the tender offer or that could give rise to ambiguity in a contract arising from the tender offer, which written request and related response shall not change or affect their competitive position or the substance of the tenderer's offer.

C.3.11 Evaluation of tender offers

Add the following Clauses after clause C.3.11.1 and before Clause C.3.12

C.3.11.2 Where the scoring of functionality forms part of a bid process, each member of the Bid Evaluation Committee must individually score functionality. The individual scores must then be interrogated and calibrated if required where there are significant discrepancies. The individual scores must then be added together and averaged to determine the final score.

C.3.11.3 The tender will be evaluated in terms of the requirements of the Preferential Procurement Regulations of 2022 as follows:

C.3.11.3.1 The preference point system applicable to this tender is the 80/20 preference point system.

C.3.11.3.2 Price and specific goals will be scored, as relevant, to two decimal places.

C.3.11.3.3 Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences.

Points will be awarded to tenderers who are eligible for preferences in terms of the **Preference Schedule** (where preferences are granted in respect of B-BBEE contribution) which is included in T2.2 Returnable Schedules.

The terms and conditions of the **Preference Schedule** shall apply in all respects to the tender evaluation process and any subsequent contract.

In addition, the various deemed B-BBEE Status Level of Contributor in accordance with the relevant Codes can be attained and such tenderers must be awarded the appropriate number of points.

It should be noted that such Deemed B-BBEE Status Level of Contribution can be enhanced or discounted in accordance with the relevant clauses in the applicable Codes.

C.3.11.4 Risk Analysis

Notwithstanding compliance with regard to CIDB registration or any other requirements of the tender, the employer will perform a risk analysis in respect of the following:

a) reasonableness of the financial offer
b) reasonableness of unit rates and prices
c) the tenderer's ability to fulfil its obligations in terms of the tender document, that is, that the tenderer can demonstrate that he/she/it possesses the necessary professional and technical qualifications, professional and technical competence, financial resources (Bank Ratings will be requested), equipment and other physical facilities, managerial capability, reliability, capacity, experience, reputation, personnel to perform the contract, etc.; the Employer reserves the right to consider a tenderer's existing contracts with the Employer in this regard
d) any other matter relating to the submitted bid, the tendering entity, matters of compliance, verification of submitted information and documents.

The conclusions drawn from this risk analysis will be used by the Employer in determining the acceptability of the tender offer in terms of C.3.13.

C.3.13 Acceptance of tender offer

Delete first sentence of C.3.13 and replace with the following):

Accept the tender offer, if in the opinion of the employer, it does not present any material risk and only if the tenderer:

Delete C.3.13 a) and replace with the following):

a) is not under restrictions, has any principals who are under restrictions, or is not currently a supplier to whom notice has been served for abuse of the supply chain management system, preventing participation in the employer's procurement;

Add the following below C.3.13 f)

If an award cannot be made in terms of anything contained herein, the Employer reserves the right to consider the next ranked tenderer(s). The Employer does not bind himself to accept the lowest priced tender, highest evaluation points tender or any tender offer. The Employer has the right to accept any part of a tender as he may deem expedient subject to negotiation with the successful tenderer for the whole tender.

C.3.13.1 The Employer reserves the right not to make an award, or revoke an award already made, where the implementation of the contract may result in reputational risk or harm to the Langeberg Municipality as a result of (inter alia):

a) reports of poor governance and/or unethical behaviour;
b) association with known family of notorious individuals;
c) poor performance issues, known to the Langeberg Municipality;
d) negative social media reports; and
e) adverse assurance (e.g. due diligence) report outcomes.

C.3.13.2 The Employer reserves the right to nominate an alternative bidder at the time when an award is made and in the event that a contract is terminated during the execution thereof, the LANGEBERG MUNICIPALITY may consider the award of the contract, or non-award, to the alternative bidder in terms of the procedures included its SCM Policy.

C.3.13.3 The Employer shall notify the successful tenderer in writing of the decision of the Employer's Bid Adjudication Committee to award the tender to the successful tenderer. No rights shall accrue to the successful tenderer in terms of this notice.

C.3.13.4 The Employer shall, at the same time as notifying the successful tenderer of the Bid Adjudication Committee's decision to award the tender to the successful tenderer, also give written notice to the other tenderers informing them that they have been unsuccessful.

C.3.17 Provide copies of the contract

Add the following after the first sentence:

The number of paper copies of the signed contract to be provided by the Employer is one.

Add the following Clauses after C.3.18:

C.3.19 Negotiations with preferred tenderers

The Employer may negotiate the final terms of a contract with tenderers identified through a competitive tendering process as preferred tenderers provided that such negotiation:

a) does not allow any preferred tenderer a second or unfair opportunity;
b) is not to the detriment of any other tenderer; and
c) does not lead to a higher price than the tender as submitted.

If negotiations fail to result in acceptable contract terms, the Municipal Manager (or his delegated authority) may terminate the negotiations and cancel the tender or invite the next ranked tenderer for negotiations. The original preferred tenderer should be informed of the reasons for termination of the negotiations. If the decision is to invite the next highest ranked tenderer for negotiations, the failed earlier negotiations may not be reopened by the LANGEBERG MUNICIPALITY.

Minutes of any such negotiations shall be kept for record purposes.

The provisions of this clause will be equally applicable to any invitation to negotiate with any other tenderers.

In terms of the PPPFA Regulations, 2017, tenders must be cancelled in the event that negotiations fail to achieve a market related price with any of the three highest scoring tenderers.

C.3.20 Claims arising after submission of tender

No claim for any extras arising out of any doubt or obscurity as to the true intent and meaning of anything shown on the Contract Drawings or contained in the Conditions of Contract, Scope of Work and Pricing Data,

will be admitted by the Employer/Employer's Agent after the submission of any tender and the Tenderer shall be deemed to have:

a) inspected the Contract Drawings and read and fully understood the Conditions of Contract.
b) read and fully understood the whole text of the Scope of Work and Pricing Data and thoroughly acquainted himself with the nature of the works proposed and generally of all matters which may influence the Contract.
c) visited the site of the proposed works, carefully examined existing conditions, the means of access to the site, the conditions under which the work is to be done and acquainted himself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and construction equipment to and from the site and made the necessary provisions for any additional costs involved thereby.
d) requested the Employer or his duly authorised agent to make clear the actual requirements of anything shown on the Contract Drawings or anything contained in the Scope of Work and Pricing Data, the exact meaning or interpretation of which is not clearly intelligible to the Tenderer.
   Before submission of any tender, the Tenderer should check the number of pages, and if any are found to be missing or duplicated, or the figures or writing indistinct, or if the Pricing Data contain any obvious errors, the tenderer must apply to the Employer/Employer's Agent at once to have the same rectified, as no liability will be admitted by the Employer/Employer's Agent in respect of errors in any tender due to the foregoing.
e) received any Addenda to the tender documents which have been issued in accordance with the Employer's Supply Chain Management Policy.

C.3.21 General supply chain management conditions applicable to tenders

In terms of its Supply Chain Management Policy the Employer may not consider a tender unless the provider who submitted the tender:

a) has furnished the Employer with that provider's:
   - full name;
   - identification number or company or other registration number; and
   - tax reference number and VAT registration number, if any;

b) has indicated whether:
   - the provider is in the service of the state, or has been in the service of the state in the previous twelve months;
   - the provider is not a natural person, whether any of the directors, managers, principal shareholders or stakeholders is in the service of the state, or has been in the service of the state in the previous twelve months;
   - whether a spouse, child or parent of the provider or of a director, manager, shareholder or stakeholder referred to above is in the service of the state, or has been in the service of the state in the previous twelve months; or

c) irrespective of the procurement process followed, the Employer is prohibited from making an award to:
   - a person who is in the service of the state;
   - a juristic entity of which any director, manager, principal shareholder or stakeholder is in the service of the state;
   - an advisor or consultant contracted with the Employer, or
   - a person, advisor or corporate entity involved with the bid specification committee, or a director of such corporate entity.

The Contract Price shall not be subject to any contract price adjustment, the rates and prices tendered in the bills of quantities shall. In this regard, tenderers shall complete Schedule 1, Part T2.2: Returnable Schedules: Compulsory Enterprise Questionnaire. Failure to complete this Schedule may result in the tender not being considered.

C.3.22 Combating abuse of the Supply Chain Management Policy

In terms of the Municipality's Supply Chain Management Policy, the Employer may reject the tender of any tenderer if that tenderer or any of its directors has:

a) failed to pay municipal rates and taxes or municipal service charges and such rates, taxes and charges are in arrears for more than three months
b) failed, during the last five years, to perform satisfactorily on a previous contract with the Municipality or any other organ of state after written notice was given to that tenderer that performance was unsatisfactory.
c) abused the supply chain management system of the Employer or has committed any improper conduct in relation to this system.
d) been convicted of fraud or corruption during the past five years.

e) wilfully neglected, reneged on, or failed to comply with any government, municipal or other public sector contract during the past five years; or
f) been listed with the Register of Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004) or has been listed on National Treasury's database as a person or juristic entity prohibited from doing business with the public sector.

In this regard, tenderers shall complete Part T2.2: Returnable Schedules: Declaration of Tenderer's Past Supply Chain Management Practices (in terms of the Municipal Finance Management Act). Failure to complete this Schedule may result in the tender not being considered.

C.3.23 UIF payments
The Tenderer shall submit to the Employer a letter from the Industrial Council indicating his good standing with regard to UIF payments upon being requested to do so.

C.3.24 Price variations
Tender document or part thereof. Only those tenders that have been completed on the issued hard copy tender final and binding throughout the period of the contract. However, price adjustments for variations in the costs of special materials may be applicable where the Employer/Employer's Agent specifies such materials and the relevant information in the Contract Data.

Notwithstanding the above, if, as a result of any extension of time granted, the duration of the contract period exceeds one year, the contract will automatically be subject to contract price adjustment for that period by which the extended contract period exceeds such one year.

Adjustment in rates or prices shall be subject to the provisions of Part C1.2: Contract Data.

C.3.25 Requests for contract documents, or parts thereof, in electronic format
The Employer shall not formally issue tender documents in electronic format as contemplated in C.2.13.2 and C.2.13.3 and shall only issue tender documents in hardcopy. An electronic version of the issued tender documents may be made available to the tenderer, upon written request in terms of this clause, subject to the following:

a) Electronic copies of the contract document, or parts thereof, will only be provided to tenderers who have been issued with the tender documents as contemplated in C.1.2 in hardcopy.
b) The electronic version shall not be regarded as a substitute for the issued tender documents.
c) The Employer shall not accept tenders submitted in electronic format. Tenderers may **not** complete and submit a printed copy of the electronic version of the tender document.
d) The Employer accepts no responsibility or liability arising from any reliance on or use of the electronic version provided in terms of this clause. The Employer further does not guarantee that the electronic version corresponds with the issued tender documents in all respects. Tenderers are alerted to the fact that electronic versions of the tender documents may not reflect any notices or addenda that amend the tender document.
e) Any non-compliance with these provisions, including effecting any unauthorised alterations to the tender document as contemplated in C.2.11, shall render the tender invalid. The Employer reserves the right to take any action against such tenderer allowed in law including, in circumstances where the tender had already been awarded, the right to cancel the contract.
f) In requesting the electronic version of the tender document or parts thereof, the tenderer is deemed to have read, understood, and accepted all of the above conditions.

C.3.26 Bidders who do not submit B-BBEE Status Level Verification Certificates or are non-compliant contributors to B-BBEE do not qualify for preference points for B-BBEE but should not be disqualified from the bidding process. They will score points out 80 for price only and zero (0) points out of 20 for B-BBEE. A trust, consortium or joint venture must submit a consolidated B-BBEE Status Level Verification Certificate for every separate bid

Annex C
(normative)
Standard Conditions of Tender

C.1 General

C.1.1 Actions

C.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note:
1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.
2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

C.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

C.1.2 Tender Documents issued by the employer for the purpose of a tender offer are listed in the tender data.

C.1.3 Interpretation

C.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

C.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

a) conflict of interest means any situation in which:
i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially;
ii) an individual or tenderer is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
iii) incompatibility or contradictory interests exist between an employee and the tenderer who employs that employee.
b) comparative offer means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;
c) corrupt practice means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process;
d) fraudulent practice means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels;

C.1.4 Communication and employer's agent
Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer may, prior to the award of the tender, cancel a tender if-

a) due to changed circumstances, there is no longer a need for the engineering and construction works specified in the invitation;
b) funds are no longer available to cover the total envisaged expenditure; or
c) no acceptable tenders are received.
d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General
Unless otherwise stated in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

C.1.6.2 Competitive negotiation procedure

C.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.

Notwithstanding the provisions of C.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their tender offer based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

C.1.6.2.4 The contract shall be awarded in accordance with the provisions of C.3.11 and C.3.13 after tenderers have been requested to submit their best and final offer.

C.1.6.3 Proposal procedure using the two stage-system

C.1.6.3.1 Option 1
Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

C.1.6.3.2 Option 2

C.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

C.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data and award the contract in terms of these conditions of tender.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

C.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

C.2.2 Cost of tendering

C.2.2.1 Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

C.2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

C.2.3 Check documents
Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

C.2.4 Confidentiality and copyright of documents
Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

C.2.5 Reference documents
Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

C.2.6 Acknowledge addenda
Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary, apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

C.2.7 Clarification meeting
Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

C.2.8 Seek clarification
Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.2.9 Insurance
Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

C.2.10 Pricing the tender offer

C.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable fourteen (14) days before the closing time stated in the tender data.

C.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

C.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

C.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

C.2.11 Alterations to documents
Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

C.2.12 Alternative tender offers

C.2.12.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

C.2.12.2 Accept that an alternative tender offer must be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

C.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

C.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

C.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

C.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

C.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked “financial proposal” and place the remaining returnable documents in an envelope marked “technical proposal”. Each envelope shall state on the outside the employer’s address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

C.2.13.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

C.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

C.2.14 Information and data to be completed in all respects
Accept that tender offers, which do not provide all the data or information requested completely and, in the form, required, may be regarded by the employer as non-responsive.

C.2.15 Closing time

C.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

C.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

C.2.16 Tender offer validity

C.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

C.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

C.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted. If the validity period stated in C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).

C.2.16.4 Where a tender submission is to be substituted, a tenderer must submit a substitute tender in accordance with the requirements of C.2.13 with the packages clearly marked as "SUBSTITUTE".

C.2.17 Clarification of tender offer after submission
Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: Sub-clause C.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.

C.2.18 Provide other material

C.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment.

Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

C.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

C.2.19 Inspections, tests, and analysis
Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

C.2.20 Submit securities, bonds, and policies
If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies, and certificates of insurance required in terms of the conditions of contract identified in the contract data.

C.2.21 Check final draft
Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

C.2.22 Return of other tender documents
If so, instructed by the employer, return all retained tender documents within twenty-eight (28) days after the expiry of the validity period stated in the tender data.

C.2.23 Certificates
Include in the tender submission or provide the employer with any certificates as stated in the tender data.

C.3 The employer's undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:
a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

C.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three (3) working days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who collected tender documents.

C.3.3 Return late tender offers
Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

C.3.4 Opening of tender submissions

C.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

C.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, number of points claimed for its BBBEE status level and time for completion for the main tender offer only.

C.3.4.3 Make available the record outlined in C.3.4.2 to all interested persons upon request.

C.3.5 Two-envelope system

C.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

C.3.5.2 Evaluate functionality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on BBBEE status level. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

C.3.6 Non-disclosure
Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

C.3.7 Grounds for rejection and disqualification
Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

C.3.8 Test for responsiveness

C.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

a) complies with the requirements of these Conditions of Tender,
b) has been properly and fully completed and signed, and
c) is responsive to the other requirements of the tender documents.

C.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
b) significantly change the Employer's or the tenderer's risks and responsibilities under the contract, or
c) affect the competitive position of other tenderers presenting responsive tenders if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

C.3.9 Arithmetical errors, omissions, and discrepancies

C.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

C.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with C.3.11 for:
a) the gross misplacement of the decimal point in any unit rate;
b) omissions made in completing the pricing schedule or bills of quantities; or c) arithmetic errors in:

(i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
(ii) the summation of the prices.

C.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

C.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:
a) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern, and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
b) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

C.3.10 Clarification of a tender offer
Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

C.3.11 Evaluation of tender offers
The Standard Conditions of Tender standardize the procurement processes, methods, and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project.

Conditions of tender are by definition the document that establishes a tenderer’s obligations in submitting a tender and the employer’s undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:	
Requirement	Qualitative interpretation of goal
Fair	The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.
Equitable	Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.
Transparent	The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.
Competitive	The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.
Cost effective	The processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and least resources to effectively manage and control procurement processes.

The activities associated with evaluating tender offers are as follows:

a) Open and record tender offers received
b) Determine whether or not tender offers are complete
c) Determine whether or not tender offers are responsive
d) Evaluate tender offers
e) Determine if there are any grounds for disqualification
f) Determine acceptability of preferred tenderer
g) Prepare a tender evaluation report
h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

C.3.13 Acceptance of tender offer

Accept the tender offer; if in the opinion of the employer, it does not present any risk and only if the tenderer:

a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement;
b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract;
c) has the legal capacity to enter into the contract;
d) is not; insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her business activities or is subject to legal proceedings in respect of any of the foregoing;
e) complies with the legal requirements, if any, stated in the tender data; and
f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

C.3.14 Prepare contract documents

C.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:
a) addenda issued during the tender period,
b) inclusion of some of the returnable documents and
c) other revisions agreed between the employer and the successful tenderer.

C.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

C.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the CIDB Register of Projects.

C.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

C.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

Part T2: Returnable Documents

PART T2: RETURNABLE DOCUMENTS 35

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T2.2 RETURNABLE SCHEDULES 37

T2.1 List of Returnable Documents

The tenderer must complete the following Returnable Documents in non-erasable **black ink**:

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T2.2 Returnable Schedules

Schedule 1: Compulsory Enterprise questionnaire

The following particulars must be furnished. In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted.

Section 1: Name of enterprise: …

Section 2: VAT registration number, if any: …

Section 3: CIDB registration number, if any: …

Section 4a: National Treasury Central Supplier Database registration number: … … … … … … … … … … … … …

Section 4b: SARS Tax Compliance Status PIN: …

Section 5: Particulars of sole proprietors and partners in partnerships

Name*	**Identity number***	**Personal income tax number***

* Complete only if sole proprietor or partnership and attach separate page if more than 3 partners

Section 6: Particulars of companies and close corporations

Company registration number**… …**

Close corporation number**… …**

Tax reference number**… …**

Section 7: MBD4 – Attached to this document

Section 8: MBD6 – Attached to this document

Section 9: MBD8 – Attached to this document

Section 10: MBD9 – Attached to this document

Section 11: Foreign Bidding Suppliers Is tenderer the accredited representative in South Africa for the Goods / Services / Works offered?	☐Yes ☐No If yes, enclose proof
Is tenderer a foreign based supplier for the Goods / Services / Works offered?	☐Yes ☐No If yes, answer the Questionnaire to Bidding Foreign Suppliers (below)
Questionnaire to Bidding Foreign Suppliers	
a) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa?	☐Yes ☐No
b) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa?	☐Yes ☐No
c) Does the tenderer have a permanent establishment in the Republic of South Africa?	☐Yes ☐No
d) Does the tenderer have any source of income in the Republic of South Africa?	☐Yes ☐No
e) Is the tenderer liable in the Republic of South Africa for any form of taxation?	☐Yes ☐No

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise:

i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;

ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004 or Database of Restricted Suppliers;

iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;

iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and

v) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 2: Clarification meeting attendance certificate

Refer to tender conditions C.2.7 in section T1.2 Tender data

This is to certify that I/we, (the representative(s)) .....

representing (the tenderer) .....

of address .....

.....

.....

.....

Telephone and cellphone number .....

fax number .....

on (date) .....

attended the clarification meeting, have examined the Site of the Works and its surroundings for which I/we am/are submitting this Tender and have, so far as is practicable, familiarized myself/ourselves with all the information, risks, contingencies and other circumstances which may influence of affect my/our Tender.

Attendance of the above person(s) at the Clarification Meeting is confirmed by:

EMPLOYER'S AGENT / REPRESENTATIVE: . (Name) ……

SIGNED BY EMPLOYER'S AGENT / REPRESENTATIVE: ……

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

LANGEBERG MUNICIPALITY

TENDER NO. 46/2025

UPGRADING OF MCGREGOR WTW

Schedule 3: Certificate of Independent Tender determination (MBD9)

I, the undersigned, in submitting this tender for **TENDER NO. 46/2025: UPGRADING OF MCGREGOR WTW** in response to the invitation for the tender made by the Langeberg Municipality, do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of _____ that:
(Name of Tenderer)

1. I have read, and I understand the contents of this Certificate;
2. I understand that this tender will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the tenderer to sign this Certificate, and to submit this tender on behalf of the tenderer;
4. Each person whose signature appears on this tender has been authorized by the tenderer to determine the terms of, and to sign, the tender, on behalf of the tenderer;
5. For the purposes of this Certificate and this tender, I understand that the word "competitor" shall include any individual or organization, other than the tenderer, whether affiliated with the tenderer or not, who:
   (a) has been requested to submit a tender in response to this invitation to tender;
   (b) could potentially submit a tender in response to this invitation to tender, based on their qualifications, abilities, or experience; and
   (c) provides the same goods and services as the tenderer and/or is in the same line of business as the tenderer;
6. The tenderer has arrived at this tender independently from, and without consultation, communication, agreement, or arrangement with any competitor. However, communication between partners in a joint venture or consortium[1] will not be construed as collusive tendering;
7. In particular (without limiting the generality of paragraph 6 above) there has been no consultation, communication, agreement, or arrangement with any competitor regarding:
   (a) prices;
   (b) geographical area where product or service will be rendered (market allocation);
   (c) methods, factors, or formulas used to calculate prices;
   (d) the intention or decision to submit or not to submit a tender;
   (e) the submission of a tender which does not meet the specifications and conditions of the tender; or
   (f) tendering with the intention not to win the tender;
8. In addition, there have been no consultations, communications, agreements, or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this invitation to tender relates;
9. The terms of this tender have not been, and will not be, disclosed by the tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening or of the awarding of the contract;
10. I am aware that , in addition and without prejudice to any other remedy provided to combat any restrictive practices related to tenders and contracts, tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No. 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No. 12 of 2004 or any other applicable legislation.

[1]Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill, and knowledge in an activity for the execution of a contract.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 4: Certificate of Authority (for Companies/Joint Ventures/etc.)

Assurance shall be given at the time of submission of the tender that the tender has been signed by someone properly authorised thereto by resolution of the Directors, Members or Partners. Tenderers shall submit with their tenders the following information:

Single Company, Close Corporation or Partnership

Signatories for companies shall confirm their authority by attaching to this form a copy of the relevant resolution of the board of directors, duly signed and dated.

By resolution of the board of directors taken on (*Date*) .....
Mr/Ms (*Print Name*) .....
has been duly authorized to sign all documents in connection with this tender / contract on behalf of .....
(*Print Company Name*).....
.....
Signed on behalf of Company .....
In his/her capacity as.....
Date.....

Joint Ventures

We, the undersigned, are submitting this tender offer in joint venture and hereby authorize;
Mr/Ms ..... , authorised signatory
of the company, close corporation, or partnership.....
acting in the capacity of lead partner, to sign all documents in connection with the tender offer and any contract resulting from it on our behalf.

Date.....

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
Lead partner		Signature, Name &Designation
		Signature, Name &Designation
		Signature, Name &Designation

Note: A copy of the Joint Venture Agreement, showing clearly the **percentage contribution of each partner** to the joint venture, shall be appended to this schedule. Lead partner need to be clearly stated.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 5: Declaration of Tenderer's past Supply Chain Management practices (MBD8)

Where the entity tendering is a joint venture, each party to the joint venture must sign a declaration in terms of the Municipal Finance Management Act, 56 of 2003, and attach it to this schedule.

1 The tender offer of any tenderer may be rejected if that tenderer or any of its directors/members have:

a) abused the municipality's / municipal entity's supply chain management system or committed any improper conduct in relation to such system;

b) been convicted for fraud or corruption during the past five years;

c) willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or

d) been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).

2 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
2.1	Is the Tenderer or any of its directors listed on the National Treasury's Database of Restricted Suppliers as a company or person prohibited from doing business with the public sector? (Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the *audi alteram partem* rule was applied). **The Database of Restricted Suppliers now resides on the National Treasury's website www.treasury.gov.za and can be accessed by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.1.1	If so, furnish particulars:		
2.2	Is the Tenderer or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act, 12 of 2004? **The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.2.1	If so, furnish particulars:		
2.3	Was the Tenderer or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐
2.3.1	If so, furnish particulars:		
2.4	Does the Tenderer or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes ☐	No ☐

2.4.1	If so, furnish particulars:		
2.5	Was any contract between the Tenderer and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
2.5.1	If so, furnish particulars:		

I, _____, the undersigned,
(full name in block letters)

certify that the information furnished on this declaration form is true and correct, and accept that, in addition to cancellation of a contract, action may be taken against me should this declaration prove to be false.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 6: Declaration of interest – State Employees (MBD 4 amended)

- No bid will be accepted from:
  - 1.1 persons in the service of the state[1], or
  - 1.2 if the person is not a natural person, of which any director, manager or principal shareholder[2] or stakeholder is in the service of the state, or
  - 1.3 from persons, or entities of which any director, manager or principal shareholder or stakeholder, has been in the service of the Langeberg Municipality during the twelve (12) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality, or
  - 1.4 from an entity who has employed a former Langeberg Municipality employee who was at a level of T14 of higher at the time of leaving the LANGEBERG Municipality's employ and involved in any of the Langeberg Municipality's bid committees for the bid submitted, if:
    - 1.4.1 the Langeberg Municipality employee left the Langeberg Municipality's employment voluntarily, during a period of twelve (12) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality;
    - 1.4.2 the Langeberg Municipality employee left the Langeberg Municipality's employment whilst facing disciplinary action by the Langeberg Municipality, during a period of twenty-four (24) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality, or any other period prescribed by applicable legislative provisions, after having left the Langeberg Municipality's employ.

- Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the tenderer or their authorised representative declare their position in relation to the evaluating/adjudicating authority.

3 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

3.1 Full Name of tenderer or his or her representative:……

3.2 Identity Number:……..

3.3 Position occupied in the Company (director, trustee, shareholder[2]):……

3.4 Company or Close Corporation Registration Number:……

3.5 Tax Reference Number:……

3.6 VAT Registration Number:……

3.7 The names of all directors / trustees / shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.

3.8 Are you presently in the service of the state? **YES / NO**

3.8.1 If yes, furnish particulars:
……
……
……

3.9 Have you been in the service of the state for the past twelve months? **YES / NO**

3.9.1 If yes, furnish particulars:

……
……
……

3.10 Do you have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.10.1 If yes, furnish particulars:
……
……
……
……

3.11 Are you, aware of any relationship (family, friend, other) between any other supplier and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.11.1 If yes, furnish particulars
……
……
……
……

3.12 Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.12.1 If yes, furnish particulars:
……
……
……
……

3.13 Are any spouse, child or parent of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.13.1 If yes, furnish particulars:
……
……
……
……

13.4 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract? **YES / NO**

3.14.1 If yes, furnish particulars:
……
……
……
……

3.15 Have you, or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company been in the service of the LANGEBERG Municipality in the past twelve months? **YES / NO**

3.15.1 If yes, furnish particulars:
……
……
……
……

3.16 Do you have any employee/s who was/were in the service of the LANGEBERG Municipality at a level of T14 or higher at the time they left the employ of the LANGEBERG Municipality, and who was involved in any of the LANGEBERG Municipality's bid committees for this bid? **YES / NO**

3.16.1 If yes, furnish particulars:
……
……
……

4. Full details of directors / trustees / members / shareholders.

Full Name	Identity Number	State Employee Number

If the above table does not sufficient to provide the details of all directors / trustees / shareholders, please append full details to the tender submission.

The tenderer hereby certifies that the information set out in this schedule and/or attached thereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the employer of any other remedies available to it

[1] MSCM Regulations: "in the service of the state" means to be –
- ***(a) a member of –***
  - ***(i) any municipal council;***
  - ***(ii) any provincial legislature; or***
  - ***(iii) the national Assembly or the national Council of provinces;***
- ***(b) a member of the board of directors of any municipal entity;***
- ***(c) an official of any municipality or municipal entity;***
- ***(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);***
- ***(e) an executive member of the accounting authority of any national or provincial public entity; or***
- ***(f) an employee of Parliament or a provincial legislature.***

[2] Shareholder" means a person who owns shares in the company and is actively involved in the management of the company or business and exercises control over the company.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 7: Authorisation for the deduction of outstanding amounts owed to the Langeberg Municipality

To: **THE MUNICIPAL MANAGER, LANGEBERG MUNICIPALITY**

From: _____
(Name of tenderer)

The tenderer:

a) hereby acknowledges that according to SCM Regulation 38(1)(d)(i) the Municipal Manager may reject the tender of the tenderer if any municipal rates and taxes or municipal service charges owed by the tenderer (or any of its directors/members/partners) to the LANGEBERG MUNICIPALITY, or to any other municipality or municipal entity, are in arrears for more than 3 (three) months; and
b) therefore hereby agrees and authorises the LANGEBERG MUNICIPALITY to deduct the full amount outstanding by the Tenderer or any of its directors/members/partners from any payment due to the tenderer; and
c) confirms the information as set out in the tables below for the purpose of giving effect to b) above;
d) The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract and/or steps in terms of abuse of the Supply Chain Management Policy.

Physical **Business** address of the Tenderer	Municipal Account number(s)

If there is not enough space for all the names, please attach the additional details to the Tender Document

Name of Director / Member / Partner	Identity Number	Physical **residential** address of Director / Member / Partner	Municipal Account number(s)

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 8: Declaration in respect of compliance with labour legislation

Tenderers must be registered with the relevant Bargaining Council as contained in the tender conditions and must append to this schedule a certificate of compliance / letter of good standing in terms of the relevant Government Gazette that indicates compliance / validity at the time of tender award.

Each party to a Consortium/Joint Venture shall append separate certificates in the above regard.

Declaration in respect of labour legislation

The tenderer, by signing this schedule, declares that it will comply with all labour legislation, as may be applicable.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 9: Declaration for procurement above R10 million (MBD5)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire:

1. Are you by law required to prepare annual financial statements for auditing?***YES / NO**

    1.1. If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.
    ……
    ……

2. Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days?***YES / NO**

    2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.
    2.2 If yes, provide particulars.
    ……
    ……

3. Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?***YES / NO**
    3.1 If yes, furnish particulars
    ……
    ……

4. Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic?***YES / NO**
    4.1 If yes, furnish particulars
    ……
    ……

** Delete if not applicable*

CERTIFICATION:
I, THE UNDERSIGNED (NAME)……
CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT. I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 10: Confirmation of Central Supplier Database (CSD) registration

CENTRAL SUPPLIER DATABASE REGISTRATION		
COMPANY NAME	**REGISTERED YES/NO**	**REGISTRATION NUMBER IF APPLICABLE**

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 11: Tax Clearance Certificate

SARS Tax Compliance Status PIN	
COMPANY NAME	**SARS Tax Compliance Status PIN**

Bidders are required to submit their unique personal identification number (pin) issued by SARS to enable the organ of state to view the taxpayers' profile and tax status.

Application for the tax compliance status (TCS) certificate or pin may also be made via e-filing. In order to use this provision, taxpayers will need to register with SARS as e-filers through the website www.sars.gov.za.

Bidders may also submit a printed TCS certificate together with the bid (valid and original). In Bids where Consortia/Joint Venture/Sub-contractors are involved each party must submit a separate and Original Valid Tax Clearance Certificate.

Failure to submit proof of good standing with SARS (Tax Clearance Certificate) will result in the invalidation of the tender/bid. **Certified copies of the Tax clearance Certificate will not be acceptable.**

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 12: Confirmation of Contractor Enterprise Registration

CIDB REGISTRATION

We hereby confirm our registration on Construction Industry Development Board (CIDB) Contractor Database:

COMPANY NAME	CIDB CONTRACTOR GRADING DESIGNATION	CRS REGISTRATION NUMBER AS APPLICABLE

I/We attach a printed copy of the Active Contractor's Listing off the CIDB website www.cidb.org.za as documentary proof of the Contractor's Registration issued by the Construction Industry Development Board (CIDB) to this schedule.

Where a tenderer satisfies CIDB Contractor grading designation requirements through joint venture formation, such tenderers must submit the Certificates of Contractor Registration in respect of each partner.

Failure to affix such documentation as proof of Contractor Enterprise registration as prescribed to this Schedule shall result in this tender not being further considered for the award of the Contract.

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 13: Tenderer's banking details

Notes to tenderer:

1. **The tenderer shall attach to this form a letter from the bank at which he declares he conducts his account. The contents of the bank's letter must state the credit rating that it, in addition to the information required below, accords to the tenderer for the business envisaged by this tender. The Employer will also do an independent Bank Rating investigation via the Employer's Agent's independent source.**
2. **The tenderer's banking details as they appear below shall be completed.**
3. **If the tenderer is a joint venture enterprise, details of all the members of the joint venture shall be similarly provided and attached to this form. The nominated bank account that will be used for this project need to be completed below. Only one bank account may be used, shown below.**

The method used to obtain a bank rating is an online service provided by ABSA bank. If the tendered contract period is three months or more, an average 3-month cash flow for each tender submitted will be calculated and used as input into the online service. This process ensure that an equivalent method is used when determining the bank ratings of each tenderer. The Employer will obtain codes from the relevant independent financial institutions. The evaluation of your offer will be based on the Bank Rating received from our own independent investigation and not the Bank Rating attached by the tenderer himself. This is to ensure a fair and equal evaluation of bids.

Bidders must provide their banking details below.

The tenderer shall provide the following:

Name of Account Holder: .....

Account Number: .....

Bank name: .....

Branch Number: .....

Bank and branch contact details .....

.....

.....

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 14: Schedule of work experience of Tenderer

The tenderer shall insert in the spaces provided below a list of completed contracts and those currently being undertaken with a scope of similar nature. This information is deemed to be material to the award of the Contract.

Projects of a similar scope and nature is regarded as:
- Bulk earth works
- Road construction
- Interlocking paving with kerbing and channelling.

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will not be contacted for clarification.
The information provided in this schedule will be utilized to calculate the pre-qualification functionality scores. Tenderers must have successfully completed (please note that current incomplete projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion.

A detailed list of successfully completed projects must be completed below (or attached to this schedule).

COMPLETED SIMILAR CONTRACTS				
EMPLOYER (NAME, TEL No AND FAX No)	CONSULTING ENGINEER (NAME, TEL No AND FAX No)	NATURE OF WORK	VALUE OF WORK R(m)	DATE COMPLETED

CURRENT SIMILAR PROJECTS				
EMPLOYER (NAME, TEL No AND FAX No)	CONSULTING ENGINEER (NAME, TEL No AND FAX No)	NATURE OF WORK	VALUE OF WORK R(m)	DATE COMPLETED

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 15: Details of qualifications and experience of staff

Tenderers shall set out in the Schedule hereunder details of the Construction Manager and General Foreman's experience in work of a similar nature to that for which their Tender is submitted. Detailed, project specific CV's to be included in this Schedule. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Projects of a similar scope and nature is regarded as:

- Water treatment works of up to 600kl/day capacity
- Wastewater treatment works of up to 600kl/day capacity

.

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.

CONSTRUCTION MANAGER/SITE AGENT	**NAME**:			
CLIENT/CLIENT AGENT'S NAME AND CONTACT DETAILS	**NATURE OF WORK**	**POSITION HELD**	**VALUE OF WORK**	**YEAR COMPLETED**

GENERAL FOREMAN/CONSTRUCTION SUPERVISOR	NAME: ……			
CLIENT/CLIENT AGENT'S NAME AND CONTACT DETAILS	NATURE OF WORK	POSITION HELD	VALUE OF WORK	YEAR COMPLETED

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 16: Schedule of construction equipment

The tenderer shall state below what construction equipment will be available for this Contract. The tenderer shall differentiate, if applicable, between construction equipment immediately available and construction equipment which will become available by virtue of outstanding orders, and indicate what further construction equipment will be acquired or hired for the work should he be awarded the Contract.

CONSTRUCTION EQUIPMENT IMMEDIATELY AVAILABLE

DESCRIPTION, SIZE, CAPACITY	NUMBER

CONSTRUCTION EQUIPMENT ON ORDER
(State details of arrangements made, with delivery dates)

DESCRIPTION, SIZE, CAPACITY	NUMBER

CONSTRUCTION EQUIPMENT THAT WILL BE ACQUIRED OR HIRED
(State details of delivery arrangements)

DESCRIPTION, SIZE, CAPACITY	NUMBER

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 17: Preliminary programme

The tenderer shall attach a preliminary programme, reflecting the proposed sequence and tempo of execution of the various activities comprising the work for the Contract, to this page.

This programme shall be in the form of a bar chart (Gantt chart) or similar acceptable time/activity form reflecting the proposed sequence and tempo of the various activities and the quantities that will be carried out every week under each of the elements, comprising the work for this contract. The programme shall also indicate the point where the tenderer intends to commence work operations and the direction in which the work will proceed. The working hours shall be indicated.

The tenderer shall also take into account the additional requirements stated in the Project Specifications when drawing up the programme.

Details of the preliminary programme shall be appended to this Schedule.

Number of sheets, appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 18: Proposed work plan

The tenderer shall append their proposed work plan to this Schedule.

It should be noted that while a programme may form part of the required work plan, more than a programme is expected in response to this requirement. The work plan must indicate the approach and methodology that the tenderer intends following to reach the required outcomes. The work plan must show that the tenderer has comprehended the Scope of Work and has good insight as to what actions or activities are required to comply with the Employer's objectives.

The proposed work plan must not exceed two A4 pages.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 19: Schedule of estimated monthly expenditure

The tenderer shall state his estimated expenditure indicating the value of work done and materials not yet built into the Permanent Works for each month of the Contract period which he estimates will arise based on his preliminary programme and tendered rates, as set out in the table below. The total of the monthly amounts shall be equal to the tender sum.

MONTH	VALUE
1. 2. 3. 4.	R R R R
SUBTOTAL CONTINGENCIES 10%)	R R
SUBTOTAL VAT (15%)	R R
TOTAL	R (INCLUDING VAT @ 15%)

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 20: Schedule of sub-contractors

We notify you that it is our intention to employ the following sub-contractors for work (excluding work covered by provisional sums and contingencies) in this contract.

Acceptance of this tender shall not be construed as approval of all or any of the listed sub-contractors. Should any of the sub-contractors not be approved subsequent to acceptance of the tender, this shall in no way invalidate the contract, and the tendered unit rates for the various items making up the work activities shall remain final and binding.

Local Sub-Contractors must be utilized.

SUB-CONTRACTORS		
Sub-contractor's name	Work activities to be undertaken by the Sub-contractor	Estimated value of work (Rand)

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 21: Health and Safety plan

Tenderers are referred to the requirements of Clause C.2.18.4 in Part T1.2 Tender Data and shall append the required draft Health and Safety Plan to this Schedule.

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 22: Proposed deviations and qualifications by tenderer

The Tenderer should record any **proposed** deviations or qualifications he may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such proposed deviations and qualifications in a covering letter attached to his tender and reference such letter in this schedule. Any proposed deviations or qualifications contained in a covering letter which is not referenced in this schedule will not be considered.

The Tenderer's attention is drawn to clause C.3.8 of the Standard Conditions of Tender referenced in the Tender Data regarding the Employer's handling of material deviations and qualifications.

If no deviations or qualifications are proposed, the schedule hereunder is to be marked NIL and signed by the Tenderer.

PAGE	CLAUSE OR ITEM	PROPOSED DEVIATION OR QUALIFICATION

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 23: Functionality criteria

The Tenderer shall provide information for the functionality criteria listed in this Returnable Schedule.

The Tenderer's attention is drawn to clause C.2.1.4.3 in the Tender Data for a more detailed explanation of the functionality criteria given in the table below and how the score will be calculated (with applicable values).

Please note that points scored for Quality (functionality) will not have an influence on the total tender evaluation points and will therefore not affect the ranking of the tenderers, it will only be regarded as a pre-qualification. The minimum points required to be eligible to tender is 70 out of a 100.

THE CRITERIA to be applied in evaluating the proposal is set out in the table below:

Calculate the points for functionality according to the following formula:

$$P_s = S_o/M_s \times A_p$$

Where P_s = Percentage scored for functionality by bid under consideration
S_o = Total score of bid/proposal under consideration
M_s = Maximum possible score = 500
A_p = percentage allocated for functionality = 100

Total points by bidder on functionality:

i) $P_{s(Criterion\ 1)}$ = (Indicator allocated/scored out of 5) x weight
ii) $P_{s(Criterion\ 2)}$ = (Indicator allocated/scored out of 5) x weight
$P_{s(TOTAL)}$ = $[(P_{s(Criterion\ 1)} + P_{s(Criterion\ 2)}) / 5] \times 100$

Criteria can be amended to suit project complexity or omitted if not applicable.

Criterion	Weight
1) Relevant Experience (Returnable Schedule 14)	50%
2) Construction manager Experience (Returnable Schedule 15)	50%
Total	**100%**

EVALUATION CRITERION 1

Tenderers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

A detailed list of successfully completed projects must be completed in/attached to **Schedule 14**.

Projects of a similar scope and nature is regarded as:

- Water treatment works of up to 600kl/day capacity
- Wastewater treatment works of up to 600kl/day capacity

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.

5. RELEVANT EXPERIENCE	
INDICATOR	**Evaluation Criteria for Relevant Experience:** (number of similar projects completed by the contractor in the last 10 years)
0	The tenderer has completed zero projects in the last 10 years
1	The tenderer has completed only 1 project in the last 10 years
2	The tenderer has completed exactly 2 projects in the last 10 years
3	The tenderer has completed exactly 3 projects in the last 10 years

4	The tenderer has completed exactly 4 projects in the last 10 years
5	The tenderer has completed 5 or more projects in the last 10 years

EVALUATION CRITERION 2

Detailed, project specific CV's to be included in **Schedule 15** of the Returnable Documents. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

Projects of a similar scope and nature is regarded as:

- Water treatment works of up to 600kl/day capacity
- Wastewater treatment works of up to 600kl/day capacity

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.

If, during construction, the contractor wishes to replace the construction manager, the contractor will apply in writing to the Engineer as per clause 6.8 of FIDIC. Only similarly experienced and competent construction managers will be considered.

2. CONSTRUCTION MANAGER	
INDICATOR	**Evaluation Criteria for Construction manager:** (number of similar projects completed by the Construction manager in the last 10 years)
0	The Construction manager has completed zero projects in the last 10 years
1	The Construction manager has completed only 1 project in the last 10 years
2	The Construction manager has completed exactly 2 projects in the last 10 years
3	The Construction manager has completed exactly 3 or more projects in the last 10 years
4	The Construction manager has completed exactly 4 or more projects in the last 10 years
5	The Construction manager has completed 5 or more projects in the last 10 years

The functionality proposal will be evaluated individually on score sheets, by a representative evaluation panel according to the evaluation criteria indicated above. All service providers who scored less than 70 out of 100 points for functionality will not be considered further. At least 3 evaluators will evaluate the quality schedules separately.

NB: Points scored for Quality (functionality) will not have an influence on the total tender evaluation points.

Where the entity tendering is a Joint Venture the tender must be accompanied by a statement describing exactly what aspects of the work will be undertaken by each party to the joint venture (appended to Schedule 4, Part T2.2: Returnable Schedules).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 24: Preference Schedule: Measuring B-BBEE

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022
MBD 6.1

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

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1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to invitations to tender:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 **To be completed by the organ of state**

a) The applicable preference point system for this tender is the 80/20 preference point system.

b) The 80/20 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

1.3 Points for this tender (even in the case of a tender for income-generating contracts) shall be awarded for:

(a) Price; and

(b) Specific Goals.

1.4 **To be completed by the organ of state:**

The maximum points for this tender are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS	20
Total points for Price and SPECIFIC GOALS	**100**

1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.

1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

(a) **"tender"** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;

(b) **"price"** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;

(c) **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

(d) **"tender for income-generating contracts"** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and

(e) **"the Act"** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.1.1 Application of preference point system

3.1.1.1 The Municipality will, in the tender documents, stipulate —

(a) the preference point system applicable; and

(b) any specific goal as envisaged in section 2(1)(d) and (e) of the Preferential Procurement Act.

3.1.1.2 If it is unclear whether the 80/20 or 90/10 preference point system applies—

(a) in the case of a tender to generate income or to dispose of or lease assets, the highest acceptable tender; or

(b) in the case of any other tender, the lowest acceptable tender, must be used to determine the applicable preference point system.

3.1.2 Points for Price: 80/20 preference point system for acquisition of goods or services with Rand value equal to or above R30 000 and up to R50 million

3.1.2.1 The following formula must be used to calculate the points out of 80 for price in respect of a tender with a Rand value equal to or above R30 000 and up to a Rand value of R50 million, inclusive of all applicable taxes:

$$Ps = 80\left(1 - \frac{Pt - P\,min}{P\,min}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmin = Price of lowest acceptable tender.

3.1.2.2 A maximum of 20 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.1.2.3 The points scored must be rounded off to the nearest two decimal places.

3.1.2.4 The contract must be awarded to the tenderer scoring the highest points.

3.1.3 Points for price: 90/10 preference point system for acquisition of goods or services with Rand value above R50 million

3.1.3.1 The following formula must be used to calculate the points out 90 for price in respect of a tender with a Rand value above R50 million, inclusive of all applicable taxes:

$$Ps = 90\left(1 - \frac{Pt - P\,min}{P\,min}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmin = Price of lowest acceptable tender.

3.1.3.2 A maximum of 10 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.1.3.3 The points scored must be rounded off to the nearest 2 decimal places.

3.1.3.4 The contract must be awarded to the tenderer scoring the highest points.

3.2. FORMULAE FOR DISPOSAL OR LEASING OF STATE ASSETS AND INCOME GENERATING PROCUREMENT

The following formula must be used to calculate the points for price in respect of a tender to generate income or to dispose of or lease assets, with a Rand value equal to, or above R 30 000 and up to a Rand value of R50 million, inclusive of all applicable taxes:

$$Ps = 80\left(1 + \frac{Pt - Pmax}{Pmax}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmax = Price of highest acceptable tender.

3.2.1 A maximum of 20 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.2.2 The points scored must be rounded off to the nearest 2 decimal places.

3.3.3 The contract must be awarded to the tenderer scoring the highest points.

3.3.4 Points for price:90/10 preference point system for tenders to generate income or to dispose of or lease assets with Rand value equal to or above R50 million

3.3.5 The following formula must be used to calculate the points for price in respect of a tender to generate income or to dispose of or lease assets, with a Rand value above R50 million, inclusive of all applicable taxes:

$$Ps = 90\left(1 + \frac{Pt - Pmax}{Pmax}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmax = Price of highest acceptable tender.

3.3.6 A maximum of 10 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.3.7 The points scored must be rounded off to the nearest 2 decimal places.

3.3.8 The contract must be awarded to the tenderer scoring the highest points.

4. POINTS AWARDED FOR SPECIFIC GOALS

4.1 The tendering conditions will stipulate the specific goals, as contemplated in section 2(1)(d)(ii) of the Preferential Procurement Act, be attained.

4.2 A maximum of 20 points (80/20 preference points system) or 10 (90/10) preference points system), will be allocated for specific goals. These goals are:

(a) contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender or disability (BBBEE);

(b) Promotion of enterprises located in the municipal area

4.3 Regarding par 4.2 (a) 50% of the 20/10 points will be allocated to promote this goal and points will be allocated in terms of the BBBEE scorecard as follows:

B-BBEE Status Level of Contributor	Number of Points for Preference (80/20)	Number of Points for Preference (90/10)
1	20	10
2	18	9
3	16	8
4	12	5
5	8	4
6	6	3
7	4	2
8	2	1
Non-compliant contributor	0	0

4.4 A tenderer must submit proof of its BBBEE status level contributor [scorecard].

4.5 A tenderer failing to submit proof of BBBEE status level of contributor –

4.5.1 may only score in terms of the 80/90-point formula for price; and

4.5.2 scores 0 points out of 10/5 BBBEE status level of contributor, which is in line with section 2 (1) (d) (i) of the Act, where the supplier or service provider did not provide proof thereof.

4.6 Regarding par 4.2 (b) 50% of the **20/10 points** will be allocated to promote this goal. Points will be allocated as follows.

Locality of supplier	Points
Within the boundaries of the Langeberg municipality	**10/5**
Outside of the boundaries of the Langeberg municipality	0

4.7 The policy should not include Pre-qualification goals.

4.8 Any specific goal for which a point may be awarded, must be clearly specified in the invitation to submit a tender.

4.9 A tenderer failing to submit proof of required evidence to claim preferences for other specified goals, which is in line with section 2 (1) (d) (ii) of the Act.

4.9.1 may only score in terms of the 80/90-point formula for price; and

4.9.2 scores 0 points out of 10/5 of the relevant specific goals where the supplier or service provider did not stipulate.

4.10 The preference points scored by a tenderer must be added to the points scored for price.

4.11 The points scored must be rounded off to the nearest two decimal places.

4.12 The contract must be awarded to the tenderer scoring the highest procurement points.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.

Note to tenderers: The tenderer must indicate how they claim points for each preference point system.)

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
BBBEE preference points system	05	10		
Promotion of enterprises located in the municipal area	05	10		

5. DECLARATION WITH REGARD TO COMPANY/FIRM

Name of company/firm…….

5.1. Company registration number: ……...

5.2. TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One-person business/sole propriety
- ☐ Close corporation
- ☐ Public Company
- ☐ Personal Liability Company
- ☐ (Pty) Limited
- ☐ Non-Profit Company
- ☐ State Owned Company

[TICK APPLICABLE BOX]

5.3. I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/ firm for the preference(s) shown and I acknowledge that:

i) The information furnished is true and correct;

ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;

iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;

iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –

(a) disqualify the person from the tendering process;

(b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

(c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;

(d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

(e) forward the matter for criminal prosecution, if deemed necessary.

……
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: ……

DATE: ……

ADDRESS: ……

……

……

……

Schedule 25: Record of addenda to tender documents

We confirm that the following communications received from the Employer before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer:

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Attach additional pages if more space is required.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 26: Mechanical and Electrical Datasheets

TECHNICAL DATA SHEET NO. **1.1**

Centrifugal Pumps

1.1.1 Filter Feed Pumps - 100PS01 & 100PS02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.1.1	Manufacturer			
1.1.1.2	Max Pressure	m	5.9	
1.1.1.3	Min Pressure	m	1.26	
1.1.1.4	Maximum duty flow rate for pump set	m^3/hr	80	
1.1.1.5	Minimum flow rate for pump set	m^3/hr	49	
1.1.1.6	VSD		Required	
1.1.1.7	Pump delivery size	mm		
1.1.1.8	Pump suction size	mm		
1.1.1.9	Pump Casing material			
1.1.1.10	Wear plate			
1.1.1.11	Seal faces			
1.1.1.12	Impeller material			
1.1.1.13	Pump Shaft material			
1.1.1.14	Electric motor			
1.1.1.15	Make of motor			
1.1.1.16	Country of origin			
1.1.1.17	Type of motor		TEFC	
1.1.1.18	Motor rating	kW		
1.1.1.19	Rotational speed	rpm	≤ 1 500	
1.1.1.20	Enclosure rating		IP 55	

1.1.2 Backwash Pumps - 101PS01 & 101PS02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Max Pressure	m	7.2	
1.1.2.3	Min Pressure	m	3.9	
1.1.2.4	Maximum duty flow rate for pump set	m^3/hr	391	
1.1.2.5	Minimum flow rate for pump set	m^3/hr	195.5	
1.1.2.6	VSD		Required	
1.1.2.7	Pump delivery size	mm		
1.1.2.8	Pump suction size	mm		
1.1.2.9	Pump Casing material			
1.1.2.10	Wear plate			
1.1.2.11	Seal faces			
1.1.2.12	Impeller material			
1.1.2.13	Pump Shaft material			
1.1.2.14	Electric motor			
1.1.2.15	Make of motor			
1.1.2.16	Country of origin			
1.1.2.17	Type of motor		TEFC	
1.1.2.18	Motor rating	kW		

1.1.2.19	Rotational speed	rpm	≤ 1 500	
1.1.2.20	Enclosure rating		IP 55	

1.1.3 Service Water Pumps - 102PS01 & 102PS02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Max Pressure	m	40	
1.1.2.3	Min Pressure	m		
1.1.2.4	Maximum duty flow rate for pump set	m^3/hr	10	
1.1.2.5	Minimum flow rate for pump set	m^3/hr	3	
1.1.2.6	VSD		Required	
1.1.2.7	Pump delivery size	mm		
1.1.2.8	Pump suction size	mm		
1.1.2.9	Pump Casing material			
1.1.2.10	Wear plate			
1.1.2.11	Seal faces			
1.1.2.12	Impeller material			
1.1.2.13	Pump Shaft material			
1.1.2.14	Electric motor			
1.1.2.15	Make of motor			
1.1.2.16	Country of origin			
1.1.2.17	Type of motor		TEFC	
1.1.2.18	Motor rating	kW		
1.1.2.19	Rotational speed	rpm	≤ 1 500	
1.1.2.20	Enclosure rating		IP 55	

1.1.4 Reservoir 3 Pumps - 103PS01 & 103PS02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Max Pressure	m	14	
1.1.2.3	Min Pressure	m	3	
1.1.2.4	Maximum duty flow rate for pump set	m^3/hr	40	
1.1.2.5	Minimum flow rate for pump set	m^3/hr	20	
1.1.2.6	VSD		Required	
1.1.2.7	Pump delivery size	mm		
1.1.2.8	Pump suction size	mm		
1.1.2.9	Pump Casing material			
1.1.2.10	Wear plate			
1.1.2.11	Seal faces			
1.1.2.12	Impeller material			
1.1.2.13	Pump Shaft material			
1.1.2.14	Electric motor			
1.1.2.15	Make of motor			
1.1.2.16	Country of origin			
1.1.2.17	Type of motor		TEFC	
1.1.2.18	Motor rating	kW		
1.1.2.19	Rotational speed	rpm	≤ 1 500	
1.1.2.20	Enclosure rating		IP 55	

1.1.5 Dam Transfer Pump - 104PS01

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Max Pressure	m	16.6	
1.1.2.3	Min Pressure	m	9.5	
1.1.2.4	Maximum duty flow rate for pump set	m^3/hr	40	
1.1.2.5	Minimum flow rate for pump set	m^3/hr		
1.1.2.6	VSD		Required	
1.1.2.7	Pump delivery size	mm		
1.1.2.8	Pump suction size	mm		
1.1.2.9	Pump Casing material			
1.1.2.10	Wear plate			
1.1.2.11	Seal faces			
1.1.2.12	Impeller material			
1.1.2.13	Pump Shaft material			
1.1.2.14	Electric motor			
1.1.2.15	Make of motor			
1.1.2.16	Country of origin			
1.1.2.17	Type of motor		TEFC	
1.1.2.18	Motor rating	kW		
1.1.2.19	Rotational speed	rpm	≤ 1 500	
1.1.2.20	Enclosure rating		IP 55	

1.1.6 WTW Feed Pumps - 105PS01 & 105PS02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Max Pressure	m	7.5	
1.1.2.3	Min Pressure	m	1.1	
1.1.2.4	Maximum duty flow rate for pump set	m^3/hr	80	
1.1.2.5	Minimum flow rate for pump set	m^3/hr	40	
1.1.2.6	VSD		Required	
1.1.2.7	Pump delivery size	mm		
1.1.2.8	Pump suction size	mm		
1.1.2.9	Pump Casing material			
1.1.2.10	Wear plate			
1.1.2.11	Seal faces			
1.1.2.12	Impeller material			
1.1.2.13	Pump Shaft material			
1.1.2.14	Electric motor			
1.1.2.15	Make of motor			
1.1.2.16	Country of origin			
1.1.2.17	Type of motor		TEFC	
1.1.2.18	Motor rating	kW		
1.1.2.19	Rotational speed	rpm	≤ 1 500	
1.1.2.20	Enclosure rating		IP 55	

TECHNICAL DATA SHEET NO. **1.2**

Blowers

1.2.1 **Media Filters Backwash Blowers 110BLO01 & 110BLO02**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.2.1.1	Manufacturer			
1.2.1.2	Blower type		Roots type rotary lobe	
1.2.1.3	Pressure	m	3 m Water Column (WC)	
1.2.1.4	Max inlet air temperature and ambient temperature	°C	35 °C	
1.2.1.5	Duty flow rate	Nm^3/hr	538	
1.2.1.6	VSD		Required	
1.2.1.7	Blower delivery size	mm		
1.2.1.8	Blower suction size	mm		
1.2.1.9	Silencers on in & outlet pipes		Required	
1.2.1.10	Acoustic enclosure		Required	
1.2.1.11	Air Filters on suction side		Required	
1.2.1.12	Acoustic enclosure heat ventilation		Required	
1.2.1.13	Noise level with acoustic cabinet	dB	≤80	
1.2.1.14	Blower Casing material			
1.2.1.15	Wear plate			
1.2.1.16	Seal faces			
1.2.1.17	Impeller material			
1.2.1.18	Pump Shaft material			
1.2.1.19	Electric motor			
1.2.1.20	Make of motor			
1.2.1.21	Country of origin			
1.2.1.22	Type of motor		TEFC	
1.2.1.23	Motor rating	kW		
1.2.1.24	Rotational speed	rpm	≤ 1 500	
1.2.1.25	Enclosure rating		IP 55	

TECHNICAL DATA SHEET NO. **1.3**

Filter Media & Underdrain

1.3.1 Filter Media - Sand

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.3.1.1	Type		Quartzitic	
1.3.1.2	Bed Depth – L	(m)	0.8	
1.3.1.3	Media Density - ρs	(kg/m^3)	>2500	
1.3.1.4	Fixed loose-bed Porosity - ε0		0.45	
1.3.1.5	Sphericity – Ψ		0.78	
1.3.1.6	Coefficient of uniformity – UC		1.4	
1.3.1.7	Effective size – EC	(mm)	0.7	

1.3.2 Dual Parallel Lateral Underdrains

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.3.2.1	Original Equipment Manufacturer (OEM)		Leopold or equivalent	
1.3.2.2	Material of equipment		Corrosion-resitant HDPE	
1.3.2.3	Underdrain height	mm		
1.3.2.4	Underdrain block length	mm		
1.3.2.5	Underdrain block width	mm		
1.3.2.6	Joints		Gasketed bell and spigot type joined by snap-lock	
1.3.2.7	Max filtration rate per filter cell	m/hr	5.75	
1.3.2.8	Backwash Water Rate High	m/hr	40	
1.3.2.9	Backwash Water Rate Low	m/hr	20	
1.3.2.10	Backwash Air Rate	m/hr	55	

TECHNICAL DATA SHEET NO. **1.4**

Preconditioning and pH Adjustment

1.4.1 Soda-Ash Mixers 20MX01 & 20MX02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.1.1	Shaft and impellor material		SS316	
1.4.1.2	Motor size	kW		
1.4.1.3	Mixer rpm	rpm		
1.4.1.4	Manufacturer			

1.4.2 Coagulant Mixer 20MX11

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.2.1	Shaft and impellor material		SS316	
1.4.2.2	Motor size	kW		
1.4.2.3	Mixer rpm	rpm		
1.4.2.4	Manufacturer			

1.4.3 Flocculation Mixer 21MX01

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.3.1	Shaft and impellor material		SS316	
1.4.3.2	Motor size	kW		
1.4.3.3	Mixer rpm	rpm		
1.4.3.4	Manufacturer			
1.4.3.5	Starter type		VSD	
1.4.3.6	G value at 50 Hz	s^{-1}	70	
1.4.3.7	Tip speed	m/s	<0.6	

1.4.4 Flocculation Mixer 21MX02

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.4.1	Shaft and impellor material		SS316	
1.4.4.2	Motor size	kW		
1.4.4.3	Mixer rpm	rpm		
1.4.4.4	Manufacturer			
1.4.4.5	Starter type		VSD	
1.4.4.6	G value at 50 Hz	s^{-1}	35	
1.4.4.7	Tip speed	m/s	<0.5	

1.4.5 Flocculation Mixer 21MX03

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.4.1	Shaft and impellor material		SS316	
1.4.4.2	Motor size	kW		
1.4.4.3	Mixer rpm	rpm		
1.4.4.4	Manufacturer			
1.4.4.5	Starter type		VSD	
1.4.4.6	G value at 50 Hz	s^{-1}	15	
1.4.4.7	Tip speed	m/s	<0.4	

1.4.6 Soda Ash Dosing

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.6.1	Mixing Tank volume	litres	600L or larger	
1.4.6.2	Dosing Pump Manufacturer			
1.4.6.3	Dosing Pump Model			
1.4.6.4	Dosing Pump Type		End suction slurry pump	
1.4.6.5	Dosing Pump duty flow rate	m3/hr		
1.4.6.6	Dosing Pump duty pressure	kPa		

1.4.7 Coagulant Dosing: Polyaluminium Chloride

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.7.1	Dosing Pump Manufacturer			
1.4.7.2	Dosing Pump Model			
1.4.7.3	Dosing Pump duty flow rate	l/hr	50	
1.4.7.4	Dosing Pump duty pressure	bar	5	
1.4.7.5	Day Tank Volume	litres	300	

TECHNICAL DATA SHEET NO. **1.5**

Chlorine Disinfection

1.5.1 Chlorine Dosing System

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.5.1.1	Type Cylinders	kg	68	
1.5.1.1	Original Equipment Manufacturer (OEM)			
1.5.1.2	Minimum no. of Cl_2 cylinder to be stored on site	No.	10	
1.5.1.3	No of Cylinders per duty and per standby train	No.	2	
1.5.1.4	**Disinfection (4-log Viruss inactivation)**			
1.5.1.5	Maximum Cl_2 dosing concentration	mg/l	10	
1.5.1.6	Maximum Cl_2 dosing rate	kg/hr	0.8	

TECHNICAL DATA SHEET NO. 1.6

RSV Gate Valves

1.6.1 **DN200 (Manual)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.6.1.1	Manufacturer			
1.6.1.2	Data Sheet attached?		Yes	
1.6.1.3	Valve diameter	mm	200	
1.6.1.4	Operation		Manual	
1.6.1.5	Liquid		Water (clarifier sludge and clear water)	
1.6.1.6	Actuation/Control		Handwheel, clockwise close	
1.6.1.7	Connection		Flanged	
1.6.1.8	Pressure Class		PN10	
1.6.1.9	Spindle Length		Standard	
1.6.1.10	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. 1.7

Butterfly Valves

1.7.1 **DN150 (Actuated)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.1.1	Manufacturer			
1.7.1.2	Data Sheet attached?		Yes	
1.7.1.3	Valve diameter	mm	150	
1.7.1.4	Operation		Actuated	
1.7.1.5	Liquid		Raw and treated water	
1.7.1.6	Actuation/Control		Open/close feedback to PLC/HMI	
1.7.1.7	Actuator Turn Ratio		Quarter Turn Actuator	
1.7.1.8	Actuation Type		Electrical	
1.7.1.9	Connection		Flanged	
1.7.1.10	Communication protocol		Modbus	
1.7.1.10	Pressure Class		PN10	
1.7.1.11	Spindle Length		Standard	
1.7.1.12	Material		Cast Iron, FBE coating and lining	

1.7.2 **DN150 (Actuated)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.2.1	Manufacturer			
1.7.2.2	Data Sheet attached?		Yes	
1.7.2.3	Valve diameter	mm	150	
1.7.2.4	Operation		Actuated	
1.7.2.5	Liquid		Air	
1.7.2.6	Actuation/Control		Open/close feedback to PLC/HMI	
1.7.2.7	Actuator Turn Ratio		Quarter Turn Actuator	
1.7.2.8	Actuation Type		Electrical	
1.7.2.9	Connection		Flanged	
1.7.2.10	Communication protocol		Modbus	
1.7.2.11	Pressure Class		PN10	
1.7.2.12	Spindle Length		Standard	
1.7.2.13	Material		Cast Iron, FBE coating and lining	

1.7.3 **DN300 (Actuated)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.3.1	Manufacturer			
1.7.3.2	Data Sheet attached?		Yes	
1.7.3.3	Valve diameter	mm	300	
1.7.3.4	Operation		Actuated	
1.7.3.5	Liquid		Raw and treated water	
1.7.3.6	Actuation/Control		Open/close feedback to PLC/HMI	
1.7.3.7	Actuator Turn Ratio		Quarter Turn Actuator	
1.7.3.8	Actuation Type		Electrical	
1.7.3.9	Connection		Flanged	
1.7.3.10	Communication protocol		Modbus	
1.7.3.11	Pressure Class		PN10	
1.7.3.12	Spindle Length		Standard	
1.7.3.13	Material		Cast Iron, FBE coating and lining	

1.7.4 **DN350 (Actuated)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.4.1	Manufacturer			
1.7.4.2	Data Sheet attached?		Yes	
1.7.4.3	Valve diameter	mm	350	
1.7.4.4	Operation		Actuated	
1.7.4.5	Liquid		Raw and treated water	
1.7.4.6	Actuation/Control		Open/close feedback to PLC/HMI	
1.7.4.7	Actuator Turn Ratio		Quarter Turn Actuator	
1.7.4.8	Actuation Type		Electrical	
1.7.4.9	Connection		Flanged	
1.7.4.10	Communication protocol		Modbus	

1.7.4.11	Pressure Class		PN10	
1.7.4.12	Spindle Length		Standard	
1.7.4.13	Material		Cast Iron, FBE coating and lining	

1.7.5 DN80 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.5.1	Manufacturer			
1.7.5.2	Data Sheet attached?		Yes	
1.7.5.3	Valve diameter	mm	80	
1.7.5.4	Operation		Manual	
1.7.5.5	Liquid		Raw and treated water	
1.7.5.6	Actuation/Control		Handwheel, clockwise close	
1.7.5.7	Connection		Flanged	
1.7.5.8	Communication protocol		None	
1.7.5.9	Pressure Class		PN10	
1.7.5.10	Spindle Length		Standard	
1.7.5.11	Material		Cast Iron, FBE coating and lining	

1.7.6 DN100 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.6.1	Manufacturer			
1.7.6.2	Data Sheet attached?		Yes	
1.7.6.3	Valve diameter	mm	100	
1.7.6.4	Operation		Manual	
1.7.6.5	Liquid		Raw and treated water	
1.7.6.6	Actuation/Control		Handwheel, clockwise close	
1.7.6.7	Connection		Flanged	
1.7.6.8	Communication protocol		None	
1.7.6.9	Pressure Class		PN10	
1.7.6.10	Spindle Length		Standard	
1.7.6.11	Material		Cast Iron, FBE coating and lining	

1.7.7 DN200 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.7.1	Manufacturer			
1.7.7.2	Data Sheet attached?		Yes	
1.7.7.3	Valve diameter	mm	200	
1.7.7.4	Operation		Manual	
1.7.7.5	Liquid		Raw and treated water	
1.7.7.6	Actuation/Control		Handwheel, clockwise close	
1.7.7.7	Connection		Flanged	
1.7.7.8	Communication protocol		None	
1.7.7.9	Pressure Class		PN10	
1.7.7.10	Spindle Length		Standard	
1.7.7.11	Material		Cast Iron, FBE coating and lining	

1.7.8 DN300 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.7.1	Manufacturer			
1.7.7.2	Data Sheet attached?		Yes	
1.7.7.3	Valve diameter	mm	300	
1.7.7.4	Operation		Manual	
1.7.7.5	Liquid		Raw and treated water	
1.7.7.6	Actuation/Control		Handwheel, clockwise close	
1.7.7.7	Connection		Flanged	
1.7.7.8	Communication protocol		None	
1.7.7.9	Pressure Class		PN10	
1.7.7.10	Spindle Length		Standard	
1.7.7.11	Material		Cast Iron, FBE coating and lining	

1.7.9 DN400 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.7.1	Manufacturer			
1.7.7.2	Data Sheet attached?		Yes	

1.7.7.3	Valve diameter	mm	400	
1.7.7.4	Operation		Manual	
1.7.7.5	Liquid		Raw and treated water	
1.7.7.6	Actuation/Control		Handwheel, clockwise close	
1.7.7.7	Connection		Flanged	
1.7.7.8	Communication protocol		None	
1.7.7.9	Pressure Class		PN10	
1.7.7.10	Spindle Length		Standard	
1.7.7.11	Material		Cast Iron, FBE coating and lining	

1.7.10 DN450 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.7.1	Manufacturer			
1.7.7.2	Data Sheet attached?		Yes	
1.7.7.3	Valve diameter	mm	450	
1.7.7.4	Operation		Manual	
1.7.7.5	Liquid		Raw and treated water	
1.7.7.6	Actuation/Control		Handwheel, clockwise close	
1.7.7.7	Connection		Flanged	
1.7.7.8	Communication protocol		None	
1.7.7.9	Pressure Class		PN10	
1.7.7.10	Spindle Length		Standard	
1.7.7.11	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. 1.8

Check Valves

1.8.1 DN80

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.8.1.1	Manufacturer			
1.8.1.2	Data Sheet attached?		Yes	
1.8.1.3	Valve diameter	mm	80	
1.8.1.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.8.1.3	Connection		Flanged	
1.8.1.4	Pressure Class		PN10	
1.8.1.3	Material		Cast Iron, FBE coating and lining	

1.8.2 DN100

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.8.2.1	Manufacturer			
1.8.2.2	Data Sheet attached?		Yes	
1.8.2.3	Valve diameter	mm	100	
1.8.2.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.8.2.3	Connection		Flanged	
1.8.2.4	Pressure Class		PN10	
1.8.2.3	Material		Cast Iron, FBE coating and lining	

1.8.3 DN150

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.8.3.1	Manufacturer			
1.8.3.2	Data Sheet attached?		Yes	
1.8.3.3	Valve diameter	mm	150	
1.8.3.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.8.3.3	Connection		Flanged	
1.8.3.4	Pressure Class		PN10	
1.8.3.3	Material		Cast Iron, FBE coating and lining	

1.8.4 DN300

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.8.3.1	Manufacturer			
1.8.3.2	Data Sheet attached?		Yes	
1.8.3.3	Valve diameter	mm	300	
1.8.3.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.8.3.3	Connection		Flanged	
1.8.3.4	Pressure Class		PN10	
1.8.3.3	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. **1.9**

Electromagnetic Flow Meters

1.9.1 **Dia: 50mm**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.9.1.1	Manufacturer			
1.9.1.2	Data Sheet attached?		Yes	
1.9.1.3	Diameter	mm	50	
1.9.1.4	Local Display		Yes	
1.9.1.5	Tube Material			
1.9.1.6	Lining Material			
1.9.1.7	Electrodes			

1.9.2 **Dia: 100mm**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.9.2.1	Manufacturer			
1.9.2.2	Data Sheet attached?		Yes	
1.9.2.3	Diameter	mm	100	
1.9.2.4	Local Display		Yes	
1.9.2.5	Tube Material			
1.9.2.6	Lining Material			
1.9.2.7	Electrodes			

1.9.3 **Dia: 250mm**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.9.3.1	Manufacturer			
1.9.3.2	Data Sheet attached?		Yes	
1.9.3.3	Diameter	mm	250	
1.9.3.4	Local Display		Yes	
1.9.3.5	Tube Material			
1.9.3.6	Lining Material			
1.9.3.7	Electrodes			

TECHNICAL DATA SHEET NO. **1.10**

Instrumentation - Sensors

1.1.1 Ultrasonic Level Sensors (0 - 4000mm)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.1.1	Manufacturer			
1.1.1.2	Data Sheet attached?		Yes	
1.1.1.3	Level Range		0 - 4000mm	
1.1.1.4	Liquid		Raw and treated water	
1.1.1.5	Local Display		No	
1.1.1.6	Communication Protocol		Modbus	
1.1.1.7	Environmental Protection		IP68	
1.1.1.8	Units		mm	

1.1.2 Ultrasonic Level Sensors (0 - 1500mm)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.1.1	Manufacturer			
1.1.1.2	Data Sheet attached?		Yes	
1.1.1.3	Level Range		0 - 1500mm	
1.1.1.4	Liquid		Chemicals	
1.1.1.5	Local Display		No	
1.1.1.6	Communication Protocol		Modbus	
1.1.1.7	Environmental Protection		IP68	
1.1.1.8	Units		mm	

1.1.2 pH Sensor

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.2.1	Manufacturer			
1.1.2.2	Data Sheet attached?		Yes	
1.1.2.3	pH Range		3 - 12	
1.1.2.4	Liquid		Raw and treated water	
1.1.2.5	Local Display		No	
1.1.2.6	Communication Protocol		Modbus	
1.1.2.7	Environmental Protection		IP68	
1.1.2.8	Units		pH	

1.1.3 Turbidity Meter

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.3.1	Manufacturer			
1.1.3.2	Data Sheet attached?		Yes	
1.1.3.3	NTU Range		0 - 30	
1.1.3.4	Liquid		Potable water	
1.1.3.5	Local Display		No	
1.1.3.6	Communication Protocol		Modbus	
1.1.3.7	Environmental Protection		IP68	
1.1.3.8	Units		NTU	

1.1.4 Chlorine Residual Analyser

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.4.1	Manufacturer			
1.1.4.2	Data Sheet attached?		Yes	
1.1.4.3	Range		0 – 10 mg/l free chlorine	
1.1.4.4	Liquid		Potable water	
1.1.4.5	Local Display		No	

1.1.4.6	Communication Protocol		Modbus	
1.1.4.7	Environmental Protection		IP68	
1.1.4.8	Units		mg/l	

1.1.5 Pressure Transducers (-100kPa to 100kPa)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.5.1	Manufacturer			
1.1.5.2	Data Sheet attached?		Yes	
1.1.5.3	Range		-100kPa to 100kPa	
1.1.5.4	Liquid		Raw and treated water	
1.1.5.5	Local Display		Yes	
1.1.5.6	Communication Protocol		Modbus	
1.1.5.7	Environmental Protection		IP68	
1.1.5.8	Units		kPa	

1.1.6 Hydrostatic Pressure Probe (100 mbar to 2 bar)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.6.1	Manufacturer			
1.1.6.2	Data Sheet attached?		Yes	
1.1.6.3	Range		100 mbar to 2 bar	
1.1.6.4	Liquid		Dam water	
1.1.6.5	Local Display		No	
1.1.6.6	Communication Protocol		Modbus	
1.1.6.7	Probe Material		SS316L	
1.1.6.8	Units		kPa	

TECHNICAL DATA SHEET NO.1.11:
ELECTRICAL, CONTROL AND INSTRUMENTATION EQUIPMENT

ALL DATA SHEETS TO BE COMPLETED WITH SUBMISSION

PART A – ELECTRICAL, CONTROL AND INSTRUMENTATION

1. MEDIUM VOLTAGE

1.1. POLE MOUNTED TRANSFORMER

1.1.1. Manufacturer .....

1.1.2. Ratings:

1.1.2.1. Size (kVA) .....

1.1.2.2. Ratio (kV/V) .....

1.1.2.3. Vector Group……

1.1.2.4. Winding material……..…

1.1.2.5. SANS 780 Compliant (latest) .....YES / NO

1.2. OVERHEAD LINE

1.1.3. Conductor type .....

1.1.4. Surge arrester type .....

1.1.5. Fuse type .....

2. LOW VOLTAGE

2.1. MOTOR CONTROL CENTRES (MCCs)

1. MCC dimensions (l x w x h), height to include stand height

    1.1. New Main Metering and Changeover DB.....

    1.2. New WTW Main MCC: .....

    1.3. New WTW Feed PS MCC: .....

    1.4. New Transfer PS MCC: .....

2. Will MCCs be in compliance to SANS 1973-3? ..... YES / NO

3. State method of compliance .....

4. Name of steelwork/busbar manufacturer.....

5. Name and address of populator.....

5.1. If different entities in 4 and 5, confirm that all work carried out by 1.5 will comply strictly with the required OHS Act requirements (Note: this is a statement of legal compliance) .....YES / NO

6. Variable Frequency Controllers

6.1. Manufacturer and Model Number .....

2.2. CABLES

2.2.1. **Power**

1. Manufacturer .....

2. Type .....

2.2.2. **Control**

1. Manufacturer .....

2. Type .....

2.2.3. **Instrumentation**

1. Manufacturer .....

2. Type .....

2.2.4. **Network (Copper)**

1. Manufacturer .....

2. Type .....

3. CONTROL SYSTEM INTEGRATION

3.1. **SYSTEM INTGRATOR**

1. Company (Name) .....

2. Details

2.1. Years' Experience .....

2.2. Number of successfully completed industrial automation projects .....

2.3. Company Cape Town based? .....YES / NO

3.2. **PLC**

1. Manufacturer (Name) .....

2. Model and Series .....

3.3. **UPS**

1. Manufacturer (Name) .....

2. Series Model .....

3. Rating KVA .....

3.4. **HMI**

1. Manufacturer (Name) .....

2. Series Model and size .....

3. Other technical detail .....

.....

3.5. **NETWORK SWITCHES**

1. Manufacturer (Name) .....

2. Series Model .....

3. Managed type? .....YES / NO

4. Other technical detail .....

4. TELEMETRY AND SCADA

4.1. OUTSTATIONS

1. Specialist Sub-Contractor(s) utilized .....

2. RTU Equipment Provided (power supply, comms, battery, I/O units, CPU, etc.):

2.1. New WTW Outstation .....

....

2.2. New WTW Feed PS Outstation .....

....

2.3. New Reservoir Outstation .....

....

3. Path analysis completed and any additional requirements included? .....YES / NO

4.2. SCADA

1. All additional licensing requirements checked and included? .....YES / NO

2. Scan Point Allowance .....

3. Spare Scan Points after implementation.....

5. BACKUP GENERATOR

1. Specialist Supplier Utilized:.....

2. Where will sets be manufactured?.....

3. Years' experience: .....

4. Experience sheet attached of past 5-years' installations (Required)?.....YES / NO

5.1. ENGINE

1. Manufacturer .....

2. Place of Manufacture .....

3. Unit Model Number .....

4. Sea Level Rating (kW) .....

4.1. De-rating required? ..... YES / NO

4.2. De-Rating allowance: .....

5. Fuel Consumption (litres/hour):

5.1. Full-Load: .....

5.2. Half-Load: .....

6. Cooling Method .....

7. Engine protection provided: .....

8. Frame duplex? .....YES / NO

9. Engine Turbo-Charged?.....YES / NO

10. Batteries

10.1. Type, Voltage and Amount .....

10.2. Total Capacity (Ah)

5.2. ALTERNATOR

1. Manufacturer .....

2. Place of Manufacture .....

3. Unit Model Number .....

4. Sea Level Rating (kVA, at 0.8pf).....

4.1. De-rating required? ..... YES / NO

4.2. De-Rating allowance: .....

5. Transient voltage dip at full load application .....

6. Engine/Alternator coupling method .....

7. Alternator protection provided: .....

5.3. Fuel Tank

1. Capacity (litres) .....

2. Electric and hand pump included in offer? .....YES / NO

3. Sloped to the bottom? .....YES / NO

5.4. Change over System

1. Switchboard Manufacturer .....

2. Switchboard SANS compliant? .....YES / NO

3. Switchgear provided (manufacturer and rating):

3.1. Alternator CB .....

4. Controller

4.1. Manufacturer .....

4.2. Model Number .....

5.5. Enclosure

1. Dimensions .....

2. Total set weight .....

3. Material .....

4. Noise levels of the set at 5m? .....

5. Exhaust materials .....

6. Sloped canopy? ..... YES / NO

5.6. Deviations From Specification

……

……

Schedule 27:Schedule of Imported Equipment

Part C1: Agreements and Contract Data

PART C1: AGREEMENTS AND CONTRACT DATA 102

C1.1 FORM OF OFFER AND ACCEPTANCE 103
C1.2 CONTRACT DATA (PART 1) 106
C1.2 CONTRACT DATA (PART 2) 122
C1.3 FORM OF PERFORMANCE GUARANTEE 123
C1.4 OCCUPATIONAL HEALTH AND SAFETY AGREEMENT 127
C1.5 PRO FORMA FORM OF ADVANCE PAYMENT GUARANTEE 129
C1.6 INSURANCE BROKER'S WARRANTY 131

C1.1 Form of Offer and Acceptance

Offer

The employer, identified in the acceptance signature block, has solicited offers to enter into a contract for the procurement of:

TENDER NO. 46/2025: UPGRADING OF MCGREGOR WTW

The tenderer, identified in the offer signature block, has examined the documents listed in the tender data and addenda thereto as listed in the returnable schedules, and by submitting this offer has accepted the conditions of tender.

By the representative of the tenderer, deemed to be duly authorized, signing this part of this form of offer and acceptance, the tenderer offers to perform all of the obligations and liabilities of the contractor under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the contract data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS:

Rand……

……(in words);

R……(in figures)

This offer may be accepted by the employer by signing the acceptance part of this *Form of Offer and Acceptance* and returning one copy of this document to the tenderer before the end of the period of validity stated in the tender data, whereupon the tenderer becomes the party named as the contractor in the conditions of contract identified in the contract data.

Signature(s): …… ……

Name(s): …… ……

Capacity: …… ……

Name of organization/tenderer: ……

Address of organization/tenderer: ……

……

Name and signature of witness: ……Date: ……

For official use.		
INITIALS OF MUN. OFFICIALS AT TENDER OPENING		
1.	**2.**	**3.**

Acceptance

By signing this part of this form of offer and acceptance, the employer identified below accepts the tenderer's offer. In consideration thereof, the employer shall pay the contractor the amount due in accordance with the conditions of contract identified in the contract data. Acceptance of the tenderer's offer shall form an agreement between the employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract are contained in:

Part C1: Agreements and contract data (which includes this agreement)
Part C2: Pricing data
Part C3: Scope of work
Part C4: Site information

and drawings and documents or parts thereof, which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the returnable schedules as well as any changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this form of offer and acceptance. No amendments to or deviations from said documents are valid unless contained in this schedule.

The tenderer shall within two weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the employer's agent (whose details are given in the contract data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documents to be provided in terms of the conditions of contract identified in the contract data. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

CONTRACT TO BE COMPLETED AT ACCEPTANCE STAGE

Notwithstanding anything contained herein, this agreement comes into effect on the date when the parties have signed the table below and confirms receipt from the employer of one fully completed original copy of this agreement, including the schedule of deviations (if any). The tenderer (now contractor**)** shall within five working days of the agreement coming into effect notify the employer in writing of any reason why he cannot accept the contents of this agreement as a complete and accurate memorandum thereof, failing which the agreement presented to the contractor shall constitute the binding contract between the parties.

The Parties	**Employer**	**Contractor**
Business Name		
Business Registration		
Tax number (VAT)		
Physical Address		
Accepted contract sum (incl. tax)		
Accepted contract duration		
Signed (who by signature hereto warrants authority)		
Name of signatory		
Signed: Date		
Signed: Location		
Signed: Witness		
Name of Witness		

Schedule of Deviations

Notes:

1. The extent of deviations from the tender documents issued by the employer before the tender closing date is limited to those permitted in terms of the conditions of tender.
2. A tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid, become the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract shall also be recorded here.
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incorporated into the final draft of the Contract.

1 Subject . . . . . .

Details . . . . . .

. . . . . .

. . . . . .

. . . . . .

2 Subject . . . . . .

Details . . . . . .

. . . . . .

. . . . . .

. . . . . .

3 Subject . . . . . .

Details . . . . . .

. . . . . .

. . . . . .

. . . . . .

4 Subject . . . . . .

Details . . . . . .

. . . . . .

. . . . . .

. . . . . .

ONLY TO BE COMPLETED AT ACCEPTANCE STAGE

By the duly authorised representatives signing this agreement, the employer and the tenderer agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the tender data and addenda thereto as listed in the returnable schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

C1.2 Contract Data (Part 1)

Part 1: Contract Data provided by the Employer

GENERAL CONDITIONS OF CONTRACT

The following standardised General Conditions of Contract:

The Conditions of Contract comprise the General Conditions of Contract which form part of the **Conditions of Contract for Plant and Design-Build for Electrical and Mechanical Plant, and for Building and Engineering Works, Designed by the Contractor, Second Edition 2017 reprinted 2022 with amendments (Yellow Book)** published by Federation Internationale des Ingénieurs-Conseils (FIDIC) the Contract Data C1.2 Part 1 – Contract Data provided by the Employer, which includes the following Particular Conditions or "Special Provisions" amending and add to such General Conditions and the Appendix to Tender Part 1 - Contract Data provided by the Employer and Contract Data C1.2 Part 2 – Contract Data provided by the Contractor.

Copies of the Conditions of Contract are available for inspection and scrutiny at the offices of the Employer's Agent and the Engineer or can be ordered from SAICE.

The Conditions of Contract make several references to the Contract Data for specific data, which together with these conditions collectively describe the risks, liabilities and obligations of the contracting parties and the procedures for the administration of the Contract. The provisions to be found in the Special Provisions take precedence over the equivalent provisions found under the same Sub-Clause number(s) in the General Conditions, and the provisions of the Appendix to Tender take precedence over the Special Provisions

The Conditions of Contract shall be read in conjunction with the variations, amendments and additions set out in the Particular Conditions of Contract below. Each item of data given below is cross-referenced to the clause in the General Conditions of Contract to which it mainly applies.

The Contract Data and Conditions of Contract shall have precedence over the Drawings, Scope of Work and Standardised Specifications in the interpretation of any ambiguity or inconsistency between these documents.

In the event of any discrepancy and/or ambiguity in the Contract, the following precedence will govern (priority in order from highest to lowest):

1. Contract Data
2. General Conditions of Contract
3. Project Specifications
4. Drawings
5. Bill of Quantities
6. SANS 1200

PARTICULAR CONDITIONS OF CONTRACT (SPECIAL PROVISIONS)

The Particular Conditions of Contract are as numbered and set out below. These Clauses are the only variations from and/or additions to the clauses of the Conditions of Contract. The variables are listed after these clauses in the form of an Appendix to the Tender.

1. GENERAL PROVISIONS

1.1 Definitions

1.1.1 The Contract

Delete the text of Sub-Clause 1.1.9 and replaced by:

"**Contract**" means the Contract Agreement, Form of Offer and Acceptance, Contract Data, these Conditions, the Employer's Requirements, the Specifications, the Drawings, the Schedules, and the further documents (if any) which are listed in the Form of Offer and Acceptance, and further includes drawings and documents or parts thereof which any of the aforesaid documents incorporate by reference."

Delete the text of Sub-Clause 1.1.10 and replaced by:

"**Contract Agreement**" means the document defined as such and also called "Form of Offer and Acceptance".

Delete the text of Sub-Clause 1.1.11 and replaced by:

"**Contract Data**" means the documents included the Contract Data C1.2 Part 1 – Contract Data provided by the Employer, Appendix to Tender Part 1 - Contract Data provided by the Employer and Contract Data C1.2 Part 2 – Contract Data provided by the Contractor. Where the called "Form of Offer and Acceptance". Where the Conditions of Contract make references to the Contract Data for specific data, it means Appendix to Tender.

Delete the text of Sub-Clause 1.1.50 and replaced by:

"**Letter of Acceptance**" means that section of the Form of Offer and Acceptance called "Acceptance".

Delete the text of Sub-Clause 1.1.51 and replaced by:

"**Letter of Tender**" means that section of the Form of Offer and Acceptance called "Offer".

Delete the text of Sub-Clause 1.1.33 and replaced by:

"**Employer's Requirements**" means the document entitled Part C3 - Scope of Work, as included in the Contract, and any additions and modifications to such document in accordance with the Contract. This document specifies the purpose(s) for which the Works are intended, and specifies Key Personnel (if any), scope, and/or design and/or other performance, technical and evaluation criteria, for the Works, and includes inter alia the Specifications."

In Sub-Clause 1.1.72, delete "lists and schedules of payments and/or prices" *and substitute* "lists, Bills of Quantities and schedules of payments and/or prices".

Delete the text of Sub-Clause 1.1.83 and replaced by:

"**Tender**" means that section of the Form of Offer and Acceptance called "Offer" and all other documents which the contractor submitted as Returnable Documents, as included in the Contract."

Add the following Sub-clause 1.1.91:

"**Appendix to Tender**" means the complete section entitled Appendix to Tender included in this Contract Data."

Add the following Sub-Clause 1.1.92:

"Returnable Schedules" means the Schedules contained in Part T2.2 of the Tender Data as included in the Contract."

.

Delete the text of Sub-Clause 1.1.23 and replaced by:

"**Mediator**" means the person appointed under Sub-Clause 21.1.

Add the following to Sub-Clause 1.1.28:

"Delay Damages will have a similar meaning as Penalties as defined in the Conventional Penalties Act 15 of 1952".

Delete the text of Sub-Clause 1.1.6 and replaced by:

"**Commencement Date**" means the date that the Contract comes into effect in terms of the Form of Offer and Acceptance. Where the Contract refers to the date "of both Parties have signed the Contract Agreement" it will have a similar meaning than the Commencement Date.

Add the following Sub-Clause 1.1.93:

*"**Contract Price Adjustments**" means the adjustment to be included in the Contract Price for fluctuations in the Cost of Plant and Materials, Site installation and General items, Health and Safety, Environmental Management, Sundries, etc. and Variations in Rate of Exchange, Customs Surcharge and Customs Duty, all as provided for in Sub-Clause 13.7."*

Add the following Sub-Clause after Sub-Clause 1.1.56:

"**Notice"** means a written communication identified as a Notice and issued in accordance with Sub-Clause 1.3 [*Notices and Other Communications*]. Each Notice shall be issued under separate cover exclusively dealing with the matter under consideration and the title of the Notice clearly reference the Project, the provision(s) under the Contract and the specific matter.

Add the following Sub-Clause after Sub-Clause 1.1.94:

"**Letter of Notification**" means the letter of formal notification, signed by the *Employer, of the decision of the Supply Chain Management Bid Adjudication Committee sent to all tenderers. The notification of the decision does not form part of the Employer's Acceptance of the successful tenderer's Form of Offer and no rights shall accrue."*

Add the following Sub-Clause 1.1.95:

Terms that may be used elsewhere in other portions of the document

Add the following Sub-Clause after Sub-Clause 1.1.96:

"Contract Deliverables" means
1.1.96.1 – Performance Security in terms of Sub-Clause 4.2
1.1.96.2 – The Employer and the Contractor shall enter into an agreement to complete the work required for the construction of the Works in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (No. 85 of 1993) and the Construction Regulations promulgated thereunder and the Contractor shall provide proof to the Employer, within 14 days from the Commencement Date, that he has paid all contributions required in terms of the Compensation for Occupational Injuries and Diseases Act (No. 130 of 1993) in terms of Sub-Clause 6.7 and 19.2.7

1.1.96.3 – initial programme in terms of Sub-Clause 8.3
1.1.96.4 – Insurances in terms of Clause 19.1 and 19.2
1.1.96.5 – Health and Safety Plan in terms of Clause 4.8

Add the following Sub-Clause after Sub-Clause 1.1.97:

"**Time-Related General Items**" means the scheduled Time-Related Items as set out under Clause 8.4 of the SABS 1200 A-1986 and as amended in Part C3.6.2 Variations and Additions to the SANS Standardized Specifications.

1.5 Priority of Documents

Delete Sub-Clause 1.5 and substitute:
"The documents forming the Contract are to be taken as mutually explanatory of one another. If an ambiguity or discrepancy is found, the priority shall be such as may be accorded by the governing law. The Engineer has authority to issue any instruction which he considers necessary to resolve an ambiguity or discrepancy".

1.6 Contract Agreement

Delete Sub-Clause 1.6 and substitute:

The Contract Agreement means the document that formalises the legal process of offer and acceptance and gives rise to the Contract. The Contract shall come into full force and effect on the return of one fully completed original copy of the Contract Agreement, by the Employer to the Contractor, after signing the Acceptance part thereof.

1.14 Joint and Several Liability

Add at the end of Sub-Clause 1.14

"The Joint Venture agreement (or other agreements between partners) shall be subject to the Employer's approval."

1.16 Non Variation

This Contract is the entire contract between the parties regarding the matters addressed in this Contract. No representations, terms, conditions or warranties not contained in this Contract shall be binding on the parties. No agreement or addendum varying, adding to, deleting or terminating this Contract including this clause shall be effective unless reduced to writing and signed by both parties.

1.17 Time Calculations

Except where otherwise provided by the Contract, where a specific time-span is stipulated in the Contract for carrying out any task or for the termination of any right or the duration of any event or circumstance, the special non-working days set out in the Contract Data that fall within the said time-span, shall be excluded from the calculation of the time-span concerned.

2. THE EMPLOYER

2.1 Right of Access to the Site

In Sub-Clause 2.1, the first paragraph, delete "Performance Security has" *and substitute* "Performance Security and/or proof of third party insurance have".

2.4 Employer's Financial Arrangements

Delete Sub-Clause 2.4 Employer's Financial Arrangements

3 THE ENGINEER

3.2 Engineer's Duties and Authority

Add the following at the end of second paragraph:

*"*except in the upholding of good engineering principles and practice". The requirements for the Engineer to obtain the approval of the Employer before exercising a specified authority are:

a. The issuing of instructions for dealing with fossils and the like in terms of Sub-Clause 4.23.
b. Giving consent for work to be carried out on days of rest or outside normal working hours in terms of Sub- Clause 6.5 (b).
c. Suspending progress of part or the whole of the Works in terms of Sub-Clause 8.9.

3.3 The Engineer's Representative

Insert a full stop after "Sub-Clause 3.1" in the second paragraph and delete the remainder of the second paragraph.

4 THE CONTRACTOR

4.2 Performance Security

In Sub-Clause 4.2, delete "within 28 days after receiving the Letter of Acceptance" replace with:
"as stated in the Appendix to Tender." Delete "annexed to the Particular Conditions" and replace with "included as Pro Forma in the Contract".

In Sub-Clause 4.2.1, at the end, add:
"If the Performance Security is in the form of a bank guarantee, it shall be issued either (a) by a bank located in the Country, or (b) directly by a foreign bank acceptable to the Employer. If the Performance Security is not in the form of a bank guarantee, it shall be furnished by a financial entity registered, or licensed to do business, in the Country and approved
by the Employer".

4.4 Subcontractors

Add the following after 4.4 (b)

"(c) works, to subcontractors that do not have an equal or higher B-BBEE status level than what was used for the Adjudication and award of the tender to the Contractor, to a total accumulated value greater than the percentage of the Accepted Contract Amount stated in the Contract Data."

Delete "28 days' notice" *in the last sub-paragraph and replace with* "14 days' notice".

4.8 Safety Procedures

In Sub-Clause 4.8, delete "within 21 days" in the second paragraph and replace with:
"within the time as stated in the Appendix to Tender."

4.17 Protection of the Environment

In Sub-Clause 4.18, at the end, add:

"(d) comply with the Environmental Management Specification in Part C3. -- Scope of Works".

4.21 Security of the Site

In Sub-Clause 4.21, at the end, add:

"The Contractor shall in connection with the Works provide and maintain at his own cost all lights, guards, fencing, watching and other appropriate security measures when and where necessary or required by the Engineer or by any competent statutory or other authority for the protection and security of the Works and the Contractor's Equipment, or for the safety and convenience of the public and for the protection of life and property."

4.22 Contractor's Operations on Site

Add the following:

"The Contractor shall protect and cover up all works as may be required and take all other precautions necessary to avoid causing damage or soiling of new and existing plant, equipment, buildings and structures. This shall inter alia apply when activities such as abrasive blasting, painting, welding, grinding, sealing, lagging and so forth, must be performed on the Site. The Contractor shall, on completion, remove all covers and shall at his cost rectify all soiling and damage to finishes to the satisfaction of the Engineer."

5 DESIGN

5.1 General Design Obligations

In Sub-Clause 5.1, replace the first sentence with the following;

The Contractor shall carry out, and be responsible for, the design of the Works, except as otherwise stated in the Employer's Requirements.

In Sub-Clause 5.1, the first paragraph, delete the sentence "Design shall be prepared by designers who:" a*nd substitute:*

"The Contractor shall ensure that all design work to be undertaken by the Contractor or on behalf of the Contractor is undertaken by designers who:".

Insert "registered" before "professionals" in paragraph (a).

5.2 Contractor's Documents

In Sub-Clause 5.2.2, delete the fourth paragraph. For clarity, it is the paragraph of which the first sentence starts with : "If the Engineer gives no Notice within the Review Period.....".

Add the following at the end of Sub-*Clause* 5.2.2:

"The Contractor shall prepare, update and maintain a schedule of information required and documents submitted for review, which schedule shall be submitted monthly to the Engineer".

6 STAFF AND LABOUR

6.7 Health and Safety

In Sub-Clause 6.7, the first paragraph, delete reference to "medical staff" *and* "ambulance service" *and add:* "The Contractor shall display in a prominent position(s) the telephone numbers of an appropriate medical practitioner and ambulance service".

In Sub-Clause 6.7, below paragraph (b), delete "health and safety officer" *and substitute* "Safety Officer in terms of the Occupational Health and Safety Act (Act No 85 of 1993) and the Construction Regulations".

In Sub-Clause 6.7, add at the end

"See also the specification dealing with Occupational Health and Safety, if any.

The Employer and the Contractor shall enter into an agreement to complete the work required for the construction of the Works in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (No. 85 of 1993) and the Construction Regulations promulgated thereunder.

The Contractor shall provide proof to the Employer, within 14 days from the Commencement Date, that he has paid all contributions required in terms of the Compensation for Occupational Injuries and Diseases Act (No. 130 of 1993)."

7 PLANT, MATERIALS AND WORKMANSHIP

7.3 Inspection

Add the following after the last paragraph:

"The Contractor shall ensure that plant and equipment complies with the specified requirements before arranging for the Engineer's factory inspections. The Contractor shall then make all arrangements for the Engineer to perform the inspections specified in the Detailed Mechanical Specification and/or the Detailed Electrical Specification.

The purpose of these inspections is to reduce the risk of non-compliant plant and equipment being transported to Site. The inspections do not reduce the Contractor's responsibility for complying with the Contract.

7.7 Ownership of Plant and Materials

Add the following after the last paragraph:

"Notwithstanding points (a) to (c) above, the Contractor shall remain responsible for Plant and Materials that falls within the Scope of Works. The Contractor shall protect the Plant and Materials against theft, damage, vandalism and unreasonable wear and tear whether the Plant and Materials are stored on-site, off-site or installed (not yet commissioned) at no additional cost to the Employer other than stipulated under General Requirements and Conditions until final commissioning and handover. Insurance by the Contractor of this Plant and Material against these risks is also required to be included under Sub-Clause 19.2 (c)."

8 COMMENCEMENT, DELAYS AND SUSPENSION

8.1 Commencement of Work

Delete the first paragraph and replace with the following:

The Contractor shall commence executing the Works within 14 days from the Commencement Date.

Notwithstanding the above, the Contractor will not be permitted to commence executing the Works before the Contract Deliverables were submitted as required in terms of the Contract.

8.2 Programme

In Sub-Clause 8.3, the first paragraph, delete "within 28 days after receiving the Notice under Sub-Clause 8.1[*Commencement of the Works*]" *and substitute* "within the time stated in the Appendix to Tender".

In Sub-Clause 8.3, add the following after the last paragraph: "The Contractor's Programme will not be accepted as the basis to substantiate claims for extension of the Time for Completion and/or additional payment or any compensation whatsoever, where the Contractor is in breach of complying with the requirements of Sub-Clause 8.3. .

See also any requirements with regard to **Programme in Part C3.5: Management."**

8.5 Extension of Time for Completion

Replace Sub-Clause 8.5 (c) with the following:

Exceptional adverse climatic conditions which for the purpose of these Conditions shall mean abnormal rainfall and associated wet conditions and materials, strong winds and extremes of temperature. In the event that such circumstances caused actual delays to critical activities on the programme and such delays in terms of working days exceed the number of working days listed below, extension of time shall be granted. Where the critical path is not affected, no extension of time will be entertained

The number of working days for which the Contractor should allow per month is stated below; This allowance shall be cumulative for the Time for Completion.

January	2 days
February	3 days
March	4 days
April	4 days
May	4 days
June	5 days
July	5 days
August	4 days
September	4 days
October	3 days
November	2 days
December	2 days

Claims for delays for exceptional adverse climatic conditions shall be accompanied by substantiating facts and evidence as agreed by the Engineer and Contractor.

Add the following after the last paragraph:

If an extension of time is granted, except in respect of any delays attributed to abnormal climatic conditions in terms of Sub-Clause 8.5(c), the Contractor shall be paid such additional Time-Related General Items, including for special non-working days, if applicable, as are appropriate regarding any other compensation which may already have been granted in respect of the circumstances concerned.

The Contractor shall price all the items scheduled under the Time-Related Items, Clause 8.4 of the SABS 1200 A-1986. These items and prices will form the sole basis for compensation in the assessment of any Claim for extension of the Time for Completion in relation to the items listed and no other Claims for additional payment, or any compensation whatsoever, regarding these items will be considered.

8.8 Delay Damages

Replace Sub-Clause 8.8 (in its entirety) with the following:

If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Employer shall be entitled to payment of Delay Damages by the Contractor for this default. This entitlement is not subject to Sub-Clause 20.2 [*Claims For Payment and/or EOT]* and/or Sub-Clause 3.7 *[Agreement or Determination]*.

Delay Damages shall be the amount stated in the Contract Data, which shall be paid for every day, including special non-working days, which shall elapse between the relevant Time for Completion and the relevant Date of Completion of the Works or Section or termination of the Contract, which is the earlier. The Delay Damages shall be levied in the following Payment Certificate subsequent to the expiry of the relevant Time for Completion. Delay Damages will be adjusted to the extent that the Contractor succeeds in Extension of Time Claims in terms of Sub-Clause 8.5.

The total amount due under this Sub-Clause shall not exceed the maximum amount of Delay Damages (if any) stated in the Contract Data. These Delay Damages shall be the only damages due from the Contractor for the Contractor's failure to comply with Sub-Clause 8.2 [Time for Completion], other than in the event of termination under Sub-Clause 15.2 [Termination for Contractor's Default] before completion of the Works. These Delay Damages shall not relieve the Contractor from the obligation to complete the Works, or from any other duties, obligations or responsibilities which the Contractor
may have under or in connection with the Contract. This Sub-Clause shall not limit the Contractor's liability for Delay Damages in any case of fraud, gross negligence, deliberate default or reckless misconduct by the Contractor.

9 TESTS ON COMPLETION

9.1 Contractor's Obligations

In Sub-Clause 9.1, the third paragraph, subparagraph (c), after "trial operation" *insert* "(if a trial operation is required in terms of the Appendix to the Tender or the Employer's Requirements and for the period stated therein)".

Add the following before the last paragraph of this Sub-Clause:

"The Contractor shall provide all necessary test equipment, materials and tools and competent staff for the performance of the specified performance acceptance tests and shall submit for the approval of the Engineer certified copies of the calibration certificates for the test equipment.

When all tests have been successfully completed to the satisfaction of the Engineer, a trial operation period shall start and shall consist of a continuous period of operation of 28 days where all equipment has operated and performed in accordance with the Employer's Requirements including *inter alia* Specifications. During the trial operation period the Contractor shall carry out all necessary servicing and any adjustments required. The Employer's site staff will assist the Contractor in operating the plant during this period and at this time the Contractor shall train the Employer's operational staff in the starting, operating and stopping of the plant, and the Employer's maintenance staff on the maintenance requirements and procedures.

When an extended performance test period is specified, the trial operation period will run concurrently with the first 28 days of the performance acceptance test period.

At the end of the trial operation period the Contractor shall arrange for an acceptance inspection to be carried out together with the Engineer for the purpose of taking over the Works in terms of Sub-Clause 10."

10 EMPLOYER'S TAKING OVER

10.1 Taking Over of the Works and Sections

In Sub-Clause 10.1, add the following after paragraph (e): :

"(f) The trial operation period was completed successfully and at the end of the trial operation period an inspection was conducted by the Contractor and the Engineer for the purpose of taking over the Works in terms of this Clause 10."

and
delete the last paragraph.

10.2 Taking Over of Parts of the Works

In Sub-Clause 10.2, delete the second paragraph.

"10.5 Urgent Remedial Work

If, by reason of any accident, or failure, or other event occurring to, in, or in connection with the Works, or any part thereof, either during the execution of the Works, or during the Defects Notification Period, any remedial or other work is, in the opinion of the Engineer, urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work, the Employer shall be entitled to employ and pay other persons to carry out such work as the Engineer may consider necessary. If the work or repair so done by the Employer is work which, in the opinion of the Engineer, the Contractor was liable to do at his own cost under the Contract, then all costs consequent thereon or incidental thereto shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be

recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Provided that the Engineer shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof."

11.10 Unfulfilled Obligations

In Sub-Clause 11.10, replace the second paragraph with the following:

The Contractor's liability for any latent defects shall continue beyond the date of the Performance Certificate but the Employer shall have no claim against the Contractor arising out of any latent defect which first manifests itself later than 10 years after the issue of the Performance Certificate.

13 VARIATIONS AND ADJUSTMENTS

13.7 Adjustment for Changes in Cost

No Contract Price Adjustment in terms of this Clause shall be applicable to daywork,any civil engineering work and any M&E work, apart from the items listed in the Returnable Schedule T2.2.9 Schedule of Special Materials for civil works and Adjustment for Changes in Cost resulting from changes in Rates of Exchange and variations in Customs Duty and Surcharge as listed Returnable Schedule T2.2.26 Schedule of Imported Equipment for M&E works ".

Add the following to Sub-Clause 13:

"13.7.1 Plant and Materials Imported from Outside South Africa

13.7.1.1 Permissible Adjustments

Adjustment to the Contract Price for the design, manufacture, painting, testing, supply, delivery, offloading and storage of any Plant and Materials imported from outside the Republic of South Africa will be permitted only in respect of the following variables:

(a) Variations in Rates of Exchange as detailed in Sub-Clause 13.8.2.2.,

(b) Variations in Customs Surcharge and Customs Duty as detailed in Sub-Clause 13.8.2.3, and

13.7.1.2 Variations in Rates of Exchange

Adjustment for variations in rates of exchange shall be based on the following:

(a) The Tenderer shall have completed Schedule T2.2.26 for all imported Plant, Materials and Equipment intended to be subject to variations in rates of exchange, subject to the following:

i. the value in foreign currency inserted in column (A) shall be subject to Sub-Clause 13.7.1.2(e) when recalculating the Rand value,

ii. the rate of exchange inserted in column (B) shall be the closing spot selling rate quoted by FNB, on the Base Date, rounded to the second decimal place, subject to sub-paragraph iii. below,

iii. if the rate of exchange inserted by the Tenderer differs from the FNB rate referred to above, then the FNB rate shall apply and the Rand value in columns (C) and (F) shall be recalculated accordingly, without altering the price in the Schedules of Quantities for the relevant items, and

iv. if a quotation from a supplier or sub-contractor provides for variations in rates of exchange, the Contractor may only claim for variations in rates of exchange if he binds the supplier or sub-contractor to the same provision to take out forward cover as described in sub-paragraph (b) below.

(b) The Contractor (or supplier or sub-contractor) shall within five working days from the date of placing a firm order on an overseas supplier, cover or recover forward by way of a contract with a bank which is an authorised foreign exchange dealer, the foreign exchange component of the cost of any imported Plant and Materials inserted by the Tenderer in T2.2.9.

(c) When the Contractor (or supplier or sub-contractor) so obtains forward cover, the Contractor shall immediately notify the Employer of the rate obtained and furnish the Employer with a copy of the foreign exchange contract note.

(d) Based on the evidence provided in sub-paragraph (c) above, the value in Rand inserted in column (C) of Schedule T2.2.9 shall be recalculated using the forward cover rate obtained, and any increase or decrease in the Rand value defined in Sub-Clause 13.7.1.4 shall be adjusted accordingly, subject to sub- paragraph (e) below.

(e) The adjustments shall be calculated upon the value in foreign currency in the Contractor's (or supplier's or sub-contractor's) forward cover contract, provided that, should this value exceed the value in foreign currency inserted in column (A) of Schedule T2.2.9, then the value in column (A) shall be used.

13.7.1.3 Variations in Customs Surcharge and Customs Duty

(a) Any increase or decrease in the Rand value between the amounts of Customs Surcharge and Customs Duty inserted in Schedule T2.2.9 and those amounts actually paid to the Customs and Excise Authorities, which are due to changes in the percentage rates applicable or to the foreign exchange rate used by the authorities, shall be adjusted accordingly.

(b) The Tenderer shall state the Customs Duty Tariff Reference applicable to each item and the Contractor shall advise the Engineer of any changes which occur.

13.7.1.4 Value of Imported Plant and Materials at Base Date

The Rand value of imported Plant and Materials inserted in Schedule T2.2.9 (column (F)) shall be the value in foreign currency (column (A)) converted to South African Rand (column (C)) by using the closing spot selling rate quoted by FNB, on the Base Date rounded to the second decimal place (column(B)), to which shall be added any Customs Surcharge and Customs Duty applicable at that date (columns (D) and (E)).

14 CONTRACT PRICE AND PAYMENT

15 The Contract Price

Delete sub-paragraphs (c) and (d) and replace with:

"(c) Prices entered in the Schedules of Rates and Prices, together with any schedule of rates for which provision is made in a Schedule, will be used for calculating the value of completed works for the purpose of interim payments or for determining the value of changes, omissions and additions for variation instructions when in the opinion of the Engineer such prices are applicable.

(d) The amounts of work and material given in the Schedules of Rates and Prices are not to be considered as limiting or extending the amount of work to be done or material to be supplied by the Contractor.

(e) The percentage completion of the amounts of work and materials given in the Schedules of Rates and Prices shall be determined by the Engineer for interim payment certificates when checking the Contractor's Statement referred to in Sub-Clauses 14.3 and 14.6."

14.3 Application for Interim Payment Certificates

In *Sub-Clause 14.3,*
(i) delete subparagraph (i) and substitute:
"(i) the estimated contract value of the Works executed as determined from the Schedule of Rates and Prices up to the end of the month (including Variations but excluding items described in subparagraphs (ii) to (x) below."*, and*
(ii) delete subparagraph (v).

14.5 Plant and Materials intended for the Works

In subclause 14.5 (b)(i):

Add "ordered, a purchase agreement was concluded and an invoice issued by the manufacturer or" before "shipped"

Add the following after the last paragraph of b(iii)
"a copy of the order, written purchase agreement and invoice from the manufacturer for any amounts payable for the items listed in the Contract Data: Appendix to Tender Part 1"

In Sub-Clause 14.5 add paragraph (c)(iii)

(iii) Have been procured and are properly stored off site within the Republic of South Africa, are protected against loss, damage or deterioration, appear to be in accordance with the Contract, are clearly marked as the property of the Employer. The Contractor shall in writing provide documentary proof from the insurance company that these items are fully covered by the insurance policy concerned while the plant and equipment are stored away from the Site (street address of store to be stated).

In Sub-Clause 14.5 after paragraph (c)(iii) add (c)(iv)

a written undertaking by the Contractor that the Contractor will deliver to the Employer (prior to submitting the next Statement) a bank guarantee in a form and issued by an entity to which the Employer gives consent (but such consent shall not relieve the Contractor from any obligation in the following provisions of this sub-paragraph), in amounts and currencies equal to the amount due under this Sub-Clause. This guarantee shall be in a similar form to the form described in Sub-Clause 14.2.1 of which a Pro Forma is included in Part C1: C1.5 FORM OF PAYMENT GUARANTEE FOR PLANT AND MATERIAL ON SITE OR OFF SITE and shall be valid until the Plant and Materials are properly built into the Works and included under Sub-Clause 14.3 (i) – value of Works executed.

In Sub-Clause 14.5 after the last paragraph, add the following
Notwithstanding any other provisions, any payment for Plant and Material not forming part of the Permanent Works under Sub-Clause 14.3 (i) – value of Works executed, will not exceed the amount of a valid Payment Guarantee for Plant and Material on site or off site as provided by the Contractor.

14.6 Issue of Interim Payment Certificates

In Sub-Clause 14.6.1, the first paragraph, delete "within 28 days" *and substitute* "within the time stated in the Appendix to Tender".

14.13 Issue of Final Payment Certificate

In Sub-Clause 14.13, the first paragraph, delete "within 28 days" *and substitute* "within the time stated in the Appendix to Tender".

Add the following new Sub-Clauses after 14.15:

"14.16 Tax Invoices

Section 20(1) of the Value Added Tax Act of 1991 (Act 89 of 1991) requires that a supplier (person supplying goods or services) who is registered as a VAT vendor issue to the recipient a tax invoice within 21 days of the date of a supply whether requested or not.

The Contractor shall provide a tax invoice (VAT invoice) which shall be included with each Payment Certificate and a Final Payment Certificate delivered to the Employer by the Engineer in terms of Clause 14. Failure by the Contractor to provide a tax invoice (VAT invoice) timeously may delay payment by the Employer and no interest shall accrue.

15 TERMINATION BY EMPLOYER

15.2 Termination for Contractor's Default

In Sub-Clause 15.2.1, the first paragraph:

(i) in subparagraph (a), after "Sub-Clause 4.2 *[Performance Security]" add* "or fails to comply with Sub-Clauses 19.1 and *[General Requirements] and 19.2 [Insurance to be provided by the Contractor]]* and the Employer elects not to effect the relevant insurances"

16 SUSPENSION AND TERMINATION BY CONTRACTOR

16.1 Contractor's Entitlement to Suspend Work

In Sub-clause 16.1, delete "(b) the Employer fails to provide reasonable evidence in accordance with Sub-Clause 2.4 [Employer's Financial Arrangements].

16.2 Termination by Contractor

Delete sub-paragraph (a) and (f) of Sub-Clause 16.2.1.

18 EXCEPTIONAL EVENTS

19 INSURANCE

19.1 General Requirements

In Sub-Clause 19.1, add the following:

"Save as otherwise provided in the Contract, nothing herein contained shall oblige the Contractor to affect any insurance which is not generally obtainable from a registered insurer in South Africa.

The insurances shall be effected with an insurance company registered in South Africa and the terms thereof shall be subject to approval by the Employer, which approval shall not be unreasonably withheld.

The Contractor shall be liable for payment of the deductibles in respect of each claim settlement in terms of the policies effected by the Contractor.

In respect of Subcontractors, the Contractor shall be deemed to have complied with the provisions of the requirements relating to insurance by ensuring that the Subcontractors have effected such insurance.

19.2 Insurance to be Provided by the Contractor

In Sub-Clause 19.2.6, add the following:

"Other insurances which are to be effected and maintained by the Contractor and endorsed to note the interests of the Employer are:

(i) transit insurance on route to Site, including whilst in temporary storage (and intended for incorporation in the Contract),
and

(ii) where the Contract involves manufacturing and/or fabrication of the Works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and

equipment for incorporation in the Works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such Works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's policies of insurance".

19.2.5 Injury to Employees

In Sub-Clause 19.2.5, add "The insurance shall be in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act (Act No 130 of 1993)".

Add the following new Sub-Clause after 19.2.6:

"19.2.7 Special Risks Insurance

If required in terms of the Appendix to the Tender, the Contractor shall effect and maintain, in the joint names of the Employer and the Contractor a Coupon Policy for Special Risks Insurance issued by the South African Special Risks Insurance Association".

20 EMPLOYER'S AND CONTRACTOR'S CLAIMS

Add the following new Sub-Clause after Sub-Clause 20.1second paragraph.

Notwithstanding any other provision in this Contract, the Employer's entitlement to deduct Default Damages will not be dealt under Sub-Clause 20.1(a) and will not depend on compliance with Sub-Clause 20.2 and/or Sub-Clause 3.7. Delay Damages will be calculated and certified by the Engineer in terms of Sub-Clause 14.6 read with Sub-Clause 8.8.

21 DISPUTE AND ARBITRATIION

21.8 No DAAB in Place

Delete sub-paragraphs (a) and (b) and replace with (a):

And the Parties fail to agree on an the appointment within 14 days, then either Party may apply to the appointing entity or official named in the Contract Data in Sub-Clause 21.2, to appoint such DAAB.

PART C1.2 CONTRACT DATA: APPENDIX TO TENDER PART 1

Sub-Clause	Data to be given	Data
1.1.20	where the Contract allows for Cost Plus Profit, percentage profit to be added to the Cost:	5%
1.1.27	Defects Notification Period (DNP):	365 Days
1.1.30	The Employer's Representative:	Carel Posthumus
1.1.76	Time for Completion: for the works as a whole	24 months
1.3 (a)(ii)	agreed methods of electronic transmission:	e-mail
1.3(d)	address of Employer for communications:	Tel :(023) 615 8000 28 Main Road, Ashton, 6715 Mail : cposthumus@langeberg.gov.za
1.3(d)	address of Employer's Representative for communications:	Tel :(023) 615 8000 28 Main Road, Ashton, 6715 Mail : cposthumus@langeberg.gov.za
1.3(d)	address of Contractor for communications:	(TBP)
1.4	Contract shall be governed by the law of:	South Africa
1.4	ruling language:	English
1.4	language for communications:	English
1.8	number of additional paper copies of Contractor's Documents....	Two
1.15	total liability of the Contractor to the Employer under or in connection with the Contract	Accepted Contract Amount as stated in the Contract Agreement
1.16	special non-working days are	Statutory holidays and the annual construction holiday period from 15 December to 15 January
2.1	The Contractor shall be given right of access to all or part of the Site within	14 days from the Commencement Date
2.4	Employer's financial arrangements	Clause deleted
4.2	Performance Security – Pro-forma annexed (as percentages of the Accepted Contract Amount as stated in the Contract Agreement in Currencies): percent currency	 10% South African Rand (ZAR)
4.2 …….	Periods for submission of Performance Security	Within 14 days of Commencement Date
4.4(a)	maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount):	50%
4.4(b)	parts of the Works for which subcontracting is not permitted.....	No further restriction
4.4(c)	maximum allowable accumulated value of work subcontracted to subcontractor's with a lower B-BEEE status level than what was used for the Adjudication and award of the tender to the Contractor (as a percentage of the Accepted Contract Amount):	25%
4.7.2	Period for notification of errors in the items of reference	14 days
4.8 …….	Periods for submission of Occupational, Health and Safety plan	Within 14 days of Commencement Date

Sub-Clause	Data to be given	Data
4.19	period of payment for temporary utilities.....	Included in next Statement and interim payment
4.20	number of additional paper copies of progress reports.....	One
6.5	normal working hours on the Site	08:00 to 17:00 on days other than Saturdays, Sundays and special non-working days 08:00 to 14:00 on Saturdays
8.3 ……	Time for submission of programme and cash-flow	Within 14 days of Commencement Date
8.3	programming software..... number of additional paper copies of programmes.....	Microsoft Project One
8.8	Delay Damages payable for each day of delay	R5 000
8.8	Maximum amount of delay damages……	15% of the Accepted Contract Amount as stated in the Contract Agreement
9.1 …….	Trial operational period	28 days
13.4(b)(ii)....	percentage rate to be applied to Provisional Sums for overhead charges and profit	Percentage as tendered in the Schedule of Rates and Price
14.1	The Contract shall price …….	Shall be a re-measurable contract
14.2	total amount of Advance Payment (as a percentage of the final Accepted Contract Amount)	N/A
14.2	currency or currencies of Advance Payment	N/A
14.2.3	percentage deductions for the repayment of the Advance Payment	N/A
14.3	period of payment	N/A
14.3(b).....	number of additional paper copies of Statements.....	One
14.3(iii).....	percentage of retention	10%
14.3(iii).....	limit of Retention Money (as a percentage of Accepted Contract Amount as stated in the Contract Agreement).....	10%
14.5(b)(i).....	Plant and Materials for payment when ordered or shipped.....	N/A
14.5(c)(i).....	Plant and Materials for payment when delivered to the Site	Tanks Pumps and Pipework Pressure Filters Limestone Contactors Blowers Electrical control centre Electrical motor Structural steel and steelwork
14.6.2	minimum amount of interim payment.....	N/A
14.7(b)(i).....	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.6 [*Interim Payment*].....	35 days
14.7(b)(ii)....	period for the Employer to make interim payments to the Contractor under Sub-Clause 14.13 [*Final Payment*].....	35 days
14.7(c)	period for the Employer to make final payment to the Contractor	35 days
14.8	financing charges for delayed payment (percentage points above the average bank short–term lending rate as referred to under sub-paragraph (a))	2%
14.11.1(b)...	number of additional paper copies of draft Final Statement.....	One

Sub-Clause	Data to be given	Data
14.15	currencies for payment of Contract Price	South African Rand (ZAR)
14.15(a)(i)...	proportions or amounts of Local and Foreign Currencies are: Local..... Foreign.....	 100%
14.15(c)	Currencies and proportions for payment of Delay Damages	South African Rand (ZAR)
14.15(g).....	rates of exchange.....	FNB Base Date rate
17.2(d).....	forces of nature, the risks of which are allocated to the Contractor	Applies
19.1	Contract works insurance to be affected by the ...	Contractor
19.1 …….	Periods for submission of insurance : a) Evidence of insurance	Within 14 days of Commencement Date
19.1	Permitted deductible limits: • insurance required for the Works ..... • insurance required for Goods..... • insurance required for liability for breach of professional duty • insurance required against liability for fitness for purpose, and or breach of professional duty..... • insurance required for injury to persons and damage to property..... • insurance required for injury to employees..... • other insurances required by Laws and by local practice:	 R25,000.00 or to be approved by Employer
19.2(1)(b)....	additional amount to be insured (as a percentage of the replacement value, if less or more than 15%).....	25%
19.2(1)(iv)...	list of Exceptional Risks which shall not be excluded from the insurance cover for the Works.....	All Insurable events or risks under Contractor's All Risk Insurance
19.2.2	extent of insurance required for Goods……. amount of insurance required for Goods…….	Full Replacement Value
19.2.3(a).....	amount of insurance required for liability for breach of professional duty	Accepted Contract Amount as stated in the Contract Agreement plus 25%
19.2.3(b).....	insurance required against liability for fitness for purpose	Yes
19.2.3	period of insurance required for liability for breach of professional duty	5 years after the issuing of the Performance Certificate
19.2.4	amount of insurance required for injury to persons and damage to property.....	R50,000,000.00
19.2.6	other insurances required by Laws and by local practice (give details)	SASRIA to the value of the Accepted Contract Amount as stated in the Contract Agreement plus 25%
19.2.7 ….	Proof of Payment or letter with respect to the Compensation for Occupational Injuries and Diseases act (Workmen's Compensation Act)	Within 14 days of Commencement Date
19.2.7 ….	Special risk Coupon policy	Required
21.1	time for appointment of DAAB.....	28 days of the Commencement Date
21.1	the DAAB shall comprise.....	One member
21.1	list of proposed members of DAAB - proposed by Employer ..... - proposed by Contractor.....	 1. _____ _____ 2. _____ _____ 3. _____ _____ 1. _____ _____ 2. _____ _____ 3. _____ _____
21.2	Appointing entity (official) for DAAB members.....	SA Association of Arbitrators

C1.2 Contract Data (Part 2)

Data provided by the Contractor

No additional information is required.

C1.3 Form of Performance Guarantee

PERFORMANCE GUARANTEE

For use with the Conditions of Contract for Design and Build, Fidic, second edition 2017

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means: .....

"Physical address: .....

"Employer" means: Langeberg Municipality .....

"Contractor" means: .....

"Engineer" means: .....

“Works” means: **CONTRACT NO. 46/2025**

"Site" means: The site as defined in Clause 1.1.77 of the Conditions of Contract.....

"Contract" means: The Agreement made in terms of the Form of Offer and Acceptance and such amendments or additions to the Contract as may be agreed in writing between the parties.

“Performance Guarantee” means: Performance Security, the security under Sub-clause 4.2

"Contract Price" means: The accepted amount inclusive of tax as defined in Sub Clause 14.1 of R .....

Amount in words: .....

"Guaranteed Sum" means: The maximum aggregate amount of R.....

Amount in words: .....

"Expiry Date" means: The “Expiry Date” of the Defects Notification Period .....

CONTRACT DETAILS

Engineer issues: Interim Payment Certificates, Final Payment Certificate and the Taking Over Certificate of the Works as defined in the Contract.

PERFORMANCE GUARANTEE

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.

2. The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the Expiry Date or the date of payment in full of the Guaranteed Sum, whichever occurs first. The Engineer and/or the Employer shall advise the Guarantor in writing of the date on which the Taking Over Certificate of the Works has been issued, the date on when the Defects Notification Period commences and the expected Expiry Date of the Defects Notification Period, which shall be the Expiry Date of the Guarantee.

3. The Guarantor hereby acknowledges that:

3.1 any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship;

3.2 its obligation under this Performance Guarantee is restricted to the payment of money.

4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:

4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Engineer in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 4.2;

4.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum certified has still not been paid;

4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.

5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:

5.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or

5.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 5; and

5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.

6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.

7. Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

9. Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.

10. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.

11. The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.

12. This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.

13. This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.

14. Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court

of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of t he claim may exceed the jurisdiction of the Magistrate's Court.

Signed at .....

Date .....

Guarantor's signatory (1) .....

Capacity .....

Guarantor's signatory (2) .....

Capacity .....

Witness signatory (1) .....

Witness signatory (2) .....

ANNEXURE

LIST OF APPROVED FINANCIAL INSTITUTIONS

The following financial institutions are currently (as at 18 October 2016) approved for issue of contract guarantees to the LANGEBERG Municipality:

National Banks:
ABSA Bank Ltd.
FirstRand Bank Ltd.
Investec Bank Ltd.
Nedbank Ltd.
Standard Bank of SA Ltd.

International Banks (with branches in SA):
Barclays Bank plc.
Citibank n.a.
Credit Agricole Corporate and Investment Bank
HSBC Bank plc.
JP Morgan Chase Bank
Societe Generale
Standard Chartered Bank

Insurance companies:
ABSA Insurance
Coface s.a.
Compass Insurance Co.
Constantia Insurance Co.
Credit Guarantee Insurance Co.
Guardrisk Insurance Co.
Hollard Insurance Company Ltd.
Infiniti Insurance Limited
Lombard Insurance
New National Assurance Co.
Regent Insurance Co.
Renasa Insurance Company Ltd.
Santam Limited
Zurich Insurance Co.

LANGEBERG MUNICIPALITY

TENDER NO. 46/2025

UPGRADING OF MCGREGOR WTW

C1.4 Occupational Health and Safety Agreement

AGREEMENT MADE AND ENTERED INTO BETWEEN _____ (HEREINAFTER CALLED THE "EMPLOYER") AND

_____
(Contractor/Mandatory/Company/CC Name)

IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, ACT No. 85 OF 1993 AS AMENDED.

I, _____, representing

_____ , as an employer in its own right, do hereby undertake to ensure, as far as is reasonably practicable, that all work will be performed, and all equipment, machinery or plant used in such a manner as to comply with the provisions of the Occupational Health and Safety Act (OHSA) and the Regulations promulgated thereunder.

I furthermore confirm that I am/we are registered with the Compensation Commissioner and that all registration and assessment monies due to the Compensation Commissioner have been fully paid or that I/We are insured with an approved licensed compensation insurer.

COID ACT Registration Number:

OR Compensation Insurer: _____ Policy No.: _____

I undertake to appoint, where required, suitable competent persons, in writing, in terms of the requirements of OHSA and the Regulations and to charge him/them with the duty of ensuring that the provisions of OHSA and Regulations as well as the Council's Special Conditions of Contract, Way Leave, Lock-Out and Work Permit Procedures are adhered to as far as reasonably practicable.

I further undertake to ensure that any subcontractors employed by me will enter into an Occupational Health and Safety agreement separately, and that such subcontractors comply with the conditions set.

I hereby declare that I have read and understand the appended Occupational Health and Safety Conditions and undertake to comply therewith at all times.

I hereby also undertake to comply with the Occupational Health and Safety Specification and Plan.

Signed at _____ on the _____day of _____ 20 _____

_____ _____
Witness **Mandatory**

Signed at _____ on the _____ day of _____20 _____

_____ _____
Witness for and on behalf of Langeberg Municipality

OCCUPATIONAL HEALTH AND SAFETY CONDITIONS

1. The Chief Executive Officer of the Contractor shall assume the responsibility in terms of Section 16(1) of the Occupational Health and Safety Act (as amended). Should the Contractor assign any duty in terms of Section 16(2), a copy of such assignment shall immediately be provided to the representative of the Employer as defined in the Contract.

2. All work performed on the Employer's premises shall be performed under the supervision of the construction supervisor who understand the hazards associated with any work that the Contractor performs on the site in terms of Construction Regulations 2014 (as amended).

3. The Contractor shall appoint a Competent Person who shall be trained on any occupational health and safety aspect pertaining to them or to the work that is to be performed.

4. The Contractor shall ensure that he familiarises himself with the requirements of the Occupational Health and Safety Act and the Construction Regulations and that he, his employees, and any sub-contractors, comply with them.

5. Discipline in the interests of occupational health and safety shall be strictly enforced.

6. Personal protective equipment shall be issued by the Contractor as required and shall be worn at all times where necessary.

7. Written safe work procedures and appropriate precautionary measures shall be available and enforced, and all employees shall be made conversant with the contents of these practices.

8. No substandard equipment/machinery/articles or substances shall be used on the site.

9. All incidents referred to in terms of Section 24 of the Occupational Health and Safety Act shall be reported by the Contractor to the Department of Labour and the Employer.

10 The Employer hereby obtains an interest in the issue of any formal inquiry conducted in terms of Section 32 of the Occupational Health and Safety Act and into any incident involving a Contractor and/or his employees and/or his sub-contractor/s.

11. No use shall be made of any of the Employer's machinery/plant/equipment/substance/personal protective equipment or any other article without prior arrangement and written approval.

12. No alcohol or any other intoxicating substance shall be allowed on the site. Any person suspected of being under the influence of alcohol or any other intoxicating substance shall not be permitted access to, or allowed to remain on the site.

13. Prior to commencement of any work, verified copies of all documents mentioned in the agreement, must be presented to the Employer.

C1.5 Pro Forma Form of Advance Payment Guarantee

Guarantee No.: _____ [*insert guarantee reference number*]

The Guarantor: _____
[insert name and address of place of issue, unless indicated in the letterhead].

Name of Contract/Contract No.: _____

_____ *[insert reference number or other information identifying the contract between the Applicant and the Beneficiary on which the guarantee is based]*

The Beneficiary (the "Employer"): _____

_____ *[insert name and address of the Beneficiary].*

We have been informed that _____ [*insert name of the Contractor and address*] (hereinafter called the "Applicant") is your Contractor under such Contract and wishes to receive an advance payment, for which the Contract requires him/her to obtain a guarantee.

At the request of the Applicant, we _____ [*insert name of Guarantor*] hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of

_____

_____
[*insert in figures and words the maximum amount payable and the currency in which it is payable*] (the "Guaranteed Amount") upon receipt by us of your demand in writing and your written statement that:

(a) the Applicant has failed to repay the advance payment in accordance with the Conditions of Contract, and

(b) the amount of the advance payment which the Applicant has failed to repay.

The guarantee shall become effective upon receipt [*of the first instalment*] of the advance payment by the Applicant. The Guaranteed Amount shall be reduced by the amounts of the advance payment repaid to you, as evidenced by interim payment certificates issued under Sub-Clause 14.6 of the Conditions of Contract. Following receipt of a copy of each interim payment certificate, we shall promptly notify you of the revised Guaranteed Amount accordingly.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at the following office _____

_____ [*insert address of office*] on or before

_____[*insert the date 70 days after the expected expiry of the Time of Completion*] (the "Expiry Date"), when this guarantee shall expire.

The party liable for the payment of any charges: _____
[*insert the name of the party*].

This guarantee shall be governed by the laws of _____
[*insert the law governing the guarantee*], and shall be subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

Signed by: _____ Signed by[1]: _____

(Signature) *(Signature)*

_____ _____

(Name) *(Name)*

Date: _____

[1] Whether one or more signatories for the bank are required will depend on the bank and/or applicable law.

C1.6 Insurance Broker's Warranty

Pro Forma

Logo

Letterhead of Contractor's Insurance Broker

Date _____

LANGEBERG MUNICIPALITY
Municipal Manager
PRIVATE BAG X2
ASHTON
6715
TEL: 023 626 8200

Dear Sir

CONTRACT NO.: 46/2025

CONTRACT TITLE: UPGRADING OF MCGREGOR WTW

NAME OF CONTRACTOR: _____

I, the undersigned, do hereby confirm and warrant that all the insurances required in terms of the abovementioned contract have been issued and/or in the case of blanket/umbrella policies, have been endorsed to reflect the interests of the LANGEBERG MUNICIPALITY with regard to the abovementioned contract, and that all the insurances and endorsements, etc., are all in accordance with the requirements of the contract.

I furthermore confirm that all premiums in the above regard have been paid.

Yours faithfully

Signed: _____

For: _____

Part C2: Pricing Data

PART C2: PRICING DATA 132

C2.1 PRICING ASSUMPTIONS 133
C2.2 BILLS OF QUANTITIES 135

C2.1 Pricing Assumptions

Pricing Assumptions mean the criteria as set out below, read together with all Parts of this contract document, which it will be assumed in the contract, that the tenderer has taken into account when developing his prices.

1. The method of measurement published by the South African Bureau of Standards in clause 8 of the Standardised Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section “Applicable SANS 1200 standardised specifications”.

2. Descriptions in the Bills of Quantities are abbreviated and comply generally with those in the Standardised Specifications. Clause 8 of each Standardised Specification, read together with the relevant clauses of the Scope of Work, set out what ancillary or associated activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standardised Specification, or the Scope of Work, conflict with the terms of the Schedule, the requirements of the Standardised Specification or Scope of Work, as applicable, shall prevail.

3. The measurement and payment clauses in a specification in which further information regarding the scheduled items is given, are referenced under “Item” (pay items) in the Bills of Quantities. The referenced clauses are not necessarily the only sources of information in respect of scheduled items. Further information and specifications may be found elsewhere in the contract documents. Standardised Specifications are identified by the digits which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200 G.

4. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.

5. The quantities set out in the Bills of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Employer’s Agent from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.

6. The prices and rates to be inserted in the Bills of Quantities are to be the full inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out.

7. A price or rate should be entered against each item in the Bills of Quantities, whether the quantities are stated or not. **An item against which no rate is/are entered, or if anything other than a rate or a nil rate (for example, a zero, a dash or the word “included” or abbreviations thereof) is entered against an item, it will also be regarded as a nil rate having been entered against that item, i.e. that there is no charge for that item.** The Tenderer may be requested to clarify nil rates, or items regarded as having nil rates; and the Employer may also perform a risk analysis with regard to the reasonableness of such rates.

8. Except where rates only are required, insert all amounts to be included in the total tendered price in the "Amount" column and show the corresponding total tendered price.

9. The Tenderer shall fill in rates for all items where the words “rate only” appear in the “Total” column. “Rate Only” items have been included where:

(a) an alternative item or material is contemplated:
(b) variations of specified components in the make-up of a pay item may be expected; and
(c) no work under the item is foreseen at the tender stage but the possibility that such work may be required is not excluded.

For “Rate Only” items no quantities are given in the “Quantity” column but the quoted rate shall apply in the event of work under this item being required. The Tenderer shall however note that in terms of the Tender Data the Tenderer may be asked to reconsider any such rates which the Purchaser may regard as unbalanced.

10. Where Provisional sums or Prime Cost sums are provided for items in the Bill of Quantities, payment for the work done under such items will be made in accordance with the Contract Specifications. The Purchaser reserves the right, during the execution of the works, to adjust the stated amounts upwards or downwards according to the work actually done under the item, or the item may be omitted altogether, without affecting the validity of the Contract.

    The Tenderer shall not under any circumstance whatsoever delete or amend any of the sums inserted in the “Amount” column of the Bill of Quantities and in the Summary of the Bill of Quantities unless ordered or authorized in writing by the Purchaser before closure of tenders. Unauthorized changes made by the Tenderer to provisional items in the Bill of Quantities, or to the stated provisional percentages and sums in the Summary of the Bill of Quantities, will not be tolerated.

11. Arithmetical errors found in the Bill of Quantities as a result of faulty multiplication of addition, will be corrected by the Purchaser’s Agent at the tender evaluation stage, as set out in the Condition of Tender and the Tender Data

12. Incorrect entries shall not be erased or obliterated with correction fluid but must be crossed out neatly. The correct figures must be entered above or adjacent to the deleted entry, and the alteration must be initialled by the Tenderer.

13. The units of measurement described in the Bills of Quantities are metric units. Abbreviations which may be used in these Bills of Quantities are as follows:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1000 kg)
m2	=	square metre	No.	=	number
m2.pass	=	square metre-pass	sum	=	lump sum
ha	=	hectare	MN	=	meganewton
m3	=	cubic metre	MN.m	=	meganewton-metre
m3.km	=	cubic metre-kilometre	P C sum	=	Prime Cost sum
l	=	litre	Prov sum	=	Provisional sum
kl	=	kilolitre	%	=	per cent
MPa	=	megapascal	kW	=	kilowatt

14. Where fractions of a cent occur in calculations of prices and amounts, they shall be rounded up/down to the nearest whole cent.

15. The Tenderer is referred to C.2.24 in Part T1.2 Tender Data regarding the pricing of Deviations and/or Qualifications.

16. All descriptions or clauses where trade names or proprietary products are specified, are deemed to include the phrase “or equal approved”

17. Tenderers are referred to Clause 6.8.2 in Part C1.2 Contract Data regarding contract price adjustment.

The following bills in Part C2.2 Bills of Quantities are deemed applicable to the following categories for the purposes of Contract Price Adjustment:

NO.	BILL	CPA CATEGORY
1.	NONE	

C2.2 Bills of Quantities

Bid specifications may not make any reference to any particular trade mark, name, patent, design, type, specific origin or producer, unless there is no other sufficiently precise or intelligible way of describing the characteristics of the work, in which case such reference must be accompanied by the words “or equivalent”.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS ‘OR EQUIVALENT”

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
A1.1	SABS 1200 A	**GENERAL**				
		as specified in SABS 1200 A and in the project specifications				
	8.3	FIXED CHARGES AND VALUE RELATED ITEMS				
A1.2	PSA 8.3.1	Fixed preliminary and general charges	Sum	1		
A1.3	PSA 8.3.2	Value related preliminary and general charges	Sum	1		
	PSA 8.3.5	Cost of survey in terms of Land Survey Act:				
A1.4		Locate, record, protect and reinstate pegs	Sum	1		
	PSA 8.4	SCHEDULED TIME RELATED ITEMS				
	PSA 8.4.1	Time related preliminary and general charges :				
A1.5	PSA 8.4.1.1	The contract period during the normal industry working period (outside public holidays and the industry shutdown period during December and January)	Sum	1		
A1.6	PSA 8.4.1.2	Public Holidays	No	15		
A1.7	PSA 8.4.1.3	SAFCEC recommended shutdown period during December and January	Sum	1		
	PSA 8.5	SUMS STATED PROVISIONALLY BY ENGINEER				
	PSA 8.5.1	Works executed by the Contractor:				
A1.8		(a) Plumbing works for operator room	Prov Sum	1	20,000.00	20,000.00
A1.9		(b) Charge required by contractor on sub-item (a) above	%	20,000.00		
A1.10		(e) The raising or lowering of water pipelines	Prov Sum	1	20,000.00	20,000.00
A1.11		(f) Charge required by the Contractor on sub-item (e) above	x100%	20,000.00		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
	PSA 8.6	PRIME COST SUMS				
		(1) Communication allowances:				
A1.12		(a) The cost of calls in connection with contract administration and telephone and cellular telephone rental	PCSum	1	20,000.00	20,000.00
A1.13		(b) Charge required by Contractor on sub-item (a) above	%	20,000.00		
		(2) Additional testing of materials required by Engineer:				
A1.14		(a) Cost of testing	PCSum	1	25,000.00	25,000.00
A1.15		(b) Charge required by Contractor on sub-item (a) above	%	25,000.00		
		(4) As built surveys:				
A1.16		(a) Cost of as built surveys	PCSum	1	15,000.00	
A1.17		(b) Charge required by Contractor on sub-item (a) above	x100%	15,000		
	PSA 8.7	DAYWORK				
	PSA 8.7.1	Dayworks:				
		(a) Vehicles, plant and equipment:				
		(3) Hydraulic excavator with bucket at least 500 mm wide				
A1.18		20 Ton (> 115kW @ 1800 rmp)	h	5		
A1.19		25 Ton (> 130 kW @ 2000 rmp)	h	5		
A1.20		30 Ton (>145 kW @ 1800 rmp)	h	5		
A1.21		(4) Loader Backhoe	h	10		
A1.22		(5) Dumper (> 10m³ capacity)	h	10		
A1.23		(6) Tipper truck, more than 5m³ capacity	h	5		
A1.24		(8) Flat bed truck equipped with hydraulic crane of more than 2 t capacity	h	5		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		(9) Water trucks:				
A1.25		(i) 12 kℓ capacity	h	20		
		(11) Compressors:				
A1.26		(i) Up to 10m³/minute	h	5		
		(12) Concrete mixer:				
A1.27		(ii) Over 400 l capacity	h	100		
		(13) Water pump:				
A1.28		(i) 200 ℓ/min capacity @10m head	h	50		
A1.29		(ii) 600 ℓ/minute capacity @ 10m head	h	100		
A1.30		(iii) 1200 ℓ/minute capacity @10m head)	h	100		
		Labour:				
		(a) Labour:				
A1.31		(1) Labourer	h	40		
A1.32		(2) Semi-skilled labourer	h	10		
A1.33		(3) Skilled labourer	h	10		
A1.34		(4) Artisan	h	10		
A1.35		(5) Team Leader	h	5		
A1.36		(6) Foreman	h	5		
A1.37		(7) Surveyor	h	10		
	PSA 8.8	TEMPORARY WORKS				
A1.38	PSA 8.8.2	Accommodation of traffic	Sum	1		
	PSA 8.8.4	Location and protection of existing services:				
	PSA 8.8.4.1	Provision of detecting devices for:				
A1.39		(a) Water and sewer pipes	Sum	1		
A1.40		(b) Electrical and other cables	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
	PSA 8.8.4.2	Hand excavation necessary for locating and exposing existing services in all materials:				
A1.41		(a) In roadways	m³	100		
A1.42		(b) In all other areas	m³	50		
	PSA 8.8.7	Dealing with water:				
A1.43		(a) Dealing with subsurface water	Sum	1		
A1.44		(b) Dealing with surface water	Sum	1		
	PSA 8.8.8	Temporary fence minimum 1,2 m high				
A1.45		(a) 1,2 m high	m	1,500		
A1.46	PSA 8.8.9	Dismantle and re-erect temporary 1,2 m high fence	m	800		
A1.47	PSA 8.8.10	Dust control	Sum	1		
A1.48	PSA 8.10	Accommodating other Contractors	Sum	1		
A1.49	PSA 8.12	Compliance with the Occupational Health and Safety Act (Act No 85 of 1993) and Construction Regulations and specifications included in the Particular Specification	Sum	1		
A1.50	PSA 8.13	Compliance with the Environmental Management Plan and requirements included in the Particular Specification	Sum	1		
A1.51	PSA 8.17	Photographic Record	Sum	1		
A1.52	PSA 8.19	Liaison with residents and the local authority	Sum	1		
A1.53	PSA 8.20	Record of test results and related administration	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	GENERAL	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
B1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
B1.2		Site	m²	5		
		Pipeline routes				
B1.3		3 m wide	m²	4,000		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
B1.4		Over 1,0 m up to and including 2,0 m	No	1		
B1.5		Over 2,0 m up to and including 3,0 m	No	1		
B1.6	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	10		
B1.7	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	540		
B1.8	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	60		
B1.9	PSC 8.2.15	Remove and dispose of kerbing	m	5		
B1.10	PSC 8.2.16	Take down existing fences and deliver to municipal store	m	10		
B1.11	PSC 8.2.17	Rip and clear tarred and paved areas	m²	5		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 DB	**EARTHWORKS (PIPE TRENCHES)**				
		as specified in SABS 1200 DB and in the project specifications				
		PIPELINE TRENCHES				
	PSDB 8.3.2	Excavation:				
		Excavate in all materials for trenches, backfill, compact and dispose of surplus material:				
		(1) Pipes up to 125 mm dia for depths:				
B1.12		Up to 1,5 m	m	10		
B1.13		Over 1,5 m up to 2,5 m	m	10		
		(2) Pipes over 125 mm dia up to 400 mm dia for depths:				
B1.14		Up to 1,5 m	m	1,300		
B1.15		Over 1,5 m up to 2,5 m	m	45		
		(3) Pipes over 400 mm dia up to 550 mm dia for depths:				
B1.16		Up to 1,0 m	m	150		
B1.17		Over 1,0 m up to 2,0 m	m	10		
B1.18		Over 2,0 m up to 3,0 m	m	5		
	PSDB 8.3.2	(b) Extra over item (a) above for:				
B1.19		(1) Intermediate excavation	m³	130		
B1.20		(2) Hard rock excavation	m³	130		
B1.21		(3) Hand excavation and backfill where directed by the Employer's Agent	m³	100		
B1.22		(a) Soft material	m³	5		
B1.23		(b) Intermediate material	m³	5		
B1.24		(4) Backfill stabilized with 5% cement where directed by the Engineer	m³	1		
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.25		(6) Mass concrete Class 15 MPa/19mm encasing around pipes where directed by the Engineer	m³	2		
B1.26		(7) Excavation in marshy areas irrespective of depth	m³	20		
B1.27		(8) Backfill with clean sand compacted to 100% modified AASHTO density	m³	5		
B1.28		(9) Boulder excavation	m³	5		
B1.29		(10) Excavate in all materials for stormwater inlet and outlet structures and for manholes, catchpits, valve chambers and the like irrespective of depth and backfill around structures	m³	5		
B1.30	PSDB 8.3.2	(11) Excavate open drains in all materials	m³	2		
B1.31	8.3.2	(c) Excavate and dispose of unsuitable material from trench bottom	m³	190		
	PSDB 8.3.3	Excavation ancillaries:				
	8.3.3.1	Make up deficiency in backfill material:				
B1.32		(a) from other necessary excavations on site	m³	5		
B1.33		(c) by importation from commercial or off site sources selected by the Contractor (sand compacted to 100% Mod AASHTO)	m³	10		
	8.3.5	Existing services that intersect or adjoin a pipe trench:				
		(a) Services that intersect a pipe trench:				
B1.34		(1) LT electricity cables	No	1		
B1.35		(2) HT electricity cables	No	1		
B1.36		(3) Telkom	No	1		
B1.37		(4) Watermains	No	23		
B1.38		(5) Stormwater	No	8		
B1.39		(6) Sewer	No	1		
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		(b) Services that adjoin a trench:				
B1.40		(1) Foul sewer	m	5		
B1.41		(2) HT electrical cables	m	5		
B1.42		(3) Watermains	m	45		
	8.3.6	Finishing:				
	8.3.6.1	Reinstate road surfaces complete with all courses:				
B1.43		(c) Gravel roads	m²	1,575		
	PSDB 8.3.8	Removal of existing pipes:				
B1.44		(a) Excavate in all materials to 300mm above the pipelines	m³	10		
B1.45		(b) Hand excavation for removal by hand to expose pipes	m	5		
B1.46		(c) Remove pipes from trench and stack for inspection	m	5		
		(d) Deliver pipes and specials declared re-usable:				
B1.47		(i) Pipes	m	5		
B1.48		(ii) Specials	No	2		
		(e) Dispose of pipes and specials unsuitable for re-use				
B1.49		(i) Pipes	m	5		
B1.50		(ii) Specials	No	2		
B1.51		(f) Backfill and compact trench	m³	2		
B1.52		(g) Make up deficiency in backfill material	m³	2		
B1.53	PSDB 8.3.16	Compaction of trench invert in situ material to a depth of 300mm	m³	190		
	PSDB 8.3.17	Testing of trench related work				
		Insitu material at trench invert. (Test up to 1,5m below invert)				
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.54		1) DCP test by Contractor	No	35		
B1.55		2) DCP test by Independent laboratory	No	5		
		Bedding layer				
B1.56		1) DCP test by Contractor	No	35		
B1.57		2) DCP test by Independent laboratory	No	5		
B1.58		3) Troxler test by independent laboratory	No	5		
B1.59		4) Material classification analysis including CBR and grading analysis	No	5		
		Backfill of trenchess				
B1.60		1) DCP test by Contractor	No	35		
B1.61		2) DCP test by Independent laboratory	No	5		
B1.62		3) Troxler test by independent laboratory	No	5		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 L : MEDIUM PRESSURE PIPELINES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 L	**MEDIUM PRESSURE PIPELINES**				
		HDPE PIPES				
		as specified in SABS 1200 L and in the project specifications				
	PSL 8.2.1	Supply, lay and bed on bedding for flexible pipes, complete with couplings:				
		HDPE PE 100 PN6 pipes continuously butt welded SANS ISO 4427:1996 with the following diameters of pipe:				
B1.63		160 mm dia	m	160		
B1.64		200 mm dia	m	960		
B1.65		250 mm dia	m	90		
B1.66		355 mm dia	m	100		
B1.67		450 mm dia	m	150		
	PSL 8.2.2	Extra over item 8.2.1 for the supplying, laying and bedding of moulded HDPE PE100 PN6 pipes continuously butt welded SANS 150 4427: 1996 with the following diameters				
		11,25 degree bends				
B1.68		160 mm dia	No	2		
B1.69		200 mm dia	No	6		
B1.70		250 mm dia	No	1		
B1.71		355 mm dia	No	1		
B1.72		450 mm dia	No	1		
		22,5 degree bends				
B1.73		160mm dia	No	1		
B1.74		200mm dia	No	6		
B1.75		250mm dia	No	2		
B1.76		355mm dia	No	4		
B1.77		450mm dia	No	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		45 degree bends				
B1.78		160 mm dia	No	1		
B1.79		200 mm dia	No	7		
B1.80		250 mm dia	No	3		
B1.81		355 mm dia	No	2		
B1.82		450 mm dia	No	2		
		90 degree bends				
B1.83		160 mm dia	No	8		
B1.84		200 mm dia	No	6		
B1.85		250 mm dia	No	1		
B1.86		355 mm dia	No	6		
B1.87		450 mm dia	No	6		
		Extra over item 8.2.1 for the supplying, laying and bedding ofHDPE specials and fittings continuously butt welded for HDPE pipes				
		Tees				
B1.88		160mm dia	No	2		
B1.89		200 mm dia	No	1		
B1.90		250 mm dia	No	1		
B1.91		355 mm dia	No	7		
B1.92		450 mm dia	No	8		
		Reducing tees				
B1.93		200 mm dia x 160 mm dia	No	1		
B1.94		250 mm dia x 160 mm dia	No	1		
B1.95		250 mm dia x 200 mm dia	No	1		
B1.96		450 mm dia x 250 mm dia	No	1		
		Reducers				
B1.97		200mm x 110mm	No	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.98		355mm x 200mm	No	1		
B1.99		450mm x 200mm	No	1		
		Extra over item 8.2.1 for HDPE dedicated flange adaptors (stub ends) with Grade 316 S/S backing rings, flange drilling to table 1000/continuously butt welded to pipe				
B1.100		160 mm dia	No	7		
B1.101		200 mm dia	No	12		
B1.102		250 mm dia	No	3		
B1.103		355mm dia	No	8		
B1.104		450 mm dia	No	8		
		End caps: (HDPE) same class as pipe, continuously butt welded to pipe				
B1.105		160 mm dia	No	1		
B1.106		200 mm dia	No	1		
B1.107		250 mm dia	No	1		
B1.108		355 mm dia	No	1		
B1.109		450 mm dia	No	1		
	PSL 8.2.11	Anchor blocks / thrust blocks and pedestals:				
		Concrete:				
B1.110		Class 25MPa/19mm	m³	10		
		Formwork:				
B1.111		Rough	m²	20		
		Reinforcement:				
B1.112		High tensile steel	t	0.2		
	8.2.12	Concrete casing:				
B1.113		Class 20MPa/19mm	m³	5		
	8.2.13	Valve and hydrant chambers, etc.:				
TOTAL CARRIED FORWARD						

SECTION 1200 L : MEDIUM PRESSURE PIPELINES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.114		Valve chamber complete as per Dwg. No. 24193-C-004-113	No	23		
B1.115		Bulk water meter chamber complete as per Dwg. No. 24193-C-004-115	No	1		
	PSL 8.2.15	Special wrapping in corrosive soil: (state dia, location and type)				
	PSL 8.2.17	Marker blocks/pipeline route markers:				
B1.116		(a) Supply and install pipeline route marker asper Dwg No. 24193-C-004-114	No	20		
	PSL 8.2.18	Connection to existing main supply pipe:				
B1.117		160mm dia	No	1		
B1.118		200mm dia	No	2		
B1.119		250mm dia	No	2		
B1.120		450mm dia	No	1		
	PSL 8.2.30	Specific testing of HDPE pipe material as per SANS 4427 and SANS 6269				
B1.121		Carbon Black Content test	No	8		
B1.122		Carbon Black Dispension test	No	8		
B1.123		Oxidation Induction Time test	No	8		
B1.124		Melt Flow Rate test	No	8		
B1.125		Tensile Test	No	8		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 LB : BEDDING (PIPES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 LB	**BEDDING (PIPES)**				
		as specified in SABS 1200 LB and in the project specifications				
	8.2.2.3	From commercial sources:				
B1.126		(a) Selected granular material	m³	486		
B1.127		(b) Selected fill material	m³	258		
	PSLB 8.2.7	Provision of stone/geofabric to deal with water:				
B1.128		19mm crushed stone	m³	190		
B1.129		Geofabric A2 or equivalent approved)	m²	100		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 LC : CABLE DUCTS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 LC	**CABLE DUCTS**				
		as specified in SABS 1200 LC and in the project specifications				
	8.2.2	Excavation:				
B1.130		(a) Excavate in all materials for trenches, backfill, compact, and dispose of surplus material	m	50		
		(b) Extra over item (a) above for:				
B1.131		(1) Intermediate excavation	m³	5		
B1.132		(2) Hard rock excavation	m³	1		
B1.133		(c) Excavate unsuitable mateial from trench bottom and dispose of it	m³	5		
	PSLC 8.2.5	Supply, lay, bed and prove duct:				
		PVC-U Class 34 heavy duty complying with SANS 791 using spigot and socket rubber ring joints				
B1.134		50mm dia	m	25		
B1.135		110mm dia	m	25		
B1.136		150mm dia	m	25		
B1.137	8.2.6	Imported bedding material, where ordered	m³	2		
	8.2.8	Cable markers:				
B1.138		(a) Route markers	No	1		
B1.139	PSLC 8.2.10	Joining new duct to existing duct	No	2		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 LE : DRAINAGE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 LE	**DRAINAGE**				
		as specified in SABS 1200 LE and in the project specifications				
	8.2.1	Supply and lay concrete pipe culverts on class C bedding (spigot and socket / ogee):				
		RC Class 100 D pipes:				
B1.140		375mm dia	m	35		
B1.141		500mm dia	m	10		
	PSLE 8.2.8	Supply and installation of manholes, catchpits and the like:				
		Supply and install manholes:				
		Precast concrete manholes as shown on Detail Dwg No 24193-C-005-100 for depth:				
B1.142		0m - 1,5m	No	2		
B1.143		1,5m - 2,5m	No	1		
B1.137		2,5m -3,5m	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
4	EARTHWORKS (PIPE TRENCHES)	
16	MEDIUM PRESSURE PIPELINES	
17	BEDDING (PIPES)	
18	CABLE DUCTS	
20	DRAINAGE	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
C1.2		Site	m²	30		
C1.3	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
C1.4	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
C1.5	PSC 8.2.8	Demolish and remove structures/buildings	Sum	1		
C1.6	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
C1.7	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	4		
C1.8	PSC 8.2.17	Rip and clear tarred and paved areas	m²	5		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
C1.9		(a) Excavate for restricted foundations at WTW building in all materials, and use for backfill or embankment, or dispose	m³	40		
		(b) Extra over item 8.3.3 above for:				
C1.10		Intermediate excavation	m³	12		
C1.11		Hard rock excavation	m³	4		
C1.12		Boulder excavation Class A	m³	1		
C1.13		Boulder excavation Class B	m³	1		
C1.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
C1.15	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	30		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
C1.16		(a) Cables	No	1		
C1.17	PSD 8.3.10	Topsoiling	m³	1		
C1.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	20		
C1.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	50		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SANS1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	SCHEDULED FORMWORK ITEMS				
	8.2.1	Rough:				
		Vertical Plane				
C1.20		All faces foundations	m²	10		
	8.2.2	Smooth:				
		Vertical Plane				
C1.21		All faces of beams, supporting columns and walls	m²	10		
	8.2.5	Narrow Widths up to 250mm wide				
C1.22		25x25mm chamfers	m	5		
	PSG 8.3	SCHEDULED REINFORCEMENT ITEMS				
	PSG 8.3.1	Mild steel bars:				
C1.23	8.3.1.1	Irrespective of diameter	t	0.1		
	8.3.1	High tensile steel bars:				
C1.24	8.3.1.1	Irrespective of diameter	t	2.8		
	8.3.2	High tensile welded mesh reinforcement				
C1.25		Type ref 395	m²	20		
C1.26		Type ref 617	m²	10		
	8.4	SCHEDULED CONCRETE ITEMS				
	8.4.2	Blinding layer in 20MPa/19mm concrete				
C1.27		75mm minimum thickness	m²	40		
	8.4.3	Strength concrete:				
		20MPa/10mm concrete				
C1.28		Screed to building tank slab on exposed sections to outside conditions	m³	5		
TOTAL CARRIED FORWARD						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		20MPa/19mm concrete				
C1.29		Mass concrete where instructed by the engineer	m³	5		
	8.4.3	35MPa/19mm concrete				
C1.30		Foundation	m³	10		
C1.31		Columns and beams	m³	5		
C1.32		Slabs and walls	m³	5		
	8.4.4	UNFORMED SURFACE FINISHES				
		Wood-floated finish:				
		Upper surfaces of:				
C1.33		MCC room cable trench	m²	25		
		Steel-floated finish:				
		Upper surfaces of:				
C1.34		Columns and beams	m²	5		
C1.35		Surface bed of Pump Station	m²	40		
	8.5	JOINTS				
		Expansion joints: (See PSG 5.5.7.4)				
C1.36		Supply and install 10mm wide expansion joint between surface bed and walls as shown on drawing 24193-C-007-03	m	50		
C1.37		Construct 16mm wide by 30mm deep saw cut expansion joint in surface bed	m	20		
C1.38		Supply and install two (2) layers of malthoid or similar material between MCC slab and wall	m	5		
	PSG 8.7	GROUTING				
	(c)	GROUTING IN OF PIPES, EQUIPMENT AND ITEMS SUPPLIED BY OTHERS				
C1.39		Dry packed grout	m³	2		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	PART SPEC PB	BUILDING WORK				
		Brickwork				
C1.40		280mm thick cable trench filled cavity walls with 230mm wide x 2.8mm dia. galvanised brick force every course (on building strip footing to 100mm above ground level), both faces solid clay NFX-E stock brick	m²	5		
C1.41		280mm thick external cavity walls with 250mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of building foundation walls to roof soffit height), internal face solid clay NFX-E stock brick and external face solid clay FBX-E face brick	m²	65		
C1.42		230mm thick internal walls with 150mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of pumpstation wetwell top/roof slab to roof soffit height), both faces solid clay NFX-E stock brick	m²	20		
		Air bricks				
C1.43		Supply and build in external airbricks as specified	No	4		
		Window Sills				
C1.44		Solid clay FBX-E face brick on edge on external wall external side of window including (DPC)	m	2		
		Plaster and Skim work				
C1.45		10mm thick to both faces of internal walls of building walls	m²	85		
C1.46		3mm thick to internal faces of building gypsum plaster board ceilings	m²	25		
		Floor screed				
C1.47		Normal screed (25MPa strength)	m³	5		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		Waterproofing				
C1.48		Supply and place 375 micron DPC between 280mm thick brick cavity wall and 280mm thick brick infill cavity foundation wall, stepped one brick down from building floor slab top	m	20		
C1.49		Supply and place 375 micron DPC between 230mm thick brick wall and top/roof slab, straight across bricks at building top/roof slab top	m	5		
C1.50		Supply and place 375 micron DPC between 280mm thick brick wall and building windows and doors, horizontal and vertical to bricks around frame	m	10		
		Control, Interfacing and Movement Joints				
C1.51		Vertical straight control 10mm wide formed v-joint consisting of two off 1.2mm thick x 30mm wide x 600mm long HDG mild steel concertina ties layed in each continious brick skin mortar bed either side of joint in brick work all at every third course and polysulphide sealant installed 105mm deep in brick work cut/formed vertical joint positions	m	10		
		Roof covering				
C1.52		Supply and install 0.6mm IBR profile galvanized roof sheeting with a "Global-Duro" or similar approved coating of minimum total DFT of 50 micron (Loerie green colour)	m²	30		
		Rainwater outlets				
C1.53		Supply and install and 125mm diameter heavy duty galvanised half-round gutters including galvanised jointing seems, with down pipe connections suitable for 80mm screwed and socketed galvanised downpipes and gutter brackets spaced at a maximum of 600mm	m	15		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C1.54		Supply and install 80mm diameter heavy duty galvanised screwed and socketed down pipes including galvanised holding brackets spaced at a maximum of 500mm suitable for use with 100mm dia galvanised rainwater outlets	m	10		
C1.55		Supply and install 80mm diameter heavy duty galvanised screwed and socketed 45 degree bend suitable for use with 80mm dia. galvanised down pipes	No	4		
		Joinery				
		Supply and install doors:				
C1.56		Supply and fix (67mm x 13mm) SA Pine standard Victorian style skirting to walls	m	30		
		Metalwork				
		Supply and install doors:				
C1.57		On building external brick wall 1800mm wide x 2100mm high HDG mild steel high security outward opening double door with vented louvers lined with vermin proof mesh screens on the inside face and recessed frame with lugs coated with red oxide corrosion protection and painted with a electric orange colour top coat complete and including stainless steel components such as 100mm heavy duty 4.0mm thick flanged hinges, monkey tailed barrel bolt at top of door, barrel bolt at bottom of door, door locking barrel bolt and internal quick realese lever assembly complete	No	1		
		Supply and install windows:				
C1.58		On building internal walls 1800mm wide x 1200mm high double glased fixed pane aluminium window and frame with dark bronze anodized corrosion protection coating complete with weather bar and tinted glass assembly complete.	No	2		
		Lintels				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C1.59		Supply and install 150mm wide x 75mm deep x 2100mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over doors	No	2		
		Painting				
C1.60		Paint plastered wall faces of building with one filler coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (antique petal grey colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	85		
C1.61		Paint gypsum cove cornice internal faces of internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	85		
C1.62		Paint all faces of Iroko solid hardwoord standard single door and frame with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based enamel paint (off-white colour) all suitable for interior	m²	10		
		Roof Structure				
C1.63		(a) Supply and install wooden roof structure complete as per specialist design	Prov Sum	1	50,000.00	50,000.00
C1.64		(b) Charge required by contractor on sub-item (a) above	%	50,000.00		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
C1	CONCRETE (STRUCTURAL)	
C3	BUILDING WORK	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
D1.2		Site	m²	64		
D1.3	PSC 8.2.8	Demolish and remove structures/buildings	Sum	1		
D1.4	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings plinth in all materials, and use for backfill or embankment, or dispose				
D1.5		(a) Excavate for restricted foundations plinthin all materials, and use for backfill or embankment, or dispose	m³	20		
		(b) Extra over item 8.3.3 above for:				
D1.6		Intermediate excavation	m³	2		
D1.7		Hard rock excavation	m³	1		
D1.8	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	2		
D1.9	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	2		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
D1.10	PSD 8.3.10	Topsoiling	m³	1		
D1.11	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	10		
D1.12	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	64		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.2	Smooth:				
		Walls:				
D1.13		Plinth	m²	7		
D1.14	8.2.3	Special smooth, repaired and rubbed	m²	25		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
D1.15		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
D1.16		Irrespective of diameter	t	1		
	PSG 8.3.2	High-tensile welded mesh:				
D1.17		Type reference 395 in standard sheets	m²	5		
D1.18		Type reference 617 in m standard sheets	m²	5		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50 mm minimum thickness:				
D1.19		Plinth	m²	25		
	PSG 8.4.3	Strength concrete :				
		30MPa/20 mm:				
D1.20		Plinth	m³	9		
	PSG 8.4.4	Unformed surface finishes:				
		(a) Wood-floated finish (see PSG 7.1)				
D1.21		Top of plinth	m²	25		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
	PSG 8.5	JOINTS				
D1.22		Saw Cut Joints (30mm deep, 3mm wide cut within 12-30 hours of pouring)	m	10		
D1.23		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	10		
TOTAL CARRIED FORWARD TO SUMMARY						

STRUCTURAL STEELWORK (SUNDRY ITEMS)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 HA	**STRUCTURAL STEELWORK (SUNDRY ITEMS)**				
		as specified in SABS 1200 HA and in the project specifications				
D1.24	PSHA 8.3.17	Supply and erect steel frame structure for Transfer Pump Station complete with security panel	Sum	1	75,000.00	75,000.00
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
7	STRUCTURAL STEELWORK (SUNDRY ITEMS)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
E1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
E1.2		Site	m²	40		
E1.3	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
E1.4	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
E1.5	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
E1.6	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	5		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
E1.7		(a) Excavate for flash mixing and flocculation chambers in all materials, and use for backfill or embankment, or dispose	m³	65		
		(b) Extra over item 8.3.3 above for:				
E1.8		Intermediate excavation	m³	13		
E1.9		Hard rock excavation	m³	10		
E1.10		Boulder excavation Class A	m³	1		
E1.11		Boulder excavation Class B	m³	1		
E1.12	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
E1.13		(a) Cables	No	1		
E1.14	PSD 8.3.10	Topsoiling	m³	1		
E1.15	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	52		
	PSD 8.3.17	Variations in compactive effort:				
E1.16	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	40		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
E1.17		Vertical plane	m²	75		
	8.2.2	Smooth:				
		Walls:				
E1.18		RC walls	m²	100		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
E1.19		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
E1.20		Irrespective of diameter	t	6		
	PSG 8.3.2	High-tensile welded mesh:				
E1.21		Type reference 395 in sheets	m²	35		
E1.22		Type reference 617	m²	5		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/20mm concrete:				
		50 mm minimum thickness:				
E1.23		Flash mixing and flocculation chambers	m²	35		
	PSG 8.4.3	Strength concrete :				
E1.24		15MPa/19mm	m³	1		
E1.25		Mass	m³	5		
		35MPa/19mm:				
E1.26		Floor slab	m³	15		
E1.27		Walls	m³	30		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
E1.28		(b) Steel-floated finish (see PSG 7.2):	m²	20		
	PSG 8.5	JOINTS				
E1.29		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	35		
	PSG 8.10	Testing for watertightness:				
E1.30		(a) Flash mixing and flocculation chambers	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 300 mm nominal bore:				
E1.31		(i) Through 300mm thick wall	No	2		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
E11	SITE CLEARANCE	
E12	EARTHWORKS	
E13	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
F1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
F1.2		Site	m²	240		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
F1.3		Over 1,0 m up to and including 2,0 m	No	1		
F1.4		Over 2,0 m up to and including 3,0 m	No	1		
F1.5	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
F1.6	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
F1.7	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	4		
F1.8	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	32		
F1.9	PSC 8.2.17	Rip and clear tarred and paved areas	m²	10		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
F1.10		(a) Excavate for restricted foundations WTW building in all materials, and use for backfill or embankment, or dispose	m³	360		
		(b) Extra over item 8.3.3 above for:				
F1.11		Intermediate excavation	m³	75		
F1.12		Hard rock excavation	m³	10		
F1.13		Boulder excavation Class A	m³	1		
F1.14		Boulder excavation Class B	m³	1		
F1.15	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	20		
F1.16	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	285		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
F1.17		(a) Cables	No	2		
F1.18	PSD 8.3.10	Topsoiling	m³	4		
F1.19	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	180		
F1.20	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	220		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SAS1200G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	SCHEDULED FORMWORK ITEMS				
	8.2.1	Rough:				
		Vertical Plane				
F1.21		All faces foundations	m²	80		
	8.2.2	Smooth:				
		Horizontal Plane				
F1.22		Soffits of MCC room top/roof slab (prop height 3.4m)	m²	20		
		Vertical Plane				
F1.23		All faces of beams, supporting columns and walls	m²	300		
	8.2.5	Narrow Widths up to 25mm wide				
F1.24		25x25mm chamfers	m	565		
	PSG 8.3	SCHEDULED REINFORCEMENT ITEMS				
	PSG 8.3.1	Mild steel bars:				
F1.25	8.3.1.1	Irrespective of diameter	t	1.3		
	8.3.1	High tensile steel bars:				
F1.26	8.3.1.1	Irrespective of diameter	t	11.7		
	8.3.2	High tensile welded mesh re-inforcement				
F1.27		Type ref 395	m²	241		
F1.28		Type ref 617	m²	10		
	8.4	SCHEDULED CONCRETE ITEMS				
	8.4.2	Blinding layer in 20MPa/19mm concrete				
F1.29		75mm minimum thickness	m²	120		
	8.4.3	Strength concrete:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		20MPa/10mm concrete				
F1.30		Screed to building tank slab on exposed sections to outside conditions	m³	5		
		20MPa/19mm concrete				
F1.31		Mass concrete where instructed by the engineer	m³	5		
	8.4.3	35MPa/19mm concrete				
F1.32		Foundation	m³	50		
F1.33		Columns and beams	m³	15		
F1.34		Slabs and walls	m³	30		
F1.35		Surface beds in WTW	m³	35		
	8.4.4	UNFORMED SURFACE FINISHES				
		Wood-floated finish:				
		Upper surfaces of:				
F1.36		MCC room top slab	m²	25		
F1.37		MCC room cable trench	m²	25		
		Steel-floated finish:				
		Upper surfaces of:				
F1.38		Columns and beams	m²	7.5		
F1.39		Surface bed of WTW	m²	245		
	8.5	JOINTS				
		Expansion joints: (See PSG 5.5.7.4)				
F1.40		Supply and install 10mm wide expansion joint between surface bed and walls as shown on drawing 24193-C-007-104	m	85		
F1.41		Construct 16mm wide by 30mm deep saw cut expansion joint in surface bed	m	75		
F1.42		Supply and install two (2) layers of malthoid or similar material between MCC slab and wall	m	25		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.7	GROUTING				
	(c)	GROUTING IN OF PIPES, EQUIPMENT AND ITEMS SUPPLIED BY OTHERS				
F1.43		Non-shrink grout 40 MPa under portal frames	m³	4		
F1.44		Dry packed grout	m³	2		
TOTAL CARRIED FORWARD TO SUMMARY						

STRUCTURAL STEELWORK (SUNDRY ITEMS)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS1200 HA	**STRUCTURAL STEELWORK (SUNDRY ITEMS)**				
		as specified in SANS 1200 HA and in the project specifications				
	PS HA 8.3.1	Structural Steel				
		HDG mild steel trusses, Columns and Beams:				
F1.45		Portal Frames and Gable columns: 254 x 146 x 31 I-sections in terms of the Structural Steel Tables published by the South African Institute of Steel	t	3.35		
F1.46		Eave beams: 203 x 133 x 25 I-sections in terms of the structural steel tables published by the South African Institute of Steel	t	1.75		
F1.47		Haunches: 254 x 146 x 31 cut from I-sections in terms of the Structural Steel Tables published by the South African Institute of Steel	t	1.7		
F1.48		End-plates,base plates and stiffeners: Upto 20mm thickness	t	0.75		
		HDG mild steel purlins, girders and bracing				
F1.49		Purlins: 150 x 75 x 20 x 3,5 mm Lipped channels in terms of the Structural Steel Tables published by the South African Institute of Steel	t	2.5		
F1.50		Cross-bracing: 70 x 70 x 6 L-shape angle irons in terms of the Structural Steel Tables published by the South African Institute of Steel	t	0.80		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PART SPEC PB	BUILDING WORK				
		Brickwork				
F1.51		280mm thick cable trench filled cavity walls with 230mm wide x 2.8mm dia. galvanised brick force every course (on building strip footing to 100mm above ground level), both faces solid clay NFX-E stock brick	m²	15		
F1.52		280mm thick external cavity walls with 250mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of building foundation walls to roof soffit height), internal face solid clay NFX-E stock brick and external face solid clay FBX-E face brick	m²	200		
F1.53		230mm thick internal walls with 150mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of pumpstation wetwell top/roof slab to roof soffit height), both faces solid clay NFX-E stock brick	m²	60		
		Air bricks				
F1.54		Supply and build in external airbricks as specified	No	10		
		Window Sills				
F1.55		Solid clay FBX-E face brick on edge on external wall external side of window including (DPC)	m	10		
		Plaster and Skim work				
F1.56		10mm thick to both faces of internal walls of building walls	m²	320		
F1.57		3mm thick to internal faces of building gypsum plaster board ceilings	m²	50		
		Floor screed				
F1.58		Normal screed (25MPa strength)	m³	5		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Waterproofing				
F1.59		Supply and place 375 micron DPC between 280mm thick brick cavity wall and 280 mm thick brick infill cavity foundation wall, stepped one brick down from building floor slab top	m	70		
F1.60		Supply and place 375 micron DPC between 230mm thick brick wall and top/roof slab, straight across bricks at building top/roof slab top	m	10		
F1.61		Supply and place 375 micron DPC between 280mm thick brick wall and building windows and doors, horizontal and vertical to bricks around frame	m	30		
		Control, Interfacing and Movement Joints				
F1.62		Vertical straight control 10mm wide formed v-joint consisting of two off 1.2mm thick x 30mm wide x 600mm long HDG mild steel concertina ties layed in each continious brick skin mortar bed either side of joint in brick work all at every third course and polysulphide sealant installed 105mm deep in brick work cut/formed vertical joint positions	m	155		
		Roof covering				
F1.63		Supply and install 0.6mm IBR profile galvanized roof sheeting with a "Global-Duro" or similar approved coating of minimum total DFT of 50 micron (Loerie green colour)	m²	460		
		Rainwater outlets				
F1.64		Supply and install and 125mm diameter heavy duty galvanised half-round gutters including galvanised jointing seems, with down pipe connections suitable for 80mm screwed and socketed galvanised downpipes and gutter brackets spaced at a maximum of 600mm	m	50		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F1.65		Supply and install 80mm diameter heavy duty galvanised screwed and socketed down pipes including galvanised holding brackets spaced at a maximum of 500mm suitable for use with 100mm dia galvanised rainwater outlets	m	25		
F1.66		Supply and install 80mm diameter heavy duty galvanised screwed and socketed 45 degree bend suitable for use with 80mm dia. galvanised down pipes	No	4		
		Ceilings				
F1.67		Supply and fix gypsum plaster board ceilings on brandering maximum 300mm centre to center spacing along brandering	m²	50		
F1.68		Supply and fix 76mm gypsum cove cornice to ceilings and walls	m	45		
		Joinery				
		Supply and install doors:				
F1.69		On building internal walls 900mm wide x 2100mm high Iroko solid hardwoord standard single outward opening door, ledged, braced, framed, five lever mortice lock with keys, door stop and stainless steel 100mm heavy duty 4.0mm thick flanged hinges assembly complete	No	4		
F1.70		Supply and fix (67mm x 13mm) SA Pine standard Victorian style skirting to walls	m	45		
		Metalwork				
		Supply and install doors:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F1.71		On building external wall 900mm wide x 2100mm high solid aluminium standard single outward opening door with dark bronze anodized corrosion protection coating complete, ledged, framed, five lever mortice lock with keys, door stop, stainless steel 100mm heavy duty 4.0mm thick flanged hinges, stainless steel hook latches and internal pushbar quick realese lever assembly complete	No	1		
F1.72		On building external brick wall 1800mm wide x 2100mm high HDG mild steel high security outward opening double door with vented louvers lined with vermin proof mesh screens on the inside face and recessed frame with lugs coated with red oxide corrosion protection and painted with a electric orange colour top coat complete and including stainless steel components such as 100mm heavy duty 4.0mm thick flanged hinges, monkey tailed barrel bolt at top of door, barrel bolt at bottom of door, door locking barrel bolt and internal quick realese lever assembly complete	No	1		
F1.73		On building external brick wall 3300mm wide x 5000mm high HDG mild steel high security single roller shutter door and frame with with dark bronze colour powder coating complete and including components such as manual push/pull tubular operational head gear and recessed frame with lugs complete and including T-bar weather lip, stainless steel barrel bolt at bottom of door assembly and stainless steel heavy duty beehive rol-lock on frame complete	No	1		
		Supply and install windows:				
F1.74		On building internal walls 1800mm wide x 1200mm high double glased fixed pane aluminium window and frame with dark bronze anodized corrosion protection coating complete with weather bar and tinted glass assembly complete.	No	2		
		Security gates on:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F1.75		Building external brick wall internal face HDG mild steel high security inward opening gate to suite 900mm wide x 2100mm high single door complete with horizontal locking bolt at top and bottom of gate. Gate to be coated with a red oxide corrosion protection and painted with a dark bronze colour top coat	No	1		
		Lintels				
F1.76		Supply and install 100mm wide x 75mm deep x 1200mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over doors	No	4		
F1.77		Supply and install 150mm wide x 75mm deep x 2100mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over doors	No	4		
F1.78		Supply and install 150mm wide x 75mm deep x 3000mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over windows	No	4		
		Painting				
F1.79		Paint plastered wall faces of building with one filler coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (antique petal grey colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	520		
F1.80		Paint gypsum plaster board ceilings internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	50		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F1.81		Paint gypsum cove cornice internal faces of internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	45		
F1.82		Paint all faces of Iroko solid hardwoord standard single door and frame with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based enamel paint (off-white colour) all suitable for interior	m²	10		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
C1	CONCRETE STRUCTURAL	
C2	STRUCTURAL STEELWORK (SUNDRY ITEMS)	
C3	BUILDING WORK	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
G1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
G1.2		Site	m²	90		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
G1.3		Over 1,0 m up to and including 2,0 m	No	1		
G1.4		Over 2,0 m up to and including 3,0 m	No	1		
G1.5	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
G1.6	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
G1.7	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
G1.8	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	13		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
G1.9		(a) Excavate for Rapid Gravity Sand Filters in all materials, and use for backfill or embankment, or dispose	m³	90		
		(b) Extra over item 8.3.3 above for:				
G1.10		Intermediate excavation	m³	27		
G1.11		Hard rock excavation	m³	14		
G1.12		Boulder excavation Class A	m³	2		
G1.13		Boulder excavation Class B	m³	2		
G1.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	10		
G1.15	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	27		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
G1.16		(a) Cables	No	1		
G1.17	PSD 8.3.10	Topsoiling	m³	1		
G1.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	72		
G1.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	90		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
G1.20		Vertical plane	m²	200		
	8.2.2	Smooth:				
		Walls:				
G1.21		RC walls	m²	230		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
G1.22		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
G1.23		Irrespective of diameter	t	12		
	PSG 8.3.2	High-tensile welded mesh:				
G1.24		Type reference 395	m²	35		
G1.25		Type reference 617	m²	35		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
G1.26		50mm minimum thickness:	m²	90		
	PSG 8.4.3	Strength concrete :				
		20 MPa/40 mm:				
G1.27		Mass	m³	5		
		35MPa/19mm min superstructure:				
G1.28		Floor slabs	m³	25		
G1.29		Walls	m³	65		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
G1.30		(a) Wood-floated finish (see PSG 7.1)	m²	100		
	PSG 8.5	JOINTS				
G1.31		Saw cut joints (30mm deep 3mm wide cut within 12-30 hours of pouring	m	5		
G1.32		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	60		
	PSG 8.10	Testing for watertightness:				
G1.33		(a) Rapid Gravity Sand filters	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 300 mm nominal bore:				
G1.34		(i) Through (300mm thick wall)	No	5		
		(b) Greater than 300 mm nominal bore:				
G1.35		(i) Through (300mm thick wall)	No	9		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
H1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
H1.2		Site	m²	65		
H1.3	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
H1.4	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
H1.5	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
H1.6	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	9		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
H1.7		(a) Excavate for clear water collection sump in all materials, and use for backfill or embankment, or dispose	m³	89		
		(b) Extra over item 8.3.3 above for:				
H1.8		Intermediate excavation	m³	18		
H1.9		Hard rock excavation	m³	9		
H1.10		Boulder excavation Class A	m³	1		
H1.11		Boulder excavation Class B	m³	1		
H1.12	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
H1.13	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	9		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
H1.14		(a) Cables	No	2		
H1.15	PSD 8.3.10	Topsoiling	m³	1		
H1.16	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	71		
H1.17	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	19		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
H1.18		Vertical plane	m²	85		
	8.2.2	Smooth:				
		Walls:				
H1.19		RC walls	m²	80		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
H1.20		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
H1.21		Irrespective of diameter	t	6		
	PSG 8.3.2	High-tensile welded mesh:				
H1.22		Type reference 395	m²	60		
H1.23		Type reference 617	m²	5		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50mm minimum thickness:				
H1.24		Clear water collection sump	m²	65		
	PSG 8.4.3	Strength concrete :				
		20 MPa/40 mm:				
H1.25		Mass	m³	5		
		35MPa/19mm:				
H1.26		Floor slab	m³	28		
H1.27		Walls	m³	15		
TOTAL CARRIED FORWARD						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
H1.28		(a) Wood-floated finish (see PSG 7.1)	m²	50		
H1.29		(b) Steel-floated finish (see PSG 7.2):	m²	60		
	PSG 8.5	JOINTS				
H1.30		Saw cut joints (30mm deep 3mm wide cut within 12-30 hours of pouring)	m	5		
H1.31		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	35		
	PSG 8.10	Testing for watertightness:				
H1.32		(a) Clear water collection sump	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 300 mm nominal bore:				
H1.33		(i) Through (description and thickness of structure elements)	No	4		
		(b) Over 300 mm up to 600 mm nominal bore:				
H1.34		(i) Through 220mm thick wall	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
I1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
I1.2		Site	m²	80		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
I1.3	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
I1.4	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
I1.5	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	5		
I1.6	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	7		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
I1.7		(a) Excavate for chlorine dosing building in all materials, and use for backfill or embankment, or dispose	m³	65		
		(b) Extra over item 8.3.3 above for:				
I1.8		Intermediate excavation	m³	20		
I1.9		Hard rock excavation	m³	7		
I1.10		Boulder excavation Class A	m³	1		
I1.11		Boulder excavation Class B	m³	1		
I1.12	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
I1.13	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	55		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
I1.14		(a) Cables	No	1		
I1.15	8.3.9	Extra over for backfill or fill material against structures	m³	5		
I1.16	PSD 8.3.10	Topsoiling	m³	5		
I1.17	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	30		
I1.18	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	65		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	SCHEDULED FORMWORK ITEMS				
	8.2.1	Rough:				
		Vertical Plane				
I1.19		All faces foundations	m²	10		
	8.2.2	Smooth:				
		Vertical Plane				
I1.20		All faces of beams, supporting columns and walls	m²	5		
	PSG 8.3	SCHEDULED REINFORCEMENT ITEMS				
	PSG 8.3.1	Mild steel bars:				
I1.21	8.3.1.1	Irrespective of diameter	t	0.1		
	8.3.1	High tensile steel bars:				
I1.22	8.3.1.1	Irrespective of diameter	t	2.4		
	8.3.2	High tensile welded mesh re-inforcement				
I1.23		Type ref 395	m²	30		
I1.24		Type ref 617	m²	10		
	8.4	SCHEDULED CONCRETE ITEMS				
	8.4.2	Blinding layer in 20MPa/19mm concrete				
I1.25		75mm minimum thickness	m²	65		
	8.4.3	Strength concrete:				
		20MPa/10mm concrete				
I1.26		Screed to building tank slab on exposed sections to outside conditions	m³	2		
		20MPa/19mm concrete				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
I1.27		Mass concrete where instructed by the engineer	m³	5		
	8.4.3	35MPa/19mm concrete				
I1.28		Foundation	m³	5		
I1.29		Columns and beams	m³	2		
I1.30		Surface beds in Pump Station	m³	10		
	8.4.4	UNFORMED SURFACE FINISHES				
		Steel-floated finish:				
		Upper surfaces of:				
I1.31		Columns and beams	m²	5		
I1.32		Surface bed of Pump Station	m²	60		
	8.5	JOINTS				
		Expansion joints: (See PSG 5.5.7.4)				
I1.33		Supply and install 10mm wide expansion joint between surface bed and walls as shown on drawing 24193-C-007-102	m	85		
I1.34		Construct 16mm wide by 30mm deep saw cut expansion joint in surface bed	m	15		
	PSG 8.7	GROUTING				
	(c)	GROUTING IN OF PIPES, EQUIPMENT AND ITEMS SUPPLIED BY OTHERS				
I1.35		Dry packed grout	m³	2		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PART SPEC PB	BUILDING WORK				
		Brickwork				
I1.36		280mm thick cable trench filled cavity walls with 230mm wide x 2.8mm dia. galvanised brick force every course (on building strip footing to 100mm above ground level), both faces solid clay NFX-E stock brick	m²	5		
I1.37		280mm thick external cavity walls with 250mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of building foundation walls to roof soffit height), internal face solid clay NFX-E stock brick and external face solid clay FBX-E face brick	m²	100		
I1.38		230mm thick internal walls with 150mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of pumpstation wetwell top/roof slab to roof soffit height), both faces solid clay NFX-E stock brick	m²	40		
		Air bricks				
I1.39		Supply and build in external airbricks as specified	No	5		
		Window Sills				
I1.40		Solid clay FBX-E face brick on edge on external wall external side of window including (DPC)	m	5		
		Plaster and Skim work				
I1.41		10mm thick to both faces of internal walls of building walls	m²	40		
I1.42		3mm thick to internal faces of building gypsum plaster board ceilings	m²	140		
		Floor screed				
I1.43		Normal screed (25MPa strength)	m³	5		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Waterproofing				
I1.44		Supply and place 375 micron DPC between 280mm thick brick cavity wall and 280 mm thick brick infill cavity foundation wall, stepped one brick down from building floor slab top	m	50		
I1.45		Supply and place 375 micron DPC between 230mm thick brick wall and top/roof slab, straight across bricks at building top/roof slab top	m	40		
I1.46		Supply and place 375 micron DPC between 280mm thick brick wall and building windows and doors, horizontal and vertical to bricks around frame	m	10		
		Control, Interfacing and Movement Joints				
I1.47		Vertical straight control 10mm wide formed v-joint consisting of two off 1.2mm thick x 30mm wide x 600mm long HDG mild steel concertina ties layed in each continious brick skin mortar bed either side of joint in brick work all at every third course and polysulphide sealant installed 105mm deep in brick work cut/formed vertical joint positions	m	5		
		Roof covering				
I1.48		Supply and install 0.6mm IBR profile galvanized roof sheeting with a "Global-Duro" or similar approved coating of minimum total DFT of 50 micron (Loerie green colour)	m²	65		
		Rainwater outlets				
I1.49		Supply and install and 125mm diameter heavy duty galvanised half-round gutters including galvanised jointing seems, with down pipe connections suitable for 80mm screwed and socketed galvanised downpipes and gutter brackets spaced at a maximum of 600mm	m	2		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
I1.50		Supply and install 80mm diameter heavy duty galvanised screwed and socketed down pipes including galvanised holding brackets spaced at a maximum of 500mm suitable for use with 100mm dia galvanised rainwater outlets	m	10		
I1.51		Supply and install 80mm diameter heavy duty galvanised screwed and socketed 45 degree bend suitable for use with 80mm dia. galvanised down pipes	No	2		
		Ceilings				
I1.52		Supply and fix gypsum plaster board ceilings on brandering maximum 300mm centre to center spacing along brandering	m²	60		
I1.53		Supply and fix 76mm gypsum cove cornice to ceilings and walls	m	45		
		Joinery				
		Supply and install doors:				
I1.54		Supply and fix (67mm x 13mm) SA Pine standard Victorian style skirting to walls	m	45		
		Metalwork				
		Supply and install doors:				
I1.55		On building external brick wall 1800mm wide x 2100mm high HDG mild steel high security outward opening double door with vented louvers lined with vermin proof mesh screens on the inside face and recessed frame with lugs coated with red oxide corrosion protection and painted with a electric orange colour top coat complete and including stainless steel components such as 100mm heavy duty 4.0mm thick flanged hinges, monkey tailed barrel bolt at top of door, barrel bolt at bottom of door, door locking barrel bolt and internal quick realese lever assembly complete	No	3		
		Supply and install windows:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
I1.56		On building internal walls 1800mm wide x 1200mm high double glased fixed pane aluminium window and frame with dark bronze anodized corrosion protection coating complete with weather bar and tinted glass assembly complete.	No	4		
		Lintels				
I1.57		Supply and install 150mm wide x 75mm deep x 2100mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over doors	No	6		
		Painting				
I1.58		Paint plastered wall faces of building with one filler coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (antique petal grey colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	180		
I1.59		Paint gypsum plaster board ceilings internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	60		
I1.60		Paint gypsum cove cornice internal faces of internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	180		
		Roof Structure				
I1.61		(a) Supply and install wooden roof structure complete as per specialist design	Prov Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
I1.62		(b) Charge required by contractor on sub-item (a) above	%	75,000.00		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
C1	CONCRETE STRUCTURAL	
C3	BUILDING WORK	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
J1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
J1.2		Site	m²	60		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
J1.3		Over 1,0 m up to and including 2,0 m	No	1		
J1.4	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
J1.5	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
J1.6	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
J1.7	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	8		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
J1.8		(a) Excavate forchlorine contact channel in all materials, and use for backfill or embankment, or dispose	m³	110		
		(b) Extra over item 8.3.3 above for:				
J1.9		Intermediate excavation	m³	22		
J1.10		Hard rock excavation	m³	17		
J1.11		Boulder excavation Class A	m³	2		
J1.12		Boulder excavation Class B	m³	2		
J1.13	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
J1.14		(a) Cables	No	1		
J1.15	PSD 8.3.10	Topsoiling	m³	1		
J1.16	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	88		
J1.17	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	55		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
J1.18		Vertical plane	m²	12		
	8.2.2	Smooth:				
		Walls:				
J1.19		RC walls	m²	230		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
J1.20		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
J1.21		Irrespective of diameter	t	5		
	PSG 8.3.2	High-tensile welded mesh:				
J1.22		Type reference 395	m²	50		
J1.23		Type reference 617	m²	5		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50mm minimum thickness:				
J1.24		Chlorine Contact Channel	m²	60		
	PSG 8.4.3	Strength concrete :				
		20 MPa/40 mm:				
J1.25		Mass	m³	5		
		35MPa/19mm:				
J1.26		Floor slabs	m³	15		
J1.27		Walls	m³	25		
TOTAL CARRIED FORWARD						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
J1.28		(a) Wood-floated finish (see PSG 7.1)	m²	50		
J1.29		(b) Steel-floated finish (see PSG 7.2):	m²	10		
	PSG 8.5	JOINTS				
J1.30		Saw cut joints (30mm deep 3mm wide cut within 12-30 hours of pouring)	m	5		
J1.31		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	85		
	PSG 8.10	Testing for watertightness:				
J1.32		(a) Chlorine Contact Channel	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 300 mm nominal bore:				
J1.33		(i) Through 250mm thick wall	No	3		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
K1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
K1.2		Site	m²	170		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
K1.3		Over 1,0 m up to and including 2,0 m	No	1		
K1.4		Over 2,0 m up to and including 3,0 m	No	1		
K1.5	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
K1.6	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
K1.7	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	3		
K1.8	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	23		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
K1.9		(a) Excavate for backwash recovery tanks in all materials, and use for backfill or embankment, or dispose	m³	319		
		(b) Extra over item8.3.3 above for:				
K1.10		Intermediate excavation	m³	32		
K1.11		Hard rock excavation	m³	16		
K1.12		Boulder excavation Class A	m³	2		
K1.13		Boulder excavation Class B	m³	2		
K1.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
K1.15	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	25		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
K1.16		(a) Cables	No	1		
K1.17	PSD 8.3.10	Topsoiling	m³	3		
K1.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	191		
K1.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	170		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
K1.20		Vertical plane	m²	165		
	8.2.2	Smooth:				
		Walls:				
K1.21		RC walls	m²	145		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
K1.22		Irrespective of diameters	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
K1.23		Irrespective of diameters	t	11		
	PSG 8.3.2	High-tensile welded mesh:				
K1.24		Type reference 395	m²	85		
K1.25		Type reference 617	m²	85		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50mm minimum thickness:				
K1.26		Backwash Recovery Tank	m²	170		
	PSG 8.4.3	Strength concrete :				
		20 MPa/40 mm:				
K1.27		Mass	m³	20		
		35MPa/19mm:				
K1.28		floor slab	m³	45		
K1.29		Walls	m³	30		
TOTAL CARRIED FORWARD						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
K1.30		(a) Wood-floated finish (see PSG 7.1)	m²	10		
K1.31		(b) Steel-floated finish (see PSG 7.2):	m²	150		
	PSG 8.5	JOINTS				
K1.32		Saw cut joints (30mm deep 3mm wide cut within 12-30 hours of pouring)	m	5		
K1.33		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	75		
	PSG 8.10	Testing for watertightness:				
K1.34		(a) Backwash Recovery Tank	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 300 mm nominal bore:				
K1.35		(i) Through 220mm thick wall	No	4		
		(b) Greater than 300 mm nominal bore:				
K1.36		(i) Through 220mm thick wall	No	4		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
L1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
L1.2		Site	m²	500		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
L1.3		Over 1,0 m up to and including 2,0 m	No	1		
L1.4		Over 2,0 m up to and including 3,0 m	No	1		
L1.5	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
L1.6	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
L1.7	PSC 8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	15		
L1.8	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	60		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
L1.9		(a) Excavate for Sludge Dams in all materials, and use for backfill or embankment, or dispose	m³	520		
		(b) Extra over item 8.3.3 above for:				
L1.10		Intermediate excavation	m³	160		
L1.11		Hard rock excavation	m³	55		
L1.12		Boulder excavation Class A	m³	2		
L1.13		Boulder excavation Class B	m³	2		
L1.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	10		
L1.15	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	65		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
L1.16		(a) Cables	No	1		
L1.17	PSD 8.3.10	Topsoiling	m³	15		
L1.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	210		
L1.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	415		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
L1.20		Vertical plane	m²	140		
	8.2.2	Smooth:				
		Walls:				
L1.21		RC walls	m²	260		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
L1.22		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
L1.23		Irrespective of diameter	t	10		
	PSG 8.3.2	High-tensile welded mesh:				
L1.24		Type reference 395	m²	15		
L1.25		Type reference 617	m²	15		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50mm minimum thickness:				
L1.26		Sludge Dams	m²	40		
	PSG 8.4.3	Strength concrete :				
		20 MPa/40 mm:				
L1.27		Mass	m³	80		
		35MPa/19mm:				
L1.28		Floor slabs	m³	10		
L1.29		Walls	m³	60		
TOTAL CARRIED FORWARD						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
	PSG 8.4.4	Unformed surface finishes:				
L1.30		(a) Wood-floated finish (see PSG 7.1)	m²	100		
L1.31		(b) Steel-floated finish (see PSG 7.2):	m²	100		
	PSG 8.5	JOINTS				
L1.32		Saw cut joints (30mm deep 3mm wide cut within 12-30 hours of pouring)	m	10		
L1.33		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	140		
	PSG 8.10	Testing for watertightness:				
L1.34		(a) Sludge Dams	Sum	1		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Greater than 300 mm nominal bore:				
L1.35		(i) Through 220mm thick wall	No	6		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
3	EARTHWORKS	
9	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
M1.1	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
M1.2	PSC 8.2.19	(a) Temporary/permanent relocation of existing services and/or structures	Prov Sum	1		
M1.3		(b) Charge required by contractor on sub-item (a) above	%	500,000		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
2	SITE CLEARANCE	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
N1.1		**PRELIMINARY AND GENERAL**				
		GENERAL REQUIREMENTS AND CONDITIONS				
		Allow for all costs and expenses in connection with the following:-				
N1.2		Providing Performance Security (Performance Guarantee) for entire scope of works	Item	1		
N1.3		Providing Insurances	Item	1		
N1.4		Design of the Works and submission of Contractor's Documents	Item	1		
N1.5		Site security	Item	1		
N1.6		Establishment of Site for Phase 1 scope of works.	Item	1		
N1.7		De-establishment of site after completion.	Item	1		
N1.8		Chairing and minuting a HAZOP meeting for full scope of works	Item	1		
N1.9		Site security	Item	1		
N1.10		General expenses incurred in complying with the requirements of the Tender Data, not included above	Item	1		
N1.11		General expenses incurred in complying with the requirements of the Contract Data, not included above	Item	1		
N1.12		Allow for all costs and expenses to conduct a detailed dimensional survey of the existing civil infrastructure prior to finalizing the design of M&E Equipment	Item	1		
N1.13		Other General expenses incurred in complying with the requirements of the Contract not included above. (Specify):	Item	1		
N1.14		1)……	Item	1		
N1.15		2)……	Item	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.16		3)……	Item	1		
N1.17		4)……	Item	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		COAGULANT DOSING SYSTEM FOR RIVER WATER				
		Allow for all cost and expenses in connection with the following:				
N1.18		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.19		300 litre chemical dosing day tank - 20TK11	No	1		
N1.20		Mixer with supports for coagulant day tank 20MX11	No	1		
N1.21		Coagulant Dosing Pumps 20PS11 including all dosing pipework, fittings, valves, pressure guages and calibration vessels required	No	1		
N1.22		Supply only of Coagulant Dosing Pumps (Same as 20PS11)	No	1		
N1.23		Dosing Point manifold to distribute chemicals evenly above rapid mix weir: 800mm long dia. 80mm SS304 half-pipe with perforations at 45 deg.	No	1		
N1.24		Safety Shower complete	No	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.25		300 litre chemical dosing day tank - 20TK11	No	1		
N1.26		Mixer with supports for coagulant day tank 20MX11	No	1		
N1.27		Coagulant Dosing Pumps 20PS11 including all dosing pipework, fittings, valves, pressure guages and calibration vessels required	No	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.28		Dosing Point manifold to distribute chemicals evenly above rapid mix weir: 800mm long dia. 80mm SS304 half-pipe with perforations at 45 deg.	No	1		
N1.29		Safety Shower complete	No	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.30		a)	Sum	1		
N1.31		b)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		pH ADJUSTMENT				
		Allow for all cost and expenses in connection with the following:				
N1.32		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.33		600L Mixing tank 20TK01 & 20TK02 (GRP or PP suitable rated for Soda-Ash)	No	2		
N1.34		Mixer with supports for mixing tank: 20MX01 & 20MX02	No	2		
N1.35		Soda-Ash dosing pumps 20PS01 & 20PS02: including all dosing pipework, fittings, valves, pressure guages and calibration vessels required	No	2		
N1.36		HDPE pipework to head of works dosing point	Sum	1		
N1.37		HDPE pipework to chlorine contact tank dosing point	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.38		600L Mixing tank 20TK01 & 20TK02 (GRP or PP suitable rated for Soda-Ash)	No	2		
N1.39		Mixer with supports for mixing tank: 20MX01 & 20MX02	No	2		
N1.40		Soda-Ash dosing pumps 20PS01 & 20PS02: including all dosing pipework, fittings, valves, pressure guages and calibration vessels required	No	2		
N1.41		HDPE pipework to head of works dosing point	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.42		HDPE pipework to chlorine contact tank dosing point	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.43		a)	Sum	1		
N1.44		b)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		MIXERS - FLOCCULATION				
		Allow for all cost and expenses in connection with the following:				
N1.45		Design, submission and approval of drawings including the submission of mixer blade design optimisation calculations and/or test results	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.46		Flocculation mixer 21MX01	No	1		
N1.47		Flocculation mixer 21MX02	No	1		
N1.48		Flocculation mixer 21MX03	No	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.49		Flocculation mixer 21MX01	No	1		
N1.50		Flocculation mixer 21MX02	No	1		
N1.51		Flocculation mixer 21MX03	No	1		
N1.52		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):	Sum	1		
N1.53		a)	Sum	1		
N1.54		b)	Sum	1		
N1.55		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		RAPID GRAVITY SAND FILTERS				
		Allow for all cost and expenses in connection with the following:				
N1.56		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.57		Dual Parallel Lateral Underdrain system complete: Filters 1 - 3	No	3		
N1.58		Filter Media complete: Filters 1 - 3	m³	24		
N1.59		Filter Outlet Box Overflow weir plates complete: Filters 1 - 3	No	3		
N1.60		Filter Outlet Box cover complete: Filters 1 - 3	No	3		
N1.61		Filter wash-out troughs complete: Filters 1 - 3	No	3		
N1.62		Filter outlet control orifice at each filter: Filters 1 - 3	No	3		
N1.63		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.64		Dual Parallel Lateral Underdrain system complete: Filters 1 - 3	No	3		
N1.65		Filter Media complete: Filters 1 - 3	m³	24		
N1.66		Filter Outlet Box Overflow weir plates complete: Filters 1 - 3	No	3		
N1.67		Filter Outlet Box cover complete: Filters 1 - 3	No	3		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.68		Filter wash-out troughs complete: Filters 1 - 3	No	3		
N1.69		Filter outlet control orifice at each filter: Filters 1 - 3	No	3		
N1.70		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.71		a)	Sum	1		
N1.72		b)	Sum	1		
N1.73		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		CHLORINE DISINFECTION SYSTEM				
		Please note that the items listed below are the minimum specified. The Contractor shall complete the schedule by including all equipment and ancillaries necessary to render the system operational, effective and compliant with the specifications.				
		Allow for all cost and expenses in connection with the following:				
N1.74		Design, submission and approval of drawings	No	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.75		Two wall mounted assemblies, each consisting of a gas heater, pressure/vacuum regulator, safety valve, liquid chlorine trap, chlorine gas filter, and braided stainless steel pipework for connection to the chlorine storage cylinders. Wallace and Tiernan or similar approved equipment to be offered. Two 68kg chlorine drums will be connected to each header manifold.	Sum	1		
N1.76		One automatic change-over device, with reed contact to report its position to a PLC, including all connection pipework between the regulator assembly and the change-over device and uPVC pipework with valves and fittings from the changeover device to the dosing control units.	Sum	1		
N1.77		Two 10kg/hr dosing units for the two dosing points. Wallace and Tiernan or similar approved, with adjusting valve for automated control and gas flow rate indicator.	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.78		Delivery pipework with valves from and inclusive of the service water main (50mm diameter uPVC class 9) through an injector up to the filtered water dosing point at the chlorine contact channel. Delivery pipework to the dosing point shall be 50NB uPVC class 16 pipes. Also include all the reducers to connect the injector. All pipework, valves, pressure gauges, non-return valves, strainer with bypass, etc. to be included.	Sum	1		
N1.79		Chlorine cylinder trolley suitable for a 68kg chlorine cylinder.	Sum	1		
N1.80		Electronic Chlorine cylinder scales	No	4		
N1.81		Chlorine gas leak alarm system with alarm control unit, gas detector for the chlorine room and warning light installed outside.	Sum	1		
N1.82		Safety and emergency equipment as specified	Sum	1		
N1.83		Emergency equipment cabinet	No	1		
N1.84		Emergency shower and eye bath	Sum	1		
N1.85		Safety notices and instructions as specified.	Sum	1		
N1.86		Painting of chlorine room	Sum	1		
N1.87		Extractor fan for the chlorine room with uPVC venting pipe venting to atmosphere above building. 90FN01 & 90FN02	Sum	2		
N1.88		Chlorine residual analyser and control unit - 90AIT(CA)01	No	1		
N1.89		Chlorine residual probes with associated pipework - 90AIT(CA)01	No	1		
N1.90		All pipework and fittings associated with dosing system	Sum	1		
N1.91		Spares and tools for the chlorine dosing system	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.92		Two wall mounted assemblies, each consisting of a gas heater, pressure/vacuum regulator, safety valve, liquid chlorine trap, chlorine gas filter, and braided stainless steel pipework for connection to the chlorine storage cylinders. Wallace and Tiernan or similar approved equipment to be offered. Two 68kg chlorine drums will be connected to each header manifold.	Sum	1		
N1.93		One automatic change-over device, with reed contact to report its position to a PLC, including all connection pipework between the regulator assembly and the change-over device and uPVC pipework with valves and fittings from the changeover device to the dosing control units.	Sum	1		
N1.94		Two 10kg/hr dosing units for the two dosing points. Wallace and Tiernan or similar approved, with adjusting valve for automated control and gas flow rate indicator.	Sum	1		
N1.95		Delivery pipework with valves from and inclusive of the service water main (50mm diameter uPVC class 9) through an injector up to the filtered water dosing point at the chlorine contact channel. Delivery pipework to the dosing point shall be 50NB uPVC class 16 pipes. Also include all the reducers to connect the injector. All pipework, valves, pressure gauges, non-return valves, strainer with bypass, etc. to be included.	Sum	1		
N1.96		Chlorine cylinder trolley suitable for a 68kg chlorine cylinder.	Sum	1		
N1.97		Electronic Chlorine cylinder scales	No	4		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.98		Chlorine gas leak alarm system with alarm control unit, gas detector for the chlorine room and warning light installed outside.	Sum	1		
N1.99		Safety and emergency equipment as specified	Sum	1		
N1.100		Emergency equipment cabinet	No	1		
N1.101		Emergency shower and eye bath	Sum	1		
N1.102		Safety notices and instructions as specified.	Sum	1		
N1.103		Painting of chlorine room	Sum	1		
N1.104		Extractor fan for the chlorine room with uPVC venting pipe venting to atmosphere above building. 90FN01 & 90FN02	Sum	2		
N1.105		Chlorine residual analyser and control unit - 90AIT(CA)01	No	1		
N1.106		Chlorine residual probes with associated pipework - 90AIT(CA)01	No	1		
N1.107		All pipework and fittings associated with dosing system	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.108		a)	Sum	1		
N1.109		b)	Sum	1		
N1.110		c)	Sum	1		
N1.111		d)	Sum	1		
N1.112		e)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		CENTRIFUGAL PUMPING EQUIPMENT				
		Allow for all cost and expenses in connection with the following:				
N1.113		Design, submission and approval of drawings including pump curves overlayed on system curves indicating duty pounts.	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.114		Centrifugal Pumps: Filter Feed pump system complete 100PS01 & 100PS02	No	2		
N1.115		Centrifugal Pumps: Backwash water pump system complete 101PS01 & 101PS02	No	2		
N1.116		Centrifugal Pumps: Service Water Pump system complete 102PS01 & 102PS02	No	2		
N1.117		Centrifugal Pumps: Reservoir 3 Pump System complete 103PS01 & 103PS02	No	2		
N1.118		Centrifugal Pumps: Dam Transfer Pump System Complete 104PS01	No	1		
N1.119		Centrifugal Pumps: WTW Feed Pump System Complete 105PS01 & 105PS02	No	2		
N1.120		Bladder Tank for Motive Water Pumps 102PS01 & 102PS02	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.121		Centrifugal Pumps: Filter Feed pump system complete 100PS01 & 100PS02	No	2		
N1.122		Centrifugal Pumps: Backwash water pump system complete 101PS01 & 101PS02	No	2		
TOTAL CARRIED FORWARD						

CENTRIFUGAL PUMPING EQUIPMENT

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.123		Centrifugal Pumps: Service Water Pump system complete 102PS01 & 102PS02	No	2		
N1.124		Centrifugal Pumps: Reservoir 3 Pump System complete 103PS01 & 103PS02	No	2		
N1.125		Centrifugal Pumps: Dam Transfer Pump System Complete 104PS01	No	1		
N1.126		Centrifugal Pumps: WTW Feed Pump System Complete 105PS01 & 105PS02	No	2		
N1.127		Bladder Tank for Motive Water Pumps 102PS01 & 102PS02	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.128		a)	Sum	1		
N1.129		b)	Sum	1		
N1.130		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		BACKWASH BLOWERS				
		Please note that the items listed below are the minimum specified. The Contractor shall complete the schedule by including all equipment and ancillaries necessary to render the system operational, effective and compliant with the specifications.				
		Allow for all cost and expenses in connection with the following:				
N1.131		Design, submission and approval of drawings	No	1		
N1.132		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:	No	2		
N1.133		Roots type rotary lobe blowers: Backwash air to the Rapid Gravity Media filters system complete: 110BLO01, 110BLO02	No	2		
N1.134		Pressure relief valve for each blower including all pipework and fittings to vent to atmosphere outside the building. (110PRV01 & 110PRV02)	Sum	1		
N1.135		Spares and tools for the Backwash air blowers	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.136		Roots type rotary lobe blowers: Backwash air to the Rapid Gravity Media filters system complete: 110BLO01, 110BLO02	No	2		
N1.137		Pressure relief valve for each blower including all pipework and fittings to vent to atmosphere outside the building. (110PRV01 & 110PRV02)	No	2		
N1.138		Spares and tools for the Backwash air blowers	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.139		a)	Sum	1		
N1.140		b)	Sum	1		
N1.141		c)	Sum	1		
N1.142		d)	Sum	1		
N1.143		e)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		PIPEWORK, FITTINGS AND VALVES				
		Allow for all cost and expenses in connection with the following:				
N1.144		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
		Straight pipe cut to size to make up specials				
N1.145		dia. 80 mm SS304	m	21		
N1.146		dia. 100 mm SS304	m	14		
N1.147		dia. 150 mm SS304	m	122		
N1.148		dia. 200 mm SS304	m	46		
N1.149		dia. 250 mm SS304	m	3		
N1.150		dia. 300 mm SS304	m	22		
N1.151		dia. 350 mm SS304	m	4		
N1.152		dia. 400 mm SS304	m	8		
N1.153		dia. 450 mm SS304	m	3		
		Flanges, welded onto pipes (PN10) - including nuts, bolts, washers and gaskets required				
N1.154		dia. 80 mm SS304	No	51		
N1.155		dia. 100 mm SS304	No	22		
N1.156		dia. 125 mm SS304	No	2		
N1.157		dia. 150 mm SS304	No	121		
N1.158		dia. 200 mm SS304	No	41		
N1.159		dia. 250 mm SS304	No	2		
N1.160		dia. 300 mm SS304	No	38		
N1.161		dia. 350 mm SS304	No	9		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.162		dia. 400 mm SS304	No	14		
N1.163		dia. 450 mm SS304	No	6		
		Long Barrel Flange Adaptors (SS304, PN 10)				
N1.164		dia. 80 mm	No	2		
N1.165		dia. 100 mm	No	2		
N1.166		dia. 125 mm	No	2		
N1.167		dia. 150 mm	No	2		
N1.168		dia. 200 mm	No	2		
N1.169		dia. 250 mm	No	2		
N1.170		dia. 300 mm	No	2		
		Puddle flanges, welded onto pipes				
N1.171		dia. 80 mm SS304	No	3		
N1.172		dia. 100 mm SS304	No	2		
N1.173		dia. 150 mm SS304	No	7		
N1.174		dia. 200 mm SS304	No	22		
N1.175		dia. 250 mm SS304	No	2		
N1.176		dia. 300 mm SS304	No	6		
N1.177		dia. 350 mm SS304	No	3		
N1.178		dia. 400 mm SS304	No	2		
N1.179		dia. 450 mm SS304	No	2		
		90˚ medium radius bends (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
N1.180		dia. 80 mm SS304	No	8		
N1.181		dia. 100 mm SS304	No	1		
N1.182		dia. 125 mm SS304	No	1		
N1.183		dia. 150 mm SS304	No	25		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.184		dia. 200 mm SS304	No	6		
N1.185		dia. 250 mm SS304	No	1		
N1.186		dia. 300 mm SS304	No	3		
N1.187		dia. 350 mm SS304	No	1		
N1.188		dia. 400 mm SS304	No	2		
		45˚ medium radius bends (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
N1.189		dia. 80 mm SS304	No	3		
N1.190		dia. 100 mm SS304	No	1		
N1.191		dia. 125 mm SS304	No	1		
N1.192		dia. 150 mm SS304	No	4		
N1.193		dia. 200 mm SS304	No	1		
N1.194		dia. 250 mm SS304	No	1		
N1.195		dia. 300 mm SS304	No	1		
N1.196		dia. 350 mm SS304	No	1		
		Tee Pieces (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
N1.197		dia. 80 mm SS304	No	3		
N1.198		dia. 100 mm SS304	No	1		
N1.199		dia. 125 mm SS304	No	1		
N1.200		dia. 150 mm SS304	No	4		
N1.201		dia. 200 mm SS304	No	3		
N1.202		dia. 250 mm SS304	No	2		
N1.203		dia. 300 mm SS304	No	3		
		Sweep Tee Pieces (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.204		dia. 100 mm SS304	No	1		
N1.205		dia. 150 mm SS304	No	4		
N1.206		dia. 200 mm SS304	No	2		
N1.207		dia. 300 mm SS304	No	1		
		Flanged rubber bellows				
N1.208		dia. 100 mm SS304	No	6		
N1.209		dia. 150 mm SS304	No	6		
N1.210		dia. 200 mm SS304	No	2		
N1.211		dia. 250 mm SS304	No	2		
N1.212		dia. 300 mm SS304	No	2		
		Welding of pipes at joints				
N1.213		dia. 80 mm SS304	No	10		
N1.214		dia. 100 mm SS304	No	10		
N1.215		dia. 150 mm SS304	No	40		
N1.216		dia. 200 mm SS304	No	20		
N1.217		dia. 250 mm SS304	No	10		
N1.218		dia. 300 mm SS304	No	5		
N1.219		dia. 350 mm SS304	No	5		
		Concentric Reducers to any smaller size (length = largest dia.) - Excluding flanges and welding onto other pipes/fittings				
N1.220		dia. 80 mm to dia.50mm SS304	No	2		
N1.221		dia. 150 mm to dia. 100 mm SS304	No	6		
N1.222		dia. 200mm to dia. 100 mm SS304	No	2		
N1.223		dia. 200mm to dia. 150 mm SS304	No	2		
N1.224		dia. 300mm to dia. 250 mm SS304	No	2		
N1.225		dia. 350 mm to dia. 300 mm SS304	No			
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Eccentric Reducers to any smaller size (length = largest dia.) - Excluding flanges and welding onto other pipes/fittings				
N1.226		dia. 80 mm to any smaller size SS304	No	2		
N1.227		dia. 100 mm to any smaller size SS304	No	1		
N1.228		dia. 150 mm to any smaller size SS304	No	1		
N1.229		dia. 200 mm to any smaller size SS304	No	6		
N1.230		dia. 400 mm to any smaller size SS304	No	2		
		Pipe supports and walkways				
N1.231		All pipe supports, fixing material and walkways for the Filter Feed pump system complete 100PS01 & 100PS02	Sum	1		
		RSV Gate Valves (Manual)				
N1.232		DN150	No	2		
N1.233		DN200	No	8		
		Butterfly Valves (Actuated - Quarter-Turn Actuators)				
N1.234		DN150	No	9		
N1.235		DN300	No	3		
N1.236		DN350	No	3		
		Butterfly Valves (Manual)				
N1.237		DN80	No	10		
N1.238		DN100	No	2		
N1.239		DN150	No	18		
N1.240		DN200	No	13		
N1.241		DN300	No	6		
N1.242		DN400	No	4		
N1.243		DN450	No	5		
		uPVC Ball Valves (Manual)				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.244		DN63	No	12		
		Check Valves				
N1.245		DN80	No	2		
N1.246		DN100	No	1		
N1.247		DN150	No	8		
N1.248		DN300	No	2		
		Telescopic Bowl Mouth Valve				
N1.249		DN250	No	3		
		Backwash Recovery Equipment				
N1.250		Floating supernatant draw off device (Including flexible pipe, guide rails and all other fixings and equipment required) - Pipe diameter - 200mm	No	2		
N1.251		SS304 Stilling Baffle at inlet - 6mm thick and 600mm deep for the width of the tank	No.	2		
N1.252		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.253		All items under Section A6.2	Sum	1		
		Fire Protection Equipment				
N1.254		Supply and install Standard Type Fire Hose Reel with a wall-mounted bracket, hose guide, nozzle, pressure guage and 30m hose. Fire hose real to be SABS approved according to SANS 543 and SANS 1086.	No.	2		
N1.255		Supply and install 4.5kg DCP Fire Extinguishers to conform to the minimum fire ratings as specified in SANS 1910:2009. Including wooden backing and signage.	No.	10		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		INSTRUMENTATION				
		Note that rates for instrumentation shall include sensors, transmitters, programming and calibration.				
		Allow for all cost and expenses in connection with the following:				
N1.256		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
		Magnetic Flow meters:				
N1.257		DN50	No	1		
N1.258		DN100	No	5		
N1.259		DN150	No	1		
N1.260		DN250	No	1		
		Thermal Mass Flow meters:				
N1.261		DN150	No	1		
		Ultrasonic level sensors:				
N1.262		50LT01, 50LT02, 50LT03	No	3		
N1.263		100LT01	No	1		
N1.264		101LT01	No	1		
N1.265		103LT01	No	1		
N1.266		20LT01, 20LT02, 20LT11	No	3		
		Turbidity Meters				
N1.267		50AIT(NTU)01	No	1		
		pH Analyzer				
N1.268		20AIT(PH)01, 20AIT(PH)02	No	2		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Pressure transmitters (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
N1.269		100PIT01, 101PIT01, 102PIT01, 103PIT01, 105PIT01, 105PIT02	No	6		
		Hydrostatic Pressure Probe (SS316 probe)				
N1.270		104PT01	No	1		
		Pressure Gauges (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
N1.271		Pressure Gauges	No	22		
		Limit switches:				
N1.272		Metal Position limit switch with stainless steel rod actuator with mounting bracket for fitment to non return valve swing arm	No	11		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
		Magnetic Flow meters:				
N1.273		DN50	No	1		
N1.274		DN100	No	5		
N1.275		DN150	No	1		
N1.276		DN250	No	1		
		Thermal Mass Flow meters:				
N1.277		DN150	No	1		
		Ultrasonic level sensors:				
N1.278		50LT01, 50LT02, 50LT03	No	3		
N1.279		100LT01	No	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.280		101LT01	No	1		
N1.281		103LT01	No	1		
N1.282		20LT01, 20LT02, 20LT11	No	3		
		Turbidity Meters				
N1.283		50AIT(NTU)01	No	1		
		Chlorine Residual Analyser				
N1.284		90AIT(CA)01	No	1		
		pH Analyzer				
N1.285		20AIT(PH)01, 20AIT(PH)02	No	2		
		Pressure transmitters (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
N1.286		100PIT01, 101PIT01, 102PIT01, 103PIT01, 105PIT01	No	5		
		Pressure Gauges (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
N1.287		Pressure Gauges	No	22		
		Limit switches:				
N1.288		Metal Position limit switch with stainless steel rod actuator with mounting bracket for fitment to non return valve swing arm	No	11		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.289		a)	Sum	1		
N1.290		b)	Sum	1		
N1.291		c)	Sum	1		
N1.292		d)	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
N1.293		e)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		HVAC & LIFTING EQUIPMENT				
		Allow for all cost and expenses in connection with the following:				
N1.294		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
N1.295		Crawl beam and manual block and tackle system complete	No	6		
N1.296		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
N1.297		Forced Ventilation and louvre system for the main pumpstation building	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
N1.298		Crawl beam and manual block and tackle system complete	No	6		
N1.299		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
N1.300		Forced Ventilation and louvre system for the main pumpstation building	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
N1.301		a)	Sum	1		
N1.302		b)	Sum	1		
N1.303		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUNDRIES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SUNDRIES				
		Allow for all costs and expenses in connection with the following:				
N1.304		Providing "as built" drawings in the latest AutoCAD version as well as 3 additional hard copies.	Item	1		
N1.305		Providing 2 draft copies of the Installation, Operation and Maintenance Manual prior to commissioning of the Works.	Item	1		
N1.306		Providing 6 final copies of the Installation, Operation and Maintenance Manual prior to the issue of the Taking -Over Certificate.	Item	1		
N1.307		Operating Instructions and Signage, as specified.	Item	1		
N1.308		Inspection, Tests, etc. of all equipment outside the Cape Metropolitan area.	Item	1		
N1.309		Provision of all Test Certificates and Certificate of Compliance in terms of the Code of Practice for Wiring of Premises.	Item	1		
N1.310		Checking, starting up, testing and commissioning of the complete Works.	Item	1		
N1.311		Operational Acceptance Testing of the complete works as well as recording the test result and presenting it to the Engineer for approval.	Item	1		
N1.312		Operational and Maintenance Training (allow for 3 full days).	Item	1		
N1.313		Trial Operation Period Obligations.	Item	1		
N1.314		Maintaining the Works during the Defects Notification Period.	Item	1		
N1.315		Maintenance inspection every 3, 6, 9 and 12 months after take over. Provide a short report to Engineer.	Item	1		
N1.316		Provision of a Contract Nameboard at the entrance of the Works	Item	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	PRELIMINARY AND GENERAL	
2	COAGULANT DOSING SYSTEM	
3	pH ADJUSTMENT	
4	MIXERS - FLOCCULATION	
5	RAPID GRAVITY SAND FILTERS	
6	CHLORINE DISINFECTION SYSTEM	
7	CENTRIFUGAL PUMPING EQUIPMENT	
8	BACKWASH BLOWERS	
9	PIPEWORK, FITTINGS AND VALVES	
10	INSTRUMENTATION	
11	HVAC & LIFTING EQUIPMENT	
12	SUNDRIES	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
O1.1	**SECTION E1: MEDIUM VOLTAGE ELECTRICAL**							
	Construction of new 11kV extension							
	Supply, install and connect							
	Material Hardware							
O1.2	Poles - 11m	each	6					
O1.3	Pole stay complete with baseplate, stay, rod and bow	each	5					
O1.4	Stay-wire with guy-grip dead end and pole-top make-off	each	5					
	Conductor							
O1.5	Fox	m	1,100					
O1.6	Weasel	m					Rate Only	
O1.7	Ferret	m					Rate Only	
	Support Structures (complete)							
O1.8	Type B	each	1					
O1.9	Type C	each	0					
O1.10	Type D	each	2					
O1.11	Type T	each	3					
O1.12	Drop-out fuses (complete), with cross arm and ancillaries	each	2					
O1.13	Surge Arresters (complete)	each	1					
O1.14	MV Cable: 35mm2 x 3 XLPE	m	0					
O1.15	MV Cable: 35mm2 x 3 XLPE	m	0					
	Connections							
O1.16	Transformer	each	1					
O1.17	Overhead line	each	3					
	Earth testing and report							
O1.18	Transformer	each	1					
O1.19	Overhead line	each	2					
	Excavations, including compaction, bedding, backfill, danger tape and surface restoration - using compressors							
O1.20	Poles	each	7					
O1.21	Stays	each	7					
O1.22	MV Cable	m	0					
O1.23	Hard rock - over and above	PC Sum	1					
O1.24	Sub-surface detection survey for water pipes and cables	m	0					
O1.25	Line survey and spanning report, including site pegging and Client coordination	Sum	1					
O1.26	Municipal coordination and application for shutdowns and temporary switching	Sum	1					
	New Pole-Mounted Transformers							
O1.27	McGregor WTW: 200kVA, 11kV/420V, DyN11	each	1					
O1.28	Transformer mounting and support ancillaries	each	1					
O1.29	Transformer earthing	each	1					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
	New LV-Line Work							
O1.30	New 9m pole	each	1					
O1.31	New stays for line ends and intermediate strain assembly	each	4					
O1.32	35mm2 ABC	m	200					
O1.33	Clamps and ancillaries	Sum	1					
O1.34	Line connections	each	2					
	Removal of Old 400V Line Sections							
O1.35	Pulling of poles by truck and closing/securing of holes	each	3					
O1.36	Disconnection, removal and securing of conductor and stays on-site	Sum	1					
O1.37	Remove existing transformer and kiosk from existing pole, including accessories	Sum	1					
O1.38	Equipment transportation to Municipal stores in Robertson	Sum	1					
O1.39	Supply authority coordination for shutdowns and connections	Sum	1					
O1.40	SANS 10142-2 compliance and report	Sum	1					
O1.41	Site testing and equipment verification and commissioning	Sum	1					
O1.42	Taking-over	Sum	1					
O1.43	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	SECTION E2: LV ELECTRICAL							
	Main Metering and Changeover DB							
	Refer Single Line Drawings							
	Supply and install							
O1.44	New Main Metering and Changeover DB, in MCC Room, for Mains and Generator Supplies	each	1					
O1.45	Municipal bulk energy meter, including coordination for configuration	each	1					
	Motor Control Centres (MCCs)							
	Refer Single Line Drawings. Note PLC and associated network equipment to be priced under Section E2							
	Supply and install, including all mounting supports							
O1.46	New Main WTW MCC	each	1					
O1.47	New Filter Control Panel	each	1					
O1.48	New WTW Feed PS MCC	each	1					
O1.49	New Transfer PS MCC	each	1					
O1.50	Factory Acceptance Testing (FAT), with Engineers and Client	each	1					
	Cable Work							
O1.51	Supply and install	Sum	1					
	Cable Connections							
	Complete with all labour, material and required coordination							
O1.52	Power Cables	Sum	1					
O1.53	Motor Cables	Sum	1					
O1.54	Earth cables	Sum	1					
O1.55	Control cables	Sum	1					
O1.56	Instrumentation cables	Sum	1					
O1.57	Network cables	Sum	1					
	Cable tray, ladder and mesh							
	Complete with all labour, brackets, supports, spacers, clamps and rods required for surface fixing							
	HDG, heavy duty tray (outdoors), complete with protective covers and bandit strapping							
O1.58	100	m	40					
O1.59	150	m	20					
O1.60	300	m	30					
O1.61	500	m	0					
	HDG, heavy duty tray (indoors)							
O1.62	100	m	70					
O1.63	150	m	50					
O1.64	300	m	0					
O1.65	500	m	50					
	HDG, mesh (indoors)							
O1.66	50	m	70					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
O1.67	75	m	0					
O1.68	100	m	30					
O1.69	150	m	0					
	Bosal (HDG conduit)							
	Complete with all labour, brackets, supports, spacers, clamps rods, and boxes required for surface fixing							
O1.70	20	m	80					
O1.71	25	m	20					
	Excavations							
	New LV (750mm)							
O1.72	Pickable soil	m	430					
O1.73	Intermediate soil	m³	65					
O1.74	Hard rock	m³	5					
O1.75	Bedding and disposal	m³	86					
O1.76	Existing services crossing	m	20					
O1.77	Danger tape	m	860					
O1.78	Protective cable cover slabs	each	10					
O1.79	Cable markers	each	19					
	Local Control Stations							
	Complete with stand, mountings, hood and specified push-buttons - SS304							
	Start/E-Stop Stations							
O1.80	All equipment	each	21					
	FWD/STOP/REV Stations							
O1.81	All equipment	each	0					
	Dedicated E-Stop Stations							
O1.82	All equipment	each	0					
	General Electrical Installation Work							
	All ancillary work, compete with required material and labour							
	Wet-Sump Work:							
O1.83	Stainless steel mounting brackets for instrumentation	each	9					
O1.84	Cable protection, bosal, brackets and ancillaries	Sum	1					
O1.85	Wiring IP68 junction boxes	each	38					
O1.86	Site Display and Housing Boxes, complete with stand, mountings, hood, display, terminations, internal supplies and coating/protection against sun damage - 3CR12	each	10					
O1.87	Extraction fan temperature controllers and lockable isolators	each	2					
O1.88	Removal of existing and redundant electrical material to Client's stores, against a signed, dated and detailed delivery receipt	Sum	1					
O1.89	Ancillaries such as draw-boxes, spacers, expanding foam, etc. for a fully compliant and neat installation	Sum	1					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
O1.90	36000BTU Industrial Inverter split-aircon, complete with ducting, mounting power supply (WTW Main MCC Room) and protective cages for outdoor units	each	2					
	Site Lighting							
	Supply and install							
O1.91	Site lighting with 9m post-top galvanised steel poles, complete with 2 x 81W LED luminaires and required excavations	each	4					
	Earthing							
	Supply, install and connect							
O1.92	Issuing of Low Voltage Certificate of Compliance	Sum	1					
O1.93	Soil resistivity tests and reporting	each	3					
O1.94	MCC earth mat (complete with excavations and all required bonding) to outside and foundation of building	each	3					
O1.95	General bonding and earthing of piping and electrical equipment and relevant structures, including all ancillaries required	Sum	1					
	Building Lighting and Power							
	Standard cost per outlet point for the complete supply and installation of recessed outlets including all required material and labour (conduit, conductors, draw-wire, terminations etc…), as per detailed drawings							
	Main WTW Building							
O1.96	Local Distribution Boards	each	1					
O1.97	Network points	each	0					
O1.98	Two-compartment powerskirting	m	0					
	Switched socket outlets - IP67							
O1.99	Industrial 16A (2-way, 1400 AFFL)	each	6					
O1.100	Industrial 16A (2-way, 1400 AFFL), corrosion-proof	each	0					
O1.101	Isolators (3-pole)	each	0					
O1.102	Isolators (3-pole), corrosion-proof	each	0					
O1.103	Isolators (2-pole)	each	2					
	Light Switches							
O1.104	Industrial one way	each	2					
O1.105	Industrial one way - WP	each	0					
O1.106	Industrial one way - corrosion-proof	each	0					
O1.107	Industrial two way	each	6					
O1.108	Industrial two way - WP	each	4					
	Luminaires							
O1.109	Warehouse: LED Vapour-proof Luminaire, 56W	each	16					
O1.110	Filter Area: LED Vapour-proof Luminaire, 56W	each	6					
O1.111	LED Vapour-proof Luminaire, 56W, corrosion-proof	each	0					
O1.112	Outdoor LED Bulkhead, 28W	each	8					
O1.113	Outdoor LED Floodlight, 120W	each	14					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
Brought Forward								
O1.114	Indoor LED Floodlight, 120W	each	4					
O1.115	Photo cell	each	1					
	Outlet points							
O1.116	Socket outlets / Isolators / Network points	each	8					
O1.117	Switches	each	12					
O1.118	Lights	each	49					
	WTW Dosing Building							
O1.119	Local Distribution Boards	each	1					
O1.120	Network points	each	0					
O1.121	Two-compartment powerskirting	m	0					
	Switched socket outlets - IP67							
O1.122	Industrial 16A (2-way, 1400 AFFL)	each	3					
O1.123	Industrial 16A (2-way, 1400 AFFL), corrosion-proof	each	2					
O1.124	Isolators (3-pole)	each	0					
O1.125	Isolators (3-pole), corrosion-proof	each	2					
O1.126	Isolators (2-pole)	each	0					
	Light Switches							
O1.127	Industrial one way	each	2					
O1.128	Industrial one way - WP	each	2					
O1.129	Industrial one way - corrosion-proof	each	1					
O1.130	Industrial two way	each	0					
O1.131	Industrial two way - WP	each	0					
	Luminaires							
O1.132	LED Vapour-proof Luminaire, 56W	each	3					
O1.133	LED Vapour-proof Luminaire, 56W, corrosion-proof	each	1					
O1.134	Outdoor LED Bulkhead, 28W	each	5					
O1.135	Outdoor LED Floodlight, 120W	each	2					
O1.136	Indoor LED Floodlight, 120W	each	0					
O1.137	Photo cell	each	1					
	Outlet points							
O1.138	Socket outlets / Isolators / Network points	each	7					
O1.139	Switches	each	5					
O1.140	Lights	each	12					
	WTW Feed PS Building							
O1.141	Local Distribution Boards	each	1					
O1.142	Network points	each	0					
O1.143	Two-compartment powerskirting	m	0					
	Switched socket outlets - IP67							
O1.144	Industrial 16A (2-way, 1400 AFFL)	each	2					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
Brought Forward								
O1.145	Industrial 16A (2-way, 1400 AFFL), corrosion-proof	each	0					
O1.146	Isolators (3-pole)	each	0					
O1.147	Isolators (3-pole), corrosion-proof	each	0					
O1.148	Isolators (2-pole)	each	0					
	Light Switches							
O1.149	Industrial one way	each	2					
O1.150	Industrial one way - WP	each	1					
O1.151	Industrial one way - corrosion-proof	each	0					
O1.152	Industrial two way	each	0					
O1.153	Industrial two way - WP	each	0					
	Luminaires							
O1.154	LED Vapour-proof Luminaire, 56W	each	0					
O1.155	LED Vapour-proof Luminaire, 56W, corrosion-proof	each	4					
O1.156	Outdoor LED Bulkhead, 28W	each	4					
O1.157	Outdoor LED Floodlight, 120W	each	1					
O1.158	Indoor LED Floodlight, 120W	each	0					
O1.159	Photo cell	each	1					
	Outlet points							
O1.160	Socket outlets / Isolators / Network points	each	2					
O1.161	Switches	each	3					
O1.162	Lights	each	10					
O1.163	Equipment delivery to site under this schedule, including all handling and loading mechanisms required	Sum	1					
O1.164	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	SECTION E3: CONTROL SYSTEM INTEGRATION							
	Network Hardware							
	System hardware for monitoring, control and communication between various WWTW sections							
	Supply, install and connect							
	New Main WTW MCC							
O1.165	Complete PLC, with required I/O and network cards, power source, networked backplane and all other equipment for a fully functional system	Sum	1					
O1.166	Managed Layer 2 network switch(es), with ancillaries, mounted in the MCC	Sum	1					
O1.167	MCC-mounted 21.5" fanless HMI	Sum	1					
O1.168	Online UPS with cables	Sum	1					
O1.169	Network cabling in and around MCC room, including connections and ancillaries	Sum	1					
O1.170	Installation ancillaries	Sum	1					
	Network Software							
	System topology and software, configuration, setup and final design for site industrial network, including integration with existing plant							
	Supply, install and connect							
O1.171	Plant network holistic design	Sum	1					
	Software							
O1.172	Plant PLCs' software and licensing costs (once-off)	Sum	1					
O1.173	Plant HMI software and licensing costs (once-off)	Sum	1					
O1.174	Industrial network management software - if applicable	Sum	1					
	New Main WTW MCC							
O1.175	PLC programming	Sum	1					
O1.176	I/O configuration and setup	Sum	1					
O1.177	HMI mimics and programming	Sum	1					
O1.178	Network switch setup and section-specific integration	Sum	1					
O1.179	Contractor Functional Design Specification (FDS), complete with iterative approval process	Sum	1					
O1.180	Factory Acceptance Testing (FAT), with Engineers and Client	each	1					
O1.181	Equipment delivery to site under this schedule, including all handling and loading mechanisms required	Sum	1					
O1.182	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	SECTION E4: CABLES							
	Power Cables							
	Refer Single Line Drawings							
	Supply and install							
	New Pole Transformer to Main Metering and Changeover DB							
O1.183	2 x 70mm2 x 4 Cu (total length)	m	140					
O1.184	1 x 95mm2 BCEC (total length)	m	70					
	New Outdoor Generator to Main Metering and Changeover DB							
O1.185	1 x 95mm2 x 4 Cu (total length)	m	30					
O1.186	1 x 50mm2 BCEC (total length)	m	30					
	New Main Metering and Changeover DB to New Main WTW MCC							
O1.187	1 x 70mm2 x 4 Cu (total length)	m	4					
O1.188	1 x 50mm2 BCEC (total length)	m	4					
	New Main Metering and Changeover DB to New WTW Feed PS MCC (via O/H Line)							
O1.189	1 x 70mm2 x 4 Cu (total length)	m	80					
O1.190	1 x 50mm2 BCEC (total length)	m	80					
	New Main Metering and Changeover DB to New Transfer PS MCC							
O1.191	1 x 25mm2 x 4 Cu (total length)	m	300					
O1.192	1 x 25mm2 BCEC (total length)	m	300					
	New Main WTW MCC To:							
O1.193	Main WTW Building Local DB: 10mm2 x 4 Cu + 6mm2 BCEC	m	10					
O1.194	WTW Dosing Building Local DB: 6mm2 x 3 Cu + 4mm2 BCEC	m	75					
O1.195	Site Lighting: 2.5mm2 x 4 Cu + 1.5mm2 BCEC	m	160					
	New Main WTW MCC To:							
O1.196	Filter Control Panel: 2.5mm2 x 3 Cu	m	75					
	New WTW Feed PS MCC To:							
O1.197	"WTW Feed PS Building Local DB:6mm2 x 3 Cu + 4mm2 BCEC"	m	10					
	Motor Cables							
	Refer Single Line Drawings							
	Supply and install							
	New Main WTW MCC To:							
O1.198	Filter Feed Pumps 1 - 2: 2.5mm2 x 4 Cu	m	70					
O1.199	Backwash Pumps 1 - 2: 16mm2 x 4 Cu	m	80					
O1.200	Service Water Pumps 1 - 2: 2.5mm2 x 4 Cu	m	90					
O1.201	Reservoir 3 Pumps 1 - 2: 4mm2 x 4 Cu	m	90					
O1.202	Backwash Blowers 1 - 2: 6mm2 x 4 Cu	m	70					
O1.203	"Chlorination Extraction Fans 1 - 2: 2.5mm2 x 4 Cu"	m	150					
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
O1.204	Soda Ash/Lime Mixers 1 - 2: 2.5mm2 x 4 Cu	m	150					
O1.205	"Soda Ash/Lime Dosing Pumps 1 - 2: 2.5mm2 x 4 Cu"	m	150					
O1.206	Coagulant Mixer: 2.5mm2 x 4 Cu	m	75					
O1.207	Coagulant Dosing Pump 1: 2.5mm2 x 4 Cu	m	75					
O1.208	"Flocculation Tank Mixers 1 - 3: 2.5mm2 x 4 Cu"	m	225					
O1.209	Actuated Valves: 2.5mm2 x 4 Cu	m	1,100					
	New WTW Feed PS MCC To:							
O1.210	WTW Feed Pumps 1 - 2: 2.5mm2 x 4 Cu	m	20					
	New Transfer PS MCC To:							
O1.211	Transfer Pump: 2.5mm2 x 4 Cu	m	10					
	Control Cables							
O1.212	Float level switches: 1.5mm2 x 7 Cu	m	0					
O1.213	"Pump/Mixer local control stations: 1.5mm2 x 7 Cu"	m	1,225					
O1.214	Pump E-Stop stations: 1.5mm2 x 3 Cu	m	0					
O1.215	Motor overheat: 1.5mm2 x 3 Cu	m	1,225					
O1.216	Actuated Valves: 1.5mm2x7	m	1,100					
O1.217	Non-return Valve Lever-Arm Proxy Switches: 1.5mm2 x 3 Cu	m	360					
O1.218	Generator Controller to Generator Incomer: 1.5mm2x12	m	30					
O1.219	Main WTW MCC to Filter Control Panel: 1.5mm2x12 (total length)	m	150					
	Instrumentation Cables							
O1.220	Pressure Sensors: 1.5 Twisted Pair, Screened	m	190					
O1.221	Level sensors: 1.5 Twisted Pair, Screened	m	550					
O1.222	Dosing pump flow input: 1.5 Twisted Pair, Screened	m	230					
O1.223	Water Analytical Sensors: 1.5 Twisted Pair, Screened	m	230					
O1.224	Hydrostatic Level Sensor Probe: 1.5 Twisted Pair, Screened, suited to application	m	80					
	Network Communication Cables							
O1.225	Flow meters: 1.5 Twisted Pair, Screened	m	250					
O1.226	Generator Controller to Telemetry Outstation: 1.5 Twisted Pair, Screened	m	50					
O1.227	Equipment delivery to site under this schedule, including all handling and loading mechanisms required	Sum						
	Cable rates:							
	Power / Motor (Copper, armoured)							
O1.228	2.5mm2 x 4	m					Rate Only	
O1.229	4mm2 x 4	m					Rate Only	
O1.230	6mm2 x 4	m					Rate Only	
O1.231	10mm2 x 4	m					Rate Only	
O1.232	16mm2 x 4	m					Rate Only	
O1.233	25mm2 x 4	m					Rate Only	
Total Carried Forward								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
O1.234	35mm2 x 4	m					Rate Only	
O1.235	50mm2 x 4	m					Rate Only	
O1.236	70mm2 x 4	m					Rate Only	
O1.237	95mm2 x 4	m					Rate Only	
O1.238	120mm2 x 4	m					Rate Only	
	Earthing							
O1.239	6mm2 BCEC	m					Rate Only	
O1.240	16mm2 BCEC	m					Rate Only	
O1.241	35mm2 BCEC	m					Rate Only	
O1.242	70mm2 BCEC	m					Rate Only	
O1.243	1.5mm2 x 3	m					Rate Only	
O1.244	1.5mm2 x 7	m					Rate Only	
O1.245	1.5mm2 x 19	m					Rate Only	
	Instrumentation (Individually and overall screened)							
O1.246	1.5TP x 2	m					Rate Only	
O1.247	1.5TP x 12	m					Rate Only	
	Cable connection rates:							
O1.248	2.5mm2 x 4	each					Rate Only	
O1.249	6mm2 x 4	each					Rate Only	
O1.250	16mm2 x 4	each					Rate Only	
O1.251	35mm2 x 4	each					Rate Only	
O1.252	70mm2 x 4	each					Rate Only	
O1.253	4mm2 BCEC	each					Rate Only	
O1.254	10mm2 BCEC	each					Rate Only	
O1.255	25mm2 BCEC	each					Rate Only	
O1.256	50mm2 BCEC	each					Rate Only	
O1.257	95mm2 BCEC	each					Rate Only	
	Control (Copper, armoured)							
O1.258	1.5mm2 x 4	each					Rate Only	
O1.259	1.5mm2 x 12	each					Rate Only	
O1.260	1.5TP x 1	each					Rate Only	
O1.261	1.5TP x 4	each					Rate Only	
O1.262	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	SECTION E5: SCADA AND TELEMETRY							
	Central SCADA							
	Supply and install							
O1.263	Central SCADA existing layout configuration changes	Sum	1					
O1.264	WTW graphic updates and changes	Sum	1					
O1.265	Software licensing and tag updates (if any)	Sum	1					
O1.266	Robertson SCADA integration and/or remote viewing functionality	Sum	1					
	Telemetry Outstations							
	Supply, install and connect							
	WTW Outstation							
O1.267	New telemetry outstation for Main MCC and associated equipment	Sum	1					
O1.268	Integrate to new MCC and associated signals	Sum	1					
O1.269	Integrate to flow meters	Sum	1					
O1.270	Integrate to backup generator	Sum	1					
O1.271	Removal and safe delivery of obsolete equipment to Client stores, against a signed delivery receipt	Sum	1					
O1.272	Additional signal integration - where Client requires during construction	PC Sum	1					
	WTW Feed PS Outstation							
O1.273	New telemetry outstation for WTW Feed MCC and associated equipment	Sum	1					
O1.274	Integrate to new MCC and associated signals	Sum	1					
O1.275	Integrate to flow meters	Sum	1					
O1.276	Removal and safe delivery of obsolete equipment to Client stores, against a signed delivery receipt	Sum	1					
O1.277	Additional signal integration - where Client requires during construction	PC Sum	1					
	Reservoir 3 Outstation							
O1.278	New telemetry outstation for reservoir instrumentation and associated equipment	Sum	1					
O1.279	Integrate to instrumentation and associated signals	Sum	1					
O1.280	Removal and safe delivery of obsolete equipment to Client stores, against a signed delivery receipt	Sum	1					
O1.281	Testing, commissioning and system optimisation	Sum	1					
O1.282	Taking-over	Sum	1					
O1.283	P&Gs	Sum	1					
O1.284	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	SECTION 6: B ACKUP GENERATOR							
	GENERATING SET							
	Complete outdoor set, with belly fuel tank, including all ancillaries listed							
	1 x Outdoor, canopy Diesel Generating Set - for site configuration - complete with belly tank, louvres and silencer as per specifications							
O1.285	Supply and Delivery	Sum	1					
O1.286	Installation	Sum	1					
O1.287	Commissioning	Sum	1					
O1.288	Sound attenuation design and final report	Sum	1					
	Sound attenuation components: 60dBA @ 5m (provisional)							
O1.289	Supply	Sum	1					
O1.290	Install	Sum	1					
	SWITCHBOARD							
	Master Controller Panel, complete with generator controller and Alternator CB - Integrated into canopy							
O1.291	Supply	Sum	1					
O1.292	Install	Sum	1					
	INTEGRATED FUEL TANK							
	Fuel tank Level sensor, explosion-proof							
O1.293	Supply	Sum	1					
O1.294	Install	Sum	1					
O1.295	Commissioning	Sum	1					
	Fuel tank Level switch (emergency backup)							
O1.296	Supply	Sum	1					
O1.297	Install	Sum	1					
O1.298	Commissioning	Sum	1					
	GENERAL ELECTRICAL, INSTALLATION, AND ANCILLARIES							
O1.299	Complete plant earthing	Sum	1					
O1.300	Control cables within generator and for telemetry feedback (Modbus 485)	Sum	1					
O1.301	Alternator power cable: Supplier size design based upon final offering	Sum	1					
O1.302	Cable connections (earthing, power and control)	Sum	1					
	Fuel for full fuel tank							
O1.303	Testing and Commissioning	Sum	1					
O1.304	Trial Operation Period	Sum	1					
O1.305	Taking Over	Sum	1					
O1.306	Transport and rigging	Sum	1					
O1.307	Sundries such as cable boxes, notices and signage, conduit, tray, etc.	Sum	1					
O1.308	H&S compliance such as fire extinguisher, signage, etc.	Sum	1					
Total Carried Forward								

LANGEBERG MUNICIPALITY
CONTRACT NO: T46/2025
UPGRADING OF MCGREGOR WTW
SCHEDULE O: ELECTRICAL
SECTION 6: B ACKUP GENERATOR

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT R	AMOUNT c
Brought Forward								
O1.309	Factory Testing	Sum	1					
	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works, or required for a complete and compliant installation (Specify):							
Total Carried Forward To Summary								

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
1	SECTION E1: MEDIUM VOLTAGE ELECTRICAL	.....
2	SECTION E2: LV ELECTRICAL	.....
3	SECTION E3: CONTROL SYSTEM INTEGRATION	.....
4	SECTION E4: CABLES	.....
5	SECTION E5: SCADA AND TELEMETRY	.....
6	SECTION 6: B ACKUP GENERATOR	.....
	SUBTOTAL	.....
	Add 15% VAT	.....
Total Carried Forward To Summary Of Schedules		

SUMMARY OF SCHEDULES OF QUANTITIES	
	AMOUNT
SCHEDULE A: PRELIMINARY AND GENERAL	
SCHEDULE B: PIPEWORK	
SCHEDULE C: WTW FEED PUMP STATION	
SCHEDULE D: TRANSFER PUMP STATION	
SCHEDULE E: FLASH MIXING AND FLOCCULATION CHAMBERS	
SCHEDULE F: WTW BUILDING	
SCHEDULE G: RAPID GRAVITY SAND FILTERS	
SCHEDULE H: CLEAR WATER COLLECTION SUMP	
SCHEDULE I: CHLORINE DOSING BUILDING	
SCHEDULE J: CHLORINE CONTACT CHANNEL	
SCHEDULE K: BACKWASH RECOVERY TANKS	
SCHEDULE L: SLUDGE DAMS	
SCHEDULE M: RELOCATION OF EXISTING SERVICES	
SCHEDULE N: MECHANICAL	
SCHEDULE O: ELECTRICAL	
SUB TOTAL	
Add contingencies (10% of nett total tender) to be spent in part or as a whole at the sole discretion of the Engineer	
SUB TOTAL	
Add allowance for VAT (15%)	
TOTAL CARRIED FORWARD TO FORM OF OFFER AND ACCEPTANCE	

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

DECLARATION (In respect of completeness of Tender)

Langeberg Municipality
28 Main Street,
Ashton

I/we, the undersigned, do hereby declare that these are the properly priced Bills of Quantities forming Part C2.2 of this Contract Document containing 166 pages plus 9 BOQ plus the Health and Safety document pages in consecutive order upon which my/our tender for **TENDER NO. 46/2025 – UPGRADING OF MCGREGOR WTW** has been based. If I/we have submitted a printed version of the Bills of Quantities, I/we warrant that no amendments have been made to it from the original, other than amendments issued in any Addenda in terms of Clause C.3.2 in Part T1.2 Tender Data.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Part C3: Scope of Work

PART C3: SCOPE OF WORK 138

C3.1 DESCRIPTION OF THE WORKS 139
C3.2 ENGINEERING / DESIGN 144
C3.3 PROCUREMENT 147
C3.4 CONSTRUCTION 152
C3.5 MANAGEMENT 448

Status

Should any requirement or provision in the parts of the Scope of Work conflict with any requirement of any Standardised Specification, particular specification or any drawings, the order of precedence, unless otherwise specified, is:

- Scope of Work (Parts C3.1, C3.4 and C3.5)
- Particular Specifications
- SANS Standardised Specifications
- Drawings

C3.1 Description of the Works

CONTENTS

3.1.1 EMPLOYER'S OBJECTIVES
3.1.2 OVERVIEW OF THE WORKS
3.1.3 EXTENT OF THE WORKS
3.1.4 TEMPORARY WORKS
3.1.5 CONTRACTOR'S CAMP SITE, POWER SUPPLY AND SERVICES
3.1.6 CONSTRUCTION IN CONFINED AREAS
3.1.7 WATER FOR CONSTRUCTION PURPOSES
3.1.8 FEATURES REQUIRING SPECIAL ATTENTION
3.1.9 ACCOMMODATION OF TRAFFIC
3.1.10 ENVIRONMENTAL REQUIREMENTS
3.1.11 MONTHLY STATEMENT AND PAYMENT CERTIFICATE
3.1.12 LIMITED FUNDS
3.1.13 ASSET REGISTER

For the purposes of interpretation the words "Employer's Agent" and "Engineer" shall have the same meaning

3.1.1 EMPLOYER'S OBJECTIVES

The objective of the Employer is to upgrade the McGregor Water Treatment Works to ensure water security and to construct adequate storage of potable water for the town of McGregor.

The description of the project contained in the Scope of Work is merely an outline of the Contract Works and shall not limit the work to be carried out by the Contractor under this Contract. Details of some of the major items are given in this section and approximate detailed quantities for each type of work to be carried out in accordance with the Contract Documents are included in the Bill of Quantities.

3.1.2 OVERVIEW OF THE WORKS

3.1.2.1 General Description

The work to be carried out under this contract consists mainly of the following:

Civil and Structural Works:

- Construction of a 20m long, 11m wide building to house the new water treatment works including 6m high portal frames, cladding, brickwork, concrete works, etc.
- Plinths for mechanical equipment at the WTW site.
- Various interconnecting pipework and valves between the WTW and existing pipes.
- General items of the works in accordance with the requirements specified in the contract documents;
- provision of all detailed as-built drawings and information;

Mechanical and Electrical Works:

- Supply and installation of various pumps and blowers for the WTW including the filter feed pumps, existing reservoir feed pumps, backwash pumps, supernatant return pumps and air scour blowers.
- Supply and installation of piping valves and other associated infrastructure between the various process stages.
- Supply and installation of filter media within rapid gravity sand filters.
- Control instrumentation, cabling, MCC and other electrical items.
- 28 day trial and operation period included in the time for completion.

This description of the works is not necessarily complete and shall not limit the work to be carried out by the contractor under this contract.

Approximate quantities of each type of work are given in the schedule of quantities3.

3.1.2.2 Work Areas

The location of the works envisaged for the Project will be shown on the drawings bound into C5 of the Project document.

3.1.2.3 Boundaries of the site

The site will be confined to the areas of construction, including the site camp of the contractor.

3.1.2.4 Occupation of the site

Access to the site of the works will be given to the Contractor on the Commencement Date.

3.1.3 EXTENT OF THE WORKS

The work that is to be carried out under the contract is as provided for in the schedule of quantities. However, if during the course of construction conditions are found to differ from those anticipated, the Engineer reserves the right to modify the scope of the work to suit the prevailing conditions and circumstances. Variations introduced in this manner will be measured and paid for at the rates tendered for appropriate items listed elsewhere in the schedule of quantities or in the absence of such rates, as extra work.

3.1.4 TEMPORARY WORKS

The contractor shall be responsible for designing and providing any temporary works required.

Such works and the positioning thereof are to be approved by the Engineer before erection and operation on site.

Such temporary works shall be removed upon completion of the Works and the site of such temporary works re-instated to a condition acceptable to the owner of the property and in accordance with the Environmental requirements.

The Contractor shall be required to provide method statements at least two weeks prior to the work that is to be undertaken to the Engineer for acceptance with the following key activities being specifically required:

- Bulk earthworks for building including spoil site arrangements.
- Concrete pour, curing and associated arrangements.
- Formwork designs and erection procedures and designs (completed by a registered professional).
- Steel erection and fixing of portal frames for the building.
- Mechanical and Electrical works as specified in the Particular Specifications.

3.1.5 CONTRACTOR'S CAMP SITE, POWER SUPPLY AND OTHER SERVICES

The Contractor will be permitted to use the area on or near the site for the establishment of a camp site and office accommodation for his construction personnel. The choice of all sites for the establishment of camps is subject to the approval of the Engineer.

The Contractor shall, however, make his own arrangements concerning the provision of water, electricity and other services for the campsite and office facilities. All Municipal rates shall apply.

No direct payment will be made for the provision of electrical and other services. The cost thereof shall be deemed to be included in the rates and amounts tendered for the various items of work for which these services are required.

3.1.6 CONSTRUCTION IN CONFINED AREAS

It will be necessary for the Contractor to work within confined and restricted areas. The method of construction in these confined areas largely depends on the contractor's constructional plant.

Regardless, measurement and payment will be in accordance with the specified cross-sections and dimensions only, irrespective of the method used for achieving these cross-sections and dimensions. It is deemed that the rates tendered in

the Pricing Schedule / Priced Bill / Schedule of Quantities include full compensation for all special equipment and construction methods and for all difficulties encountered when working in confined areas and narrow widths, and at or around obstructions. **No additional payment will be made nor will any claim for payment be considered for work done in such confined areas, despite indications to the contrary in the Standard Specifications.**

The environment needs to be respected during the construction stage. The footprint must be discussed before the start of construction and no construction or movement of vehicles should take place outside these allocated areas.

3.1.7 WATER FOR CONSTRUCTION PURPOSES

The Contractor must make adequate provision in his tender for all negotiations and procurement of water for construction activities and all related costs will be deemed to be included in his tendered rates.

3.1.8 FEATURES REQUIRING SPECIAL ATTENTION

3.1.8.1 Existing Services

Any work requiring the excavation of existing road pavements, sidewalks and verges will require the necessary wayleaves be obtained from the relevant service authorities (including DFA, Neotel, Telkom, Electrical Department / Eskom, Roads & Stormwater Department, Waterworks Department and Drainage & Sewerage Department etc).

Prior to commencing work, the Contractor shall confer with all Authorities and Departments concerned and obtain the necessary wayleaves for both overhead and underground services affected by the Works and shall satisfy himself that he has obtained all the relevant information required to complete the Contract. The Contractor will be liable for obtaining all the necessary wayleaves and work permits from the relevant service authorities prior to the commencement of work within the road reserve.

The Contractor shall carry out the works with the minimum interference to existing services and it shall be clearly understood that obtaining the necessary wayleaves, will be at his own cost. The cost of repairing any damage to services, due to miscalculations or negligence on the part of the Contractor or his failure to carry out the duties set out in this Clause, shall be borne by the Contractor.

The Contractor shall comply with the requirements of the Project Specifications in Part B of C3.4.

The contractor needs to walk through the erf with the owner or authorised person, take photographs of the condition before work. Upon completion, the erven need to be handed back to the owner or authorised person in a similar or better state.

3.1.8.2 Health and Safety Plan

Prior to commencing work, the Contractor shall submit a Health and Safety Plan, compiled in accordance with the Health and Safety Specifications in Part C of the Works Specifications to the Engineer for approval. The Contractor may not commence construction without the Engineer's approval of the Health and Safety Plan.

3.1.8.3 Standard of Materials, Workmanship, Testing and Performance

The attention of Tenderers is particularly drawn to the high standard of materials, workmanship, testing and performance applicable to his Contract as a whole and he shall convey this requirement to his proposed Sub-Contractors.

The Contractor will carry out control testing of materials and workmanship as required in terms of the specifications. Where necessary, the Engineer may carry out acceptance control testing. The Employer will not pay claims or grant extension of time for delays to the works resulting from the awaiting of test results. Testing as required by the Engineer will be effected as promptly as possible, but it is in the Contractors own interest to submit material samples and other components of workmanship for testing in good time to assist in avoiding or minimising delays.

3.1.8.4 Weatherproof Protection for Workers

All staff required to continue working during rain shall be provided with oilskins and rubber knee boots, or other approved protective clothing and footwear.

3.1.8.5 Night Work and Work on Public Holidays

Where the Contractor requires staff to work overtime, he shall make the necessary arrangements with the Engineer and obtain written approval from the Engineer. The Contractor shall bear the cost of his overtime work.

The following conditions apply:

a) No work allowed after 18:00 on weekdays.
b) Working times for Saturdays are 08:00 - 14:00.
c) No work allowed on Sundays, Public Holidays and year end break as published by SAFCEC.
d) Approval for work outside of normal working hours to be obtained from Employer.

Penalty for the transgression of above conditions is R5 000 per transgression.

3.1.9 ACCOMMODATION OF TRAFFIC

(i) The safety and convenience of the travelling public is to be considered of utmost importance and every effort must be made to ensure that all temporary road signs, cones, flagmen and speed controls are maintained and effective, and that courtesy is extended to the public at all times.

(ii) It is important that the traffic accommodation requirements described in these specifications are adhered to and that all installations meet with the approval of the relevant traffic authority ie the Traffic Manager of Langeberg Municipality and Provincial Department of Roads and Transport.

(iii) Work, including the erection and removal of traffic control facilities, shall be executed between sunrise and sunset on Monday to Saturday, inclusive. Occupation of existing traffic lanes will only be allowed during daylight hours on normal working days, which are defined as Monday to Saturday, inclusive. The existing number of lanes for each traffic movement affected by construction shall not be reduced without the written authorization of the Engineer.

(iv) It should be noted that Sundays are specified as “Special non-working days” in the Contract Data. In terms of Clause 6.5 of FIDIC, the Engineer’s permission has to be obtained for work to be carried out on special non-working days, for which permission shall be applied for at least one (1) week prior to the day.

(v) The travelling public has the right of way on public roads, and the Contractor shall make use of approved methods to control the movement of his equipment and vehicles so as not to constitute a hazard on public roads.

(vi) Failure to maintain road signs, warning signs or flicker lights, etc, in good condition shall constitute ample reason for the Engineer to bring the works to a stop until the road signs, etc, have been repaired to his satisfaction.

(vii) The Contractor may not commence construction activities before adequate provision has been made to accommodate traffic in accordance with the requirements of these specifications and Chapter 13 of Volume 2 of the South African Road Traffic Signs Manual (SARTSM).

(viii) The Contractor shall submit proposals in connection with all signs and accommodation of traffic to the Engineer for approval.

The traffic shall be accommodated on the existing surfaced carriageway and shoulders. No bypasses or temporary deviations shall be constructed. Accommodation of traffic will generally be carried out by closing off one lane of traffic at a time and accommodating the traffic on the other lane(s). During non-working days and the period from the 16th December to 6th January, the Contractor will be required to shut down normal construction activities and only emergency work will be allowed. The traffic safety officer will be required to patrol during these non-working periods and ensure that all temporary traffic-control facilities are in place and functional.

3.1.10 ENVIRONMENTAL REQUIREMENTS

The Contractor shall take particular note of the environmental requirements contained in the Works Specifications.

The Contractor shall take every precaution to avoid damage to vegetation within that area which falls outside the designated work area is indicated on the drawings. Any damage caused is to be repaired at the Contractor’s expense.

Storage and stockpiling of materials will not be permitted without the written consent of the Engineer. Excess material from excavations and waste material shall be spoiled off site at suitable locations.

3.1.11 MONTHLY STATEMENTS AND PAYMENT CERTIFICATES

The monthly statement to be submitted by the Contractor shall be prepared by the Contractor at his own cost, strictly in accordance with the standard payment certificate prescribed by the Engineer, in digital electronic computer format.

For the purposes of the Engineer's payment certificate, the Contractor shall subsequently be responsible, at his own cost, for making such adjustments to his statement as may be required by the Engineer for the purposes of accurately reflecting the actual quantities and amounts which the Engineer deems to be due and payable to the Contractor in the payment certificate.

The Contractor shall, at his own cost, make the said adjustments to the statement and return it to the Engineer within three (3) normal workings days from the date on which the Engineer communicated to the Contractor the adjustments required.

Any delay by the Contractor in making the said adjustments and submitting to the Engineer the requisite copies of the adjusted statement for the purposes of the Engineer's payment certificate will be added to the time allowed to the Engineer to submit the signed payment certificate to the Employer and the Contractor. Any such delay will also be added to the period in which the Employer is required to make payment to the Contractor.

3.1.12 LIMITED FUNDS

Limited funds are available for this project and certain portions of the works as detailed in the scope of works may be omitted depending on the tendered rates and tender amounts received. The Employer reserves the right to amend, limit or omit certain portions / parts of the works without thereby invalidating the contract.

The Contractor shall take cognisance of these additional requirements in the finalisation of his tendered rates and programme of work. No claims will be considered on account of these restrictions.

3.1.13 ASSET REGISTER

On practical completion date, a report or certificate should be issued by the Contractor indicating the total costs of the project attributable to each significant component as identified within the lowest asset hierarchy level (4) as specified within the infrastructure catalogue or Annexure A of the Langeberg Municipality's asset management policy as approved in 2014, if not contained in the catalogue.

If construction is still in progress over the year-end period of the Langeberg Municipality, being 30 June of each year, the Municipality should be furnished with a report / certificate at year-end (30 June), which details (a) The cumulative expenditure incurred up to 30 June for the project. (b) any details if the project is taking a significant longer period of time to complete than expected, including reasons for any delays. (c) details where construction or development has been halted either during the current or previous reporting period(s), including reasons for halting the construction or development of the asset/project.

C3.2 Engineering / Design

CONTENTS

3.2.1 DESIGN
3.2.2 EMPLOYER'S DESIGN
3.2.3 CONTRACTOR'S DESIGN
3.2.4 DRAWINGS

3.2.1 DESIGN

The Employer is responsible for the design of the permanent Civil and Structural Engineering Works (apart from the steel walkways and stairs and lifting beams in the WTW which the Contractor must design), while the Contractor is responsible for the design of all Electrical and Mechanical Works as reflected in the Contract Documents unless otherwise stated.
The Contractor is responsible for the design of the temporary Works and their compatibility with the permanent Works which shall include but not limited to lateral support (shoring), dewatering, dealing with sewage, overpumping, installation of mechanical and electrical equipment, etc.
The design responsibility per stage is summarized as follows:

Concept, feasibility and overall process: - Employer
Basic Engineering and detail layouts to tender stage: - Employer
Final design to approved for construction stage (Civils): - Employer with confirmation of requirements for M&E installations by Contractor
Final design to approved for construction stage (M&E): - Contractor
Temporary works: - Contractor
All mechanical -and electrical works - Contractor
Lifting beams over mechanical equipment - Contractor
Preparation of as built drawings: - Contractor

The details of the M&E items which needs to be designed is described in PS2 : Engineering : Mechanical Scope of Works included in the Particular Specifications.

Amendments to the design, if necessary, will be issued during the construction phase.

3.2.2 EMPLOYER'S DESIGN

All Civil and Structural Engineering works in this contract have been designed and is specified in the document. Some provisional sums have been allowed for, of which the works will be designed and quantities together with drawings will be provided to the successful tenderer. The Contractor is however required to confirm all requirements to be incorporated in the civil and structural design to accommodate all the M&E plant and equipment. The Contractor is also responsible for the design of the lifting beams over mechanical equipment.

3.2.3 CONTRACTOR'S DESIGN

Where the Contractor is to supply the design of designated parts of the permanent Works or temporary Works, he shall supply full working drawings supported by a professional engineer's design certificate. In addition, the FIDIC contractual requirements must be adhered to, for the M&E design.

The design of the temporary works shall be carried out in accordance with all relevant standards and codes of practice, with particular emphasis on the requirements of the OHS Act and Construction Regulations.

These drawings will have to be submitted for approval to the relevant authorities (Employer / Employer's Agent / H&S Agent/Local Authority) prior to commencement of the Works.

For the mechanical and electrical design all drawings, schedules and technical data sheets pertaining to plant and equipment forming part of the permanent works shall be submitted to the Engineer for approval, prior to placing firm orders or commencing manufacture.

The Contractor shall supply the Engineer with supporting calculations or data if so requested.

The Contractor shall allow for a period of four working weeks in his programme for the review by the Engineer for each submission.

The Engineer's approval or acceptance of any drawings, method statement, design or document will not relieve the Contractor of his responsibilities in terms of the Contract and the Specification, neither will it relieve the Contractor of any liability in terms of Health and Safety, Environmental or any other specification.

Design Procedures:

General Requirements

The requirements relating to the information and drawings to be submitted by the Contractor for approval by the Engineer prior to the purchase and manufacture of any plant and equipment must be read together with Clause 5 of the General Conditions of Contract.

All the documents listed below shall be submitted for approval by the Engineer.

The Contractor's Documents shall comply with the following general requirements:

a) Three copies of all documents shall be submitted.
b) A register of all the Contractor's documents shall be provided with each submission.
c) Drawings shall be prepared in accordance with the latest issue of SANS 10111. An equivalent international code of engineering drawing practice will also be acceptable.
d) General Arrangement drawings shall be to A1 or AO size.
e) Drawings shall be to scale, with both the scale and the drawing being large enough to clearly show all relevant components of the plant and equipment.
f) In addition to the usual plan and two side elevations, sufficient additional sections shall be included to clearly show the arrangement of all plant and equipment.
g) Item lists shall be provided on the drawing or on a separate parts list.
h) Item descriptions shall include the material of construction, quantity and full identification information, including, as applicable, brand name, manufacturer's reference number, model number, size, rating, source, duty, quantity, etc.

Required Submissions within 42 days

The Contractor shall submit the following for acceptance within 42 days from the Commencement Date:

a) Dimensioned layout drawings (preferably A0 size but no smaller than A1) of the installation showing the proposed layout and design of all plant and equipment (including lifting equipment) as well as any required building modifications. Sufficient sections and elevations must be shown so that the relative arrangement of all equipment is clear.
b) Process flow diagram, indicating items of equipment.
c) Control system specifications: Control Philosophy.
d) Dimensioned arrangement drawings of all equipment requirements in respect of the building and civil structures.
e) Loadings that the lifting gear will place on other structures.
f) Drawings of pipe support details.
g) Technical data sheets for all coatings proposed.
h) Layout and construction drawings of all electrical distribution, starter, control, instrument and indicator panels with full details of proposed switchgear, relays, timers, instruments, indicators, trips, control switches, labelling (including wording), printing, and so forth.
i) Data sheets giving performance, sizing, physical and general technical data for all components of the installation.
j) Technical Write-Up for all equipment listed in Detailed Mechanical Specification and Data Sheets.
k) Contents list for the O&M Manual.
l) Contractor's document register.
m) Contractor to provide a Technical Write-up confirming specification compliance, any deviations, cost implications and program implications. A template for the Technical Write-up is provided under clause 3.2.7.

The Contractor must within 42 Days from the Commencement Date confirm with the Engineer any changes required to the Employer's Design of the Water Treatment Works building to make provision for the specific M&E equipment. The overall dimensions of the building cannot change.

Failing the aforementioned, the Contractor shall then be responsible for any additional cost incurred to make provision for the specific manufacturer's installation requirements.

Required Submissions within 90 days
The Contractor shall submit the following for acceptance within 90 days from the Commencement Date:

a) Dimensioned drawings of equipment.
b) Electrical and control circuit diagrams.
c) Instrumentation table including, as a minimum, the make, model, range and any set points of units to be installed.
d) Cable schedule for power, data, control and instrumentation cables. This shall include the cable type and construction, conductor material, insulation, protection, voltage rating, start and finish points, route length, duty, load, voltage drop, core area, no. of cores, no. of cores used and gland size. For cable voltages above 400 Volts, the schedule shall also include the purchase details, specification and date of manufacture.
e) Contractor's drawing and document register.

Required Submissions before Commissioning the Works
Prior to commencement of the Tests on Completion or the start of the 28-day Trial Operation Period, the Contractor shall submit two copies of the O&M Manual as specified in the Standard Specification for Mechanical Works.

The Engineer will not approve of the commencement of the Trial Operation Period until Operation and Maintenance Manuals that comply with the Specification have been submitted.

Before Taking-Over Certificate
Before the Taking-Over Certificate is issued, the Contractor shall provide six copies of the final version of the Installation, Operation and Maintenance Manual and shall also provide, on electronic data storage, all drawings supplied in terms of the Required Submissions within 42 and 90 days above, corrected where necessary to be "as built". The drawings shall be configured for AutoCAD, or equivalent. The Manual shall comply with the Standard Specification for Mechanical Works.

3.2.4 DRAWINGS

Reduced drawings form part of the tender documents and shall be used for tender purposes only.

The Contractor shall use only the dimensions stated in figures on the Drawings in setting out the Works, and dimensions shall not be scaled from the Drawings, unless required by the Employer's Agent. The Employer's Agent will, at the request of the Contractor in accordance with the provisions of the Conditions of Contract, provide such dimensions as may have been omitted from the Drawings.

The Contractor shall ensure that accurate as-built records are kept of all infrastructure installed or relocated during the contract. The position of pipe bends, junction boxes, duct ends, and all other underground infrastructure shall be given by either co-ordinates or stake value and offset. Where necessary, levels shall also be given. A marked-up set of drawings shall also be kept and updated by the Contractor. This information shall be supplied to the Employer's Agent's Representative on a regular basis and at least on a monthly basis.

All information in possession of the Contractor, required by the Employer's Agent to verify the as-built/record drawings, must be submitted to the Employer's Agent before a Taking Over Certificate will be issued.

The Employer reserves the right to issue amended and/or additional drawings during the Contract.

The following drawings are applicable to this contract and will form part of the contract documents.

Additional construction drawings will, in terms of the General Conditions of Contract, be issued to the Contractor by the Employer or the Employer's Agent on the commencement date and from time to time as required

C3.3 Procurement

CONTENTS

3.3.1 TARGETED CONSTRUCTION PROCUREMENT
3.3.2 SUB-CONTRACTING
3.3.3 TARGETED CONSTRUCTION PROCUREMENT SPECIFICATIONS

3.3.1. TARGETED CONSTRUCTION PROCUREMENT

3.3.1.1 Objective

The Employer applies and promotes the principles of Targeted Construction Procurement. In terms of Employer's current procurement policy this project provides for the following objectives to be actively pursued:

- the provision of opportunities for Small, Medium and Micro- Business Enterprises (SMMEs).
- the provision of work opportunities for local labour.
- the maximising of job creation by adopting labour-intensive construction methods wherever physically feasible and economically justifiable.

3.3.1.2 Contract requirements

The Targeted Construction Procurement: Participation of Targeted Enterprises and Targeted Labour Standard Specifications is included in Part 3.3.3 of this section C3.3 of the Scope of Works and shall apply as additional Works Specifications to this contract.

For this contract, the Employer has set minimum contract participation goals, calculated as a percentage of the net amount (as defined in clause 3.2.14 below), which are specified in Schedule 24: Preferencing Schedule in Part T2.2: Returnable Schedules.

3.3.1.3 Labour workforce

On this contract, it is the intention that work is provided during the execution of the works for targeted labour residing in the target area (ward 5 in McGregor) as defined and which would normally be the local or nearest communities. Labourers of the local or nearest communities required by the contractor shall be targeted, recruited and employed for work to enable the contractor to comply with the minimum contract participation goals for targeted labour set by the employer for the contract.

3.3.1.4 Labour-intensive construction

Construction work must be undertaken using labour-intensive methods. The Contractor shall employ labourers, artisans and subcontractors for the execution and completion of this work.

Some of the activities, which must be considered as being suitable to be undertaken by labour-intensive methods include the following:

- cleaning and trimming of site
- laying of pipes
- manhole chambers, inlet structures & headwalls
- traffic accommodation

3.3.2. SUBCONTRACTING

3.3.2.1 General

The Contractor shall not subcontract more than 25% of the value of the contract to subcontractors that do not have an equal or higher B-BBEE status level than the Contractor, unless such subcontractors are exempted micro enterprises that can

demonstrate to the satisfaction of the Employer's Agent that they have the capability and ability to execute the subcontract works.

Where monetary allowances for provisional sums or prime cost items have been provided in the Bills of Quantities, and where the work is to be executed/supplied by sub-contractors/suppliers then the following selection process shall be followed in respect of the required sub-contractors/suppliers:

Where monetary allowances for provisional sums or prime cost items allowed and the monetary allowance is less than R 300 000, the Contractor shall invite three quotations from suitably qualified sub-contractors/suppliers, the selection of which shall be in consultation with, and to the approval of the Employer's Agent, for the required work or items.
Where these monetary allowances exceed R 300 000 an open tender process will have to be followed in respect of a subcontractor for this work, unless otherwise advised and approved by the Employer. In such cases where a tender process is to be followed, the tender will be issued by the Employer's Agent on behalf of the Contractor.
The quotes shall include full technical descriptions as well as a breakdown of prices, which shall be submitted to the Engineer for approval.

The evaluation of the quotation received must include a preference points system as described in C3.11 of the Tender Data

3.3.2.2 Appointment of targeted enterprise subcontractors

The Contractor is required to appoint domestic subcontractors in order to meet the participation goal for targeted enterprises as indicated in Schedule 24 of T2.2: Returnable Schedules.

The Contractor will be allowed to subcontract any portion of work that he wants to count towards his participation goal and make an award on a domestic subcontract basis, subject to the requirements of Clause 6 of the General Conditions of Contract. The Contractor may procure these subcontractors using his own subcontract selection methodology.

Prior to the appointment of any domestic subcontractor, whose work is to contribute to the participation goal, the Contractor shall submit to the Employer details of the scope of the work subcontracted including the relevant items in the Bill of Quantities, what the subcontract total sum is and what the Contractor's corresponding tender amount is for the same scope of work is including all the relevant Establishment and General sums and any other allowable sums.

In the event that the subcontract total sum is less than 85% of the corresponding Contractor's sum indicated above, or the subcontract total sum is less than 65% of the Employer's internal estimate, the Contractor shall undertake to allow the subcontractor to submit any explanatory information regarding the subcontract to the Employer, and the subcontractor shall agree be interviewed by the Employer or the Employer's Agent to discuss the breakdown of the subcontract sum in order to satisfy the Employer that the subcontractor can complete the work at the amount submitted on a reasonable sustainable commercial basis. If there are concerns about the subcontractor's tender sum the subcontractor shall have the right to withdraw their tender without any sanction of any nature by the Contractor.

If the subcontractor withdraws the Contractor may have to select a different package of work to contribute to his subcontract target or choose and propose to appoint a different subcontractor for the same scope of work, or the Contractor will have to present, for the same subcontractor a re-negotiated subcontract sum that will be acceptable to the Employer. All additional costs that may arise as a result of such a re-negotiation or re-tendering/re-appointment shall be borne by the Contractor.

If a suitable subcontractor cannot be identified for the envisaged scope of works the Contractor shall complete the work at his tendered rates and the associated part of the works shall form part of the works executed by the Contractor and be excluded from counting towards the subcontract participation goal(s).

3.3.3 TARGETED CONSTRUCTION PROCUREMENT SPECIFICATIONS

The following South African National Standard Resource Specifications for the implementation of Targeted Construction Procurement issued and published by Standards South Africa:

South African National Standard SANS 1914-4 : 2002 (Edition 1)
Targeted Construction Procurement : Part 4 : Participation of Targeted Enterprises and Targeted Labour (Local Resources)
shall apply to and form part of this Contract (see Schedule 22 of T2.2 : Returnable Schedules).

Where the South African National Standard SANS 1914-Specification is not bound in this document, it may be obtained from South African Standards (website *www.stansa.co.za)* or inspected, by appointment, at the offices of the Employer's representative during normal working hours.

The South African National Standard Specification makes provision defining targeted enterprises and targeted labour, weightings for different subcategories, for factors and additional requirements to be specified to suit a particular contract. Details of such factors or additional requirements applicable to this contract are contained in this part of the Scope of Work.

Preferences granted in terms of Targeted Enterprises and Targeted Labour (Local Resources) shall be executed in accordance with the conditions specified below and included in **Schedule 24: Preferencing Schedule where preferences are granted in respect of Targeted Enterprises and Targeted Labour (Local Resources) in Part T2.2, Returnable Schedules.**

VARIATIONS TO THE STANDARDISED SANS 1914-4: 2002 SPECIFICATION

Variations, amendments and additions to the SANS 1914-4: 2002 : Part 4 : Participation of Targeted Enterprises and Targeted Labour (Local Resources) Standardised Specification are as set out below. Should any requirements of the variations conflict with other requirements of the SANS 1914-4: 2002 Specification, the requirements of the variation shall prevail.

The number of each clause and each payment item in this part of the project specifications consists of the prefix TP4 (Targeted Procurement – Part 4) followed by a number corresponding to the number of the relevant clause or item in the SANS Specification. The number of a new clause or item which does not form part of a clause or item in the standard SANS Specification and which is included here, is also prefixed by TP4 followed by a new number. The new numbers follow on the last clause or item number used in the relevant section of the standard specifications.

TP4-2. DEFINITIONS (CLAUSE 2)

TP4-2.10 Target Area (Clause 2.10):

Add the following:

For this Contract the following Target Areas shall apply:

1. The geographical area located within **Ward 5, McGregor, labour should be from Ward 5 in McGregor, Langeberg Municipality** - Target Area 1 is **defined as the Local Area for this Contract.**
2. The geographical area, excluding Target Area 1, located within the boundaries of the Langeberg Municipal District.

TP4-2.11 Targeted Enterprise (Clause 2.11):

Add the following :

Targeted Enterprises for this Contract shall be a sole trader, partnership or legal entity from the Local Area.

TP4-2.12 Targeted Labour (Clause 2.12):

Add the following :
The following individuals are defined as the target group for this Contract:

All unskilled labour (100%) to be from Target Area. South African citizens, temporarily employed by the contractor and his subcontractors in the performance of the contract, who permanently reside within the boundaries of Target Area (ward 5, McGregor) as specified. It is incumbent on individuals to demonstrate their claims to such residency on the basis of identification and association with and recognition by members of the community residing within the aforementioned area. It is incumbent on individuals to provide evidence of qualifying for the target groups.

TP4-2.15 Weightings (Clause 2.15):

Add the following :

In terms of Targeted Labour Goal Credit calculations (Section 3.3 of SANS 1914-4) the Weighting Factor for all contributions shall be taken as 1,0.

Add the following new subclause :

TP4-2.16 (new subclause 2.16):

Wages:

The actual amount paid periodically to targeted labour employed by the main contractor and his subcontractors after all deductions made in terms of the law (e.g. UIF) and exclusive of all company overheads and other benefits such as protective clothing, transport etc.

TP4-3. REQUIREMENTS (CLAUSE 3)

TP4-3.1 Contract Participation Goal (Clause 3.1):

Add the following to Subclause 3.1.1:

For this Contract the minimum Contract Participation Goals set by the Employer are.

Contract Participation Goal	CPG_{2min}	Minimum set by Employer
Targeted Enterprises SANS 1914-4 Annex A Method 2 Clause A.2.2.1	CPG_{2Emin}	10 %
Targeted Labour SANS 1914-4 Annex A Method 2 Clause A.2.2.2	CPG_{2Lmin}	3 %
Total Contract Participation Goal SANS 1914-4 Annex A Clause A.3	CPG_{2Emin} + CPG_{2Lmin} = CPG_{2min}	**13 %**

Tenders that do not meet each of the individual abovementioned minimum Contract Participation Goals (CPG_{2min}) set by the Employer will not be considered (not applicable if minimum percentage specified is 0%).

TP4-3.2 Achieving the Contract Participation Goal (Clause 3.2):

3.2.1 General

(a) Method 1

In the first paragraph numbered (1) replace the words "not less than 50% of the wages and allowances" *with the words* "not less than **30%** of the wages and allowances".

Delete subclauses (1) and (2) and add the following to Subclause 3.2.1:

For this Contract the Contractor may achieve the specified contract participation goal by the engagement and use of targeted enterprises and targeted labour as outlined in SANS 1914-4 and measured **by using Method 2 only**. The engagement and use of targeted enterprises and targeted labour as outlined in SANS 1914-4, will not be measured by using Method 1 - **Method 1 will therefore not be applicable.**

TP4-3.3 Contract Participation Goal Credits (Clause 3.3):

Add the following new subclause after subclause 3.3.3

3.3.4 Further to the requirements of 3.3.3, credit will be denied should the Contractor not employ Targeted Labour in accordance with comply with the following relevant statutory legislation:

- Basic Conditions of Employment Act 75 of 1997
- Labour Relations Act 66 of 1995
- Employment Equity Act 55 of 1998 (Chapters 1 and 2)
- Occupational Health and Safety Act 85 of 1993
- Compensation for Occupational Injuries and Diseases Act 130 of 1993
- Skills Development Act of 1998

The statutory Department of Labour Government Notice No. R204 of 2 March 2001 : Basic Conditions of Employment Act (No. 75 of 1997) : Sectoral Determination 2 : Civil Engineering Sector, South Africa as amended shall apply in respect of any employer or employee associated with the contract.

In particular the Contractor shall pay his Labour workers at least the minimum wage prescribed in the statutory legislation.

The prime or main contractor who does not meet each of the individual minimum contract participation goals set by the Employer faces the possibility of being sanctioned. (See clause TP4-6 below)

Credits towards the contract participation goal for targeted enterprises will only be accorded to subcontractors / suppliers / manufacturers / service providers who undertake work directly for / to the main contractor. No credits will be accorded to targeted enterprises who are engaged by subcontractors / suppliers / manufacturers / service providers working under the main contractor.

Similarly, credits towards the contract participation goal for targeted labour will be granted for targeted labour employed by subcontractors only if they undertake work directly for / to the main contractor in the performance of the contract. However, in the case of subcontractors who are also targeted enterprises, the value of their targeted labour will, at the contractor's choice, count either towards the CPG for labour or the CPG for enterprise, but not both.

TP4-6. SANCTIONS (CLAUSE 6)

Add the following:
In the event that the Contractor fails to substantiate that any failure to achieve the Contract Participation Goal (CPG_{2E} and/or CPG_{2L}) relating to the granting of a preference was due to quantitative underruns, the elimination of items, or any other reason beyond the Contractor's control which may be acceptable to the Employer, the Contractor shall pay to the Employer penalties (P) in an amount determined in accordance with the following formula :

$$P = 0{,}15 \times \frac{(D - Do)}{(100)} \times N_A$$

where D = tendered Contract Participation Goal (CPG_2) percentage.
Do = the Contract Participation Goal (CPG_2) which the Employer's Representative, based on the credits passed, certifies as being achieved upon completion of the Contract.
N_A = Net Amount
P = Rand value of penalty payable

In applying the above formula the employer may give consideration to the following rules:
a) In the event of the CPG for a sub category item not being achieved, credit may be given to reduce the penalty to the extent that other sub category items under the same main category have exceeded their CPG targets provided that at least 50% of the CPG target for the offending sub category item has been achieved.
b) Where, after applying rule a), one or more of the sub category items still warrant a penalty and the CPG target for the relevant main category has also not been achieved, then only the penalty applicable to the main category item will apply.
c) No credit will be given for exceeding the CPG target of any of the three main categories (Subcontractors, Suppliers/Manufacturers and Targeted Labour)

C3.4 Construction

CONTENTS

3.4.1 TRADE NAMES OR PROPRIETARY PRODUCTS
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3.4.4 MECHANICAL AND ELECTRICAL SPECIFICATIONS

3.4.1. TRADE NAMES OR PROPRIETARY PRODUCTS

Bid specifications may not make any reference to any particular trade mark, name, patent, design, type, specific origin or producer, unless there is no other sufficiently precise or intelligible way of describing the characteristics of the work, in which case such reference must be accompanied by the words “or equivalent”.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS ‘OR EQUIVALENT”

3.4.2 APPLICABLE STANDARDISED SPECIFICATIONS

SANS 1200A	1986	General
SANS 1200C	1982	Site Clearance
SANS 1200D	1990	Earthworks
SABS 1200DB	1989	Earthworks (Pipe Trenches)
SANS 1200G	1982	Concrete (Structural)
SABS 1200H	1990	Structural Steelwork
SABS 1200HA	1990	Structural Steelwork (Sundry Items)
SABS 1200L	1983	Medium-pressure pipelines
SABS 1200LB	1983	Bedding (pipes)
SABS 1200LC	1981	Cable ducts
SANS 1200LE	1982	Stormwater Drainage

All work carried out, as well as equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

In addition, the latest revisions of the following statutory regulations, laws and obligations as pertaining specifically to any and all electrical work applicable to this specific project are applicable:

- The regulations of the local Supply Authority
- The regulations of the Client, being either Governmental, Municipal, Parastatal or Private
- Local fire regulations
- SANS 10400-A: 2010 – The application of the national building regulations, Part A: General principles and requirements

All references to “SABS” specifications shall be read as “SANS” in light of the recent changes by the South African Bureau of Standards. Where a SANS Standard does not exist or if not applicable, the relevant IEC or BS Standard shall be applicable. All applicable electrical instrumentation must be IP68.

a) The term project specifications appearing in any of the SANS 1200 standardised specifications must be replaced with the terms scope of work.

b) Departures from and/or additions to specifications listed above are in shown in accordance with the numbering system of the standardised or particular specification. Each clause with the prefix PS shall refer to the congruent clause in the appropriate section of the standardised or particular specification. Such clause shall either substitute, or supplement, or amend the clause with the same number. Where there is no such congruent clause in the standardised or particular specification, the PS clause shall be a new clause in the project specification. Any clause that is referred to in the standardised specification will also include the appropriate project specification and shall adhere to the following:

   (i) In the event of any discrepancy between the project specifications and a part of the standard specifications, the schedule of quantities, or the drawings, the project specifications shall take precedence.

   (ii) The standard specifications, which form part of this contract, may cover items not applicable to this particular contract and should be clarified with the Engineer if discrepancies are obvious.

In certain clauses the standard specifications allow a choice to be specified in the project specifications between alternative materials or methods of construction and for additional requirements to be specified to suit a particular contract. Details of such alternatives or additional requirements applicable to this contract are contained in this part of the project specifications. It also contains some additional specifications required for this particular contract.

3.4.3 PARTICULAR / PROJECT SPECIFIC SPECIFICATIONS

In certain instances, the Standard Specifications listed in 3.4.1 above allow a choice to be specified in the Scope of Work between alternative materials or methods of construction. Allowance is also made for additional requirements to be specified to suit each particular contract. Details of such alternatives of additions are contained in this part of the Scope of Works. In addition, it contains some supplementary specifications required for this particular contract. Subclauses referred to are those in the relevant Standardised Specification.

The number of each clause and each payment item in this part of the project specifications consists of the prefix PS followed by a number corresponding to the number of the relevant clause or payment item in the standard specifications. The number of a new clause or a payment item which does not form part of a clause or a payment item in the standard specifications and which is included here, is also prefixed by PS followed by a new number. The new numbers follow on the last clause or item number used in the relevant section of the standard specifications.

PSA GENERAL (1986)

PSA 1 **SCOPE**

Replace subclause 1.1 with the following:

"1.1 This specification covers requirements, principles and responsibilities of a general nature which are normally applicable to all civil engineering contracts as well as the requirements for the contractor's establishment on site."

PSA 2 **INTERPRETATIONS**

PSA 2.3 **Definitions**

In the opening phrase between the words “specification” and “the following”, insert the words “the definitions given in the conditions of contract and “

(a) General

Add the following definitions:

“Employer’s Agent: All references in the SANS specifications referring to the Engineer shall also be deemed to refer to the Employer’s Agent in terms of the General Conditions of Contract.

General conditions: The general conditions of contract specified for use with this contract and the special conditions of contract as applicable.

Specified: As specified in the standardised specifications, the drawings or the project specifications. Specifications shall have the corresponding meaning."

(c) Measurement and payment

Replace the definitions for fixed charge and time-related charge with the following:

"Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the contract amount or the contract time of completion.

Time-related charge: A charge, the amount of which is varied in accordance with the time for completion of the work as adjusted in accordance with the provisions of the contract.

PSA 2.4 **Abbreviations**

(a) Abbreviations relating to standard documents

Add the following abbreviation:

"CKS : SABS Co-ordinating Specification."

PSA 3 **MATERIALS**

PSA 3.1 **Quality**

Add the following:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SABS specifications shall bear the SABS mark, whether so specified or not. Copies of SABS Certificates of all materials used must be submitted to the Employer’s Agent."

Add the following:
"The Contractor must provide the Employer’s Agent with at least 48 hours notice prior to control testing being required. Furthermore, the contractor must make provision in his programme for the undertaking, and calculation of results, of such testing. Construction of layer works over areas for which test results are not available will be undertaken at the Contractors own risk."

Add the following subclause(s)

"PSA 3.3 **Ordering of Materials**

The quantities set out in the schedule of quantities have been determined from calculations based on data

available at the time and should therefore be considered to be only approximate quantities. The contractor shall therefore, verify the quantities before ordering materials of any kind. No liability or responsibility whatsoever shall be attached to the employer for materials ordered by the contractor except if they have been ordered in accordance with written confirmation issued by the Employer's Agent.

PSA 3.4 ***Materials Supplied By The Employer (Optional)***

All materials designated in the contract documents to be supplied by the employer shall not be obtained by the contractor from any other sources except from the employer. All requisitions for materials, which are to be supplied by the employer, shall be submitted in writing and shall be signed by the contractor or his authorized representative and the Employer's Agent. The contractor or his authorized representative shall sign a receipt upon delivery of all such materials which, have once been accepted by the contractor, will be deemed to be in sound and satisfactory condition and will be his sole responsibility thenceforth.

The onus shall be entirely on the contractor to ensure that he accepts only sound materials from the employer, and the Employer's Agent shall be authorized to reject as unsuitable any material on the site of the works, which, in his opinion is unsound or defective in any way. The contractor shall immediately remove such rejected materials from the site of the works and shall replace them at his own expense with new and sound materials to the satisfaction of the Employer's Agent."

PSA 4 **PLANT**

Replace the heading of PSA 4 with :

"PSA 4 Construction Equipment".

PSA 4.1 **Silencing of Plant**

Replace the heading of "PSA 4.1 Silencing of plant" with :

"PSA 4.1 Silencing of Construction Equipment".

Replace the contents of subclause 4.1 with the following :

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act (Act No. 85 of 1993) as amended.

The Contractor shall at all times and at its own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective silencing devices for pneumatic tools and other Construction Equipment which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise in order to comply with the said regulations."

PSA 4.2 **Contractor's Offices, Stores and Services**

Add the following paragraph before the first paragraph:

"The Contractor's construction camp shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. The camp shall always be kept in a neat and tidy condition.

No personnel will be allowed to reside on the site. Only night-watchmen may be on the site after hours."
Add the following to the second paragraph:

"The Contractor shall provide on the Site and in close proximity to the actual locations where the work is being executed, one toilet per 10 workmen, which toilets shall be effectively screened from public view and their use enforced. Such toilets shall be relocated from time to time as the location of the work being executed changes, so as to ensure that easy access to the toilets is maintained.

The contractor shall, where applicable, make all necessary arrangements and pay for the removal of night soil."

"PSA 4.3 **Site Security**

The area within the area used by the Contractor for the establishment of his camp site may be subject to a security risk. The Contractor must assess the additional risk and make his own provision for additional protection.

No separate payment will be made for these additional security measures and the cost thereof will be deemed to be included in the rates tendered for Items PSA 8.3 and PSA 8.4. Should the Contractor feel that he needs

additional insurance to cover these risks, the cost of such insurance will also be deemed to be included in the tendered rates."

PSA 5 **CONSTRUCTION**

PSA 5.1 Survey

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

Delete the words "in the vicinity of boundaries" in the second sentence of Subclause 5.1.2 and replace the words "under the direction of" in the same sentence with "in consultation and liaison with".

Add the following after the second sentence of Subclause 5.1.2 :

"The Contractor and the Employer's Agent shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

Replace the third sentence of Subclause 5.1.2 with the following :

"At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor's check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Employer's Agent, a certificate from the registered land surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor's account. This, with the provision always that the Contractor shall not be liable for the cost of replacement of pegs which :

(a) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and
(b) the Contractor can prove beyond reasonable doubt to the satisfaction of the Employer's Agent, were disturbed, damaged or destroyed by others beyond his control."

PSA 5.3 **Protection of Existing Structures**

Replace :

"Machinery and Occupational Safety Act, 1983, (Act No. 6 of 1983)" *WITH :* "Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), as amended," and insert the following after "(Act No. 27 of 1956)" : "as amended".

PSA 5.4 **Protection of Overhead and Underground Services**

Replace the heading and the contents of this subclause with the following:

"PSA 5.4 **Location and Protection of Existing Services**

PSA 5.4.1 Location of existing services

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services that can reasonably be expected by an experienced and competent Contractor to be present on, under, over or within the Site.

Without in any way limiting its liability in terms of the Conditions of Contract in relation to damage to property and interference with services, the Contractor shall, in collaboration with the Employer's Agent, obtain the most up-to-date plans as are available, showing the positions of services existing in the area where it intends to work. Neither the Employer nor the Employer's Agent offer any warranty as to the accuracy or completeness of such plans and because services can often not be reliably located from plans, the Contractor shall ascertain the actual location of services depicted on such plans by means of careful inspection of the Site and the provision and utilisation of suitable detecting and testing equipment.

Thereafter, the Contractor shall, by the use of appropriate methodologies carefully expose the services at such positions as are agreed to by the Employer's Agent, for the purposes of verifying the exact location and position of the services. Where the exposure of existing services involves excavation to expose underground services, the further requirements of Sub-clauses 4.4 and 5.1.2.2 of SABS 1200D (as amended) shall apply.

The aforesaid procedure shall also be followed in respect of services not shown on the plans but which may reasonably be anticipated by an experienced Contractor to be present or potentially present on the site.

All services, the positions of which have been determined as aforesaid at the critical points, shall henceforth be designated as 'Known Services' and their positions shall be indicated by the Contractor on a separate set of Drawings, a copy of which shall be furnished to the Employer's Agent without delay.

As soon as any service, which has not been identified and located as described above is encountered on, under, over or within the Site, it shall henceforth be deemed to be a Known Service and the aforesaid provisions pertaining to locating, verifying and recording its position on the balance of the Site shall apply. The Contractor shall notify the Employer's Agent immediately any such service is encountered or discovered on the Site.

Whilst it is in possession of the Site, the Contractor shall be liable for all loss of or damage as may occur to :

(a) Known Services, anywhere along the entire lengths of their routes, as may reasonably be deduced from the actual locations at which their positions were verified as aforesaid, due cognisance being taken of such deviations in line and level which may reasonably be anticipated ; and
(b) any other services which ought reasonably to have been a Known Service in accordance with the provisions of this clause ;

as well as for consequential damage, whether caused directly by the Contractor's operations or by the lack of proper protection ;

Provided always that the Contractor will not be held liable in respect of damages occurring to services not being Known Services.

No separate payment will be made to the Contractor in respect of its costs of providing, holding available on the Site and utilising the said detecting and testing equipment, nor for any costs incurred in preparing and submitting to the Employer's Agent, the Drawings as aforesaid and these costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor's in respect of exposing services at the positions agreed by the Employer's Agent and as described above will be made under the payment items (if any) as may be provided therefor in the respective sections of the Specifications pertaining to the type of work involved.

PSA 5.4.2 Protection during construction

The contractor shall exercise all the necessary care to prevent damage to known services during construction operations. Major excavating equipment and other plant shall not be operated in dangerously close proximity of these services. Where necessary, excavation in close proximity of these services shall be carefully carried out by means of suitable hand tools, excluding picks wherever their use could cause damage to the services.

Services left exposed shall be suitably protected from damage.

PSA 5.4.3 Alterations and repairs to existing services

Unless the contrary is clearly specified or ordered, the contractor shall not carry out any alterations to existing services. Where this may be necessary, the contractor shall inform the Employer's Agent, who will either make arrangements for such work to be executed by the owner of the service or instruct the contractor to make such arrangements himself.

Where existing services are damaged by the contractor, he shall immediately inform the Employer's Agent, or when this is not possible, the relevant authority, and shall obtain instructions as to who should carry out repairs. In urgent cases the contractor shall take all necessary steps to minimise damage to and the interruption of the service. No repairs shall be attempted to telecommunication cables or electric power lines and cables.

No liability for damages arising from any delay in having such alterations or repairs effected will be accepted by the employer. The contractor shall provide all reasonable opportunity, access and assistance to persons doing alterations or repairs to existing services."

PSA 5.7 **Safety**

Replace the contents of subclause 5.7 with the following :

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations thereunder, the Contractor shall at its own expense (except only where specific provision (if any) is

made in the Contract for the reimbursement to the Contractor in respect of particular items):

(a) Provide to its Employees on the Site of the Works, all safety materials, clothing and equipment necessary to ensure full compliance with the provisions of the Occupational Health and Safety Act (Act No 85 of 1993) and Construction Regulations as amended (hereinafter referred to as the Act) at all times, and shall institute appropriate and effective measures to ensure the proper usage of such safety materials, clothing and equipment at all times; and

(b) Provide, install and maintain on all barricades, safety signage and other measures to ensure the safety of workmen and all persons in, on and around the Site, as well as the general public; and

(c) Implement on the Site of the Works, such procedures and systems and keep all records as may be required to ensure compliance with the requirements of the Act at all times; and

(d) Implement all necessary measures as to ensure compliance of the Act by all subcontractors engaged by the Contractor and their employees engaged on the Works; and

(e) Comply fully with all other requirements pertaining to safety as may be specified in the Contract.

The Employer and the Employer's Agent shall be entitled, although not obliged, to make such inspections on the Site, as they shall deem appropriate, for the purpose of verifying the Contractor's compliance with the requirements of the Act. For this purpose, the Contractor shall grant full access to the Site of all parts of the Site and shall co-operate fully in such inspections and shall make available for inspection, all such documents and records as the Employer's and/or Employer's Agent Representative may reasonably require.

Where any such investigations reveal, or where it comes to the Employer's Agent's attention that the Contractor is in any way in breach of the requirements of the Act or is failing to comply with the provisions of this clause, the Employer's Agent shall, in accordance with the provisions of Clause 5.11 of the Conditions of Contract, be entitled to suspend progress on the Works or any part thereof until such time as the Contractor has demonstrated to the satisfaction of the Employer's Agent, that such breach has been rectified.

The Contractor shall have no grounds for a claim against the Employer for extension of time and/or additional costs if the progress on the Works or any part thereof is suspended by the Employer's Agent in terms of this clause and the Contractor shall remain fully liable in respect of the payment of penalties for late completion in accordance with the provisions of Clause 5.13 of the Conditions of Contract should the Contractor fail to complete the Works on or before the specified Due Date for Completion in consequence of the suspension.

Persistent and repeated breach by the Contractor of the requirements of the Act and/or this clause shall constitute grounds for the Employer's Agent to act in terms of Sub-Clause 9.2 of the Conditions of Contract and for the Employer to cancel the Contract in accordance with the further provisions of the said Clause.

Add the following subclause:

"PSA 5.9 **Site Meetings**

The Contractor or its authorised agent will be required to attend regular site meetings, which shall normally be held twice a month on dates and at times determined by the Employer's Agent, but in any case whenever reasonably required by the Employer's Agent. Unless otherwise indicated in the Contract or instructed by the Employer's Agent, such meetings shall be held at the Contractor's offices on the Site. At such monthly meetings, matters such as general progress on the Works, quality of work, problems, claims, payments, and safety etc, shall be discussed, but not matters concerning the day-to-day running of the Contract."
Add the following :

"PSA 5.10 Work on, Over, Under or Adjacent to a Railway Line

All work carried out on, over, under or adjacent to a railway line shall be carried out strictly in accordance with the latest edition of Transnet Specification E7, part 2. The contractor shall obtain a copy of the latest edition, which shall be kept on the site, before any work of this nature is commenced.

Attention is drawn especially to the requirements contained in the E7 Specification regarding approval that must be obtained from Transnet for a work permit or the occupation of property of the Transport Services and the approval of false work and form work plans."

PSA 6 **TOLERANCES**

Add the following subclause:

PSA 6.2 **Degrees of Accuracy**

Add to the subclause:

"Degree of Accuracy 1 shall be applicable to the following parts of the Works unless stated to the contrary elsewhere; weirs, flanges at civil/mechanical interfaces."

"PSA 6.4 **General**

No guarantee is given that the full specified tolerances will be available independently of each other, and the contractor is cautioned in regard to the fact that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified or when clearly not applicable, all quantities shall for purpose of measurement and payment be determined from the 'authorised' dimensions. This shall be taken to mean the dimensions as specified or shown on the drawings or, if changed, as finally instructed by the Employer's Agent, without any allowance for the tolerances specified. Save as hereinafter specified to the contrary, all measurements for determining quantities for purposes of payment will be based on the "authorised" dimensions.

If the work is therefore constructed in compliance with the "authorised" dimensions plus or minus any tolerances allowed, quantities will be based on the "authorised" dimensions regardless of the actual dimensions to which the work has been constructed."

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Employer's Agent may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 **TESTING**

PSA 7.1.1 Checking

Replace the last sentence with the following:

"The contractor shall obtain the services of an independent testing laboratory at his own expense (Refer subclause PS 8.4 of portion 1 of the project specifications) to carry out such checks as are prescribed in the various standardised specifications."

PSA 7.1.2 Standard of finished work not to specification

Insert the words "or checks by an approved laboratory ..." after the words "Where the Employer's Agent's checks ..." in the first line of Subclause 7.1.2.

PSA 7.2 **Approved Laboratories**

REPLACE THE CONTENTS OF SUB-CLAUSE 7.2 WITH THE FOLLOWING:

"Unless otherwise specified in the relevant specification or elsewhere in the Project Specification, the following shall be deemed to be approved laboratories in which design work, or testing required in terms of a specification for the purposes of acceptance by the Employer's Agent of the quality of materials used and/or workmanship achieved, may be carried out :

(a) any testing laboratory certified by the South African National Accreditation Systems (SANAS) in respect of the nature and type of testing to be undertaken for the purposes of the Contract ;
(b) any testing laboratory owned, managed or operated by the Employer or the Employer's Agent ;
(c) any testing laboratory established and operated on the Site by or on behalf of the Employer or the Employer's Agent.

PSA 8 **MEASUREMENT AND PAYMENT**

PSA 8.1 **Measurement**

PSA 8.1.1 Method of Measurement, All Sections of the Schedule

Delete the words *:* "and South West Africa".

PSA 8.1.2 Preliminary and general items or section

PSA 8.1.2.1 *Contents*

Delete item (c).

PSA 8.1.2.2 *Tendered sums*

Replace the contents of this subclause with the following:

"The contractor's tendered sums under items PSA 8.3 and PSA 8.4 shall collectively cover all charges for:

- Risks, costs and obligations in terms of the general conditions of contract and of this standardised specification, except to the extent that provision is made in these project specifications to cover compensation for any of these items of work.
- Cost of all wayleaves.
- Head-office and site overheads and supervision.
- Profit and financing costs.
- Expenses of a general nature not specifically related to any item or items of permanent or temporary work.
- Providing facilities on site for the contractor's personnel, including offices, storage facilities, workshops, ablutions, for providing services such as water, electricity, sewerage, sewage and rubbish disposal, for access roads and all other facilities required as well as for the maintenance and removal on completion of the works of these facilities and the cleaning-up of the camp site on completion of the works.
- Providing facilities for the Employer's Agent and his staff as specified in Part C3.4: Construction Site Establishment.
- Providing and erecting two new contract name boards as shown on the drawings.
- Providing all the required documentation described in Part C3.
- Adhering and complying with the client's Procurement requirements including the monthly completion of labour and remuneration records."

PSA 8.2 **Payment**

PSA 8.2.1 Fixed-charge and value-related items

Replace the contents of this subclause with the following:
"Payment of fixed charges in respect of item 8.3.1 will be made as follows:

Eighty per cent (80%) of the sum tendered will be paid once the facilities have been provided and approved. The remaining twenty per cent (20%) will be paid once the works have been completed, the facilities removed and the camp-site cleared and cleaned.

Payment for the sum tendered under item 8.3.2 will be made in three separate instalments as follows:

(a) The first instalment which is 40% of the sum, will be paid when the contractor has met all his obligations to date under this specification, the general conditions of contract and the special conditions of contract, and where the value of work certified for payment, excluding materials on site and any payments under preliminary and general items is equal to not less than 5% of the total value of the work listed in the schedule of quantities.

(b) The second instalment, which is 40% of the sum, will be made when the amount certified for payment, including retention moneys but excluding the second instalment referred to herein, exceeds 50% of the tender sum.

(c) The final payment, which is 20% of the sum, will be made when the works have been certified as completed and the contractor has fulfilled all his obligations to date under this specification, the general conditions of contract and the special conditions of contract.

Should the value of the measured work finally completed by more or less than the tender sum, then the sum tendered under item 8.3.2 will be adjusted pro rata up or down and this adjustment shall be applied to the third instalment. No adjustment will apply to item 8.3.1 in respect of variations in the value of work done or the time for completion finally authorised."

PSA 8.2.2 Time-related items

Replace the contents of this subclause with the following:

"Three time related items shall be scheduled and shall be full compensation for all time related preliminary and general costs and shall include the following :

- Public holidays
- Year-end break(s) not exceeding 15 working days in duration; and
- The contract period during the normal industry working period outside public holidays and outside the industry shutdown period during December and January.

Subject to the provisions of 8.2.3 and 8.2.4, payment under item 8.4.1 (time-related item) will be made as follows :

PSA 8.2.2.1 The contract period during the normal industry working period payment..... **Unit : Sum**

Payment will be made monthly in equal amounts, calculated by dividing the sum tendered for the item by the tendered contract period in Days (excluding public holidays and the year-end break during December and January), provided always that the total of the monthly amounts so paid for the item is not more than in proportion to the progress of the work as a whole.

Should the Employer's Agent grant an extension of the time for completion of the works, the Contractor will be entitled to an increase in the sum tendered for the time-related item, which increase shall be in the same proportion to the original tendered sum as the extension of time is to the original time for completion of the works.

PSA 8.2.2.2 *Public Holidays*..... **Unit : No of Statutory Public Holidays**

The tendered amount per day will be payable for the number of statutory public holidays included in the contract period which replaces normal working days.

Should an extension of time be granted and a public holiday is within this period, the Contractor will be entitled to additional payment for each additional public holiday which replaces a working day.

PSA 8.2.2.3 *Annual holiday period during December and January* ..... **Unit : Sum**

The tendered sum will be payable for the annual holiday not exceeding 15 working days in duration which falls within the construction period. Should an extension of time be granted which extends the contract period beyond the annuall holiday, the Contractor will be entitled to payment as tendered for this item 8.2.2.3.

Payment for such increased amounts determined in accordance with PSA 8.2.2.1 to PSA 8.2.2.2 will be taken to be in full compensation for all additional time-related preliminary and general costs, that result from the circumstances pertaining to the extension of time granted."

PSA 8.3 **Scheduled Fixed-Charge and Value-Related Items**

Replace the items with the following:

"PSA 8.3.1 Fixed preliminary and general charges ..... **Unit : Sum**

PSA 8.3.2 Value-related preliminary and general charges ..... **Unit : Sum**

The sums tendered shall collectively include full compensation for all fixed and value-related preliminary and general charges as described in subclause PSA 8.1.2.2. Payment will be made as described in subclause PSA 8.2.1."

Add the following subclause:

"PSA 8.3.5 Locate, record, protect and reinstate pegs ..... **Unit : Sum**

This item must cover all costs incurred to locate, record and protect pegs during the duration of the contract and the reinstatement of all disturbed pegs on completion of the contract in the manner as prescribed by the Land Survey Act."

PSA 8.4 **Scheduled Time-Related Items**

Replace the items with the following:

"PSA 8.4.1 Time-related preliminary and general charges

PSA 8.4.1.1 *The contract period during the normal industry working period payment*..... **Unit : Sum**

PSA 8.4.1.2 *Public Holidays*..... **Unit : No**

PSA 8.4.1.3 *Year-end break(s) not exceeding 15 working days in duration*..... **Unit : Sum**

The sums and rate tendered for items PSA 8.4.1.1 to PSA 8.4.1.3 shall include full compensation for all time-related preliminary and general charges as described in subclause PSA 8.1.2.2. Payment will be made as described in subclause PSA 8.2.2."

PSA 8.5 **Sums Stated Provisionally by The Employer's Agent**

Replace the contents of Subclause 8.5 with the following :

"PSA 8.5.1 Works Executed by the Contractor

The Contractor will be reimbursed in substitution of the Provisional Sums (if any) allowed in the Schedule of Quantities for work to be executed by the Contractor, in the amounts determined in accordance with the provisions of Clause 6.6 of the Conditions of Contract.

PSA 8.6 **Prime Cost Items**

Replace Subclause 8.6 with the following :

"PSA 8.6 **Prime Cost Sums**

(a) Description of Item to which Prime Cost Sum Applies ..... Unit : PC Sum
(b) Charge required by Contractor on Sub-item (a) above ..... Unit : %

Sub-items (a) and (b) will be provided in the Schedule of Quantities for each different item to which a Prime Cost Sum applies.

The Contractor shall be reimbursed under sub-item(s) (a) in substitution of the respective Prime Cost Sums included in the Contract, the actual price(s) paid or payable by him in respect of the goods, materials or services supplied, but excluding any charges for the Contractor's labour, profit, carriage, establishment or other charges related to such goods, services or materials.

The Contractor shall be paid under sub-item (b), the respective percentage, as stated by the Contractor in its Tender, of the amount certified by the Employer's Agent for payment under the related sub-item (a). The percentages tendered by the Contractor for each respective sub-item (b) included in the Schedule of Quantities shall be deemed to in full and final compensation to the Contractor in respect of any charge by the Contractor for labour, carriage profit, establishment and for any other charges related to the goods, services or materials supplied under the related sub-item (a).

If the Contractor shall have omitted within its Tender to insert a tendered percentage under sub-item (b), or tendered a zero percentage, the Contractor's tendered rate for sub-item (b) shall be deemed to be zero and the Contractor shall not be entitled to any payment under sub-item (b)."

PSA 8.7 **Daywork**

Replace the contents of Subclause 8.7 with the following :

"Measurement and payment shall be in accordance with the provisions of Sub-clause 6.5 of the Conditions of Contract."

Add the following item:

PSA 8.8 **Temporary Works**

PSA 8.8.2 Accommodation of traffic ..... **Unit : sum**

Add the following:

"This amount shall cover all costs in respect of the provision, erection, moving, re-erection and maintenance of all barriers, road signs, lights and flagmen necessary for the protection of the works, for the construction, gravelling and maintenance of detours and entrance roads affected by the work, as well as the breaking up and removal thereof at the contract completion, and for compliance with all necessary traffic rules and regulations, liaising with the road authorities, and all other costs necessary in respect of accommodation of traffic."

Replace item 8.8.4 with the following:

"PSA 8.8.4 Location and protection of existing services

Where particular items are provided in other sections of the schedule the costs of detection, exposure, protection and alterations shall be covered by such particular items. Where no such particular items are provided and where there is reason to expect the presence of such a service or services, the following items will apply:

PSA 8.8.4.1 *Provision of detecting devices for :*

The tendered rate shall include full compensation to provide a scanner to detect steel pipes and a scanner to

detect electrical cables and to mark the position of these services on site.

(a) Water and sewer pipes ..... **Unit : Sum**
(b) Electrical and other cables ..... **Unit : Sum**
(c) Other ..... **Unit : Sum**

PSA 8.8.4.2 *Hand excavation necessary for locating and exposing existing services in all materials:*

(a) In roadways ..... **Unit : m³**
(b) In all other areas ..... **Unit : m³**

The rates shall cover the cost of excavating by means of hand tools within authorised dimensions, for all precautionary measures necessary to protect the services from damage during excavation and backfilling and for subsequent backfilling and compacting. Compaction of material in all areas except in roadways shall be to 93% of modified AASHTO density.

The rate for hand excavation in roadways shall also include compensation for compacting excavated or selected backfill material to 100% of modified AASHTO density. Reinstating layerworks and surfacing shall be measured and paid for under SABS 1200 DB.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water and for removal of surplus excavated material from the site."

Add the following items :

"PSA 8.8.7 Dealing with water ..... **Unit : Sum**

The sum shall cover the cost for the provision, operation, maintaining and removal of all plant and materials required to deal with surface and subsurface water anywhere on the Site as required in terms of Subclause 5.1.3 of SABS 1200 D and Subclause 5.1.2 of SABS 1200 DB. No additional payment will be made for "Special water hazards".

The sum shall cover the cost of providing the necessary plant or materials, or both, fully erected and operative on the Site, the cost of operating and maintaining pumps, well points, sheeting, close timbering, and other equipment, as applicable, for 24 hours a day, 7 days a week, throughout the period during which the facilities are required, and the cost of removing such goods and restoring the Site to its original condition on completion of that part of the project for which the temporary works were erected.

Equal monthly payments will be made calculated by dividing the sum tendered for the item by the tendered contract period in months. The sum of the equal monthly payments shall not exceed the sum tendered for this item except where an extension of the contract period is approved by the Employer's Agent in which case the monthly payments will be made pro rata to the extension of time only if dealing with water is required."

PSA 8.8.8 Temporary fence minimum 1,2 m high ..... **Unit : m**

The tendered rate shall include full compensation for the supply and erection of the temporary fence, the maintenance of the fence and the dismantling of the fence.

The contractor shall erect a temporary high visibility barrier fence at the positions as shown on the drawings or as instructed. The tendered rate shall include full compensation for the supply, erection and maintenance of the fence and the removal thereof on completion of the civil contract. It shall at all times be kept in an upright and neat condition.

PSA 8.8.9 Dismantle and re-erect temporary 1,2 m high fence ..... **Unit : m**

The tendered rate shall include full compensation for the careful dismantling of the temporary high visibility barrier fence, the stacking, loading, transporting, off-loading and re-erection of the fence at a new required position. It will also include for the maintenance of the fence and the removal there-of at the end of the construction activities.

PSA 8.8.10 Dust control ..... **Unit : Sum**

The tendered rate shall include full compensation for the provision of a water truck on site on a continuous basis during the construction of earthworks and layerworks period and the regular wetting of the construction area to prevent any dust disturbance to adjacent areas.

PSA 8.10 **Accommodating Other Contractors** ..... **Unit : Sum**

The amount tendered shall cover the cost of accommodating civil, electrical and mechanical contractors on the Site of the Works. Payment will be made in equal monthly amounts over the Contract period."

PSA 8.12 **Compliance with The Occupational Health and Safety Act (Act No 85 Of 1993) and Construction Regulations and Specifications Included in the Particular Specifications**..... **Unit : Sum**

The tendered rate shall include full compensation for compliance with the OHS Act and Construction Regulations and the Health and Safety requirements and specification included in this tender document. Refer to the Particular Specifications and Part C3.5.

It shall further include full compensation for the registration of the project with the Authorities (Department of Labour) and any delay in awaiting for approvals by the Authorities.

Temporary barriers and fences for deep or trench excavations required in terms of the contract shall not be paid for separately.

Payment under this item will be made as follows :

(a) The first instalment which is 30% of the sum tendered, will be paid once the contractors Health and Safety Plan is approved by the Employer or the Employers Agent and the Contractor has met all his obligations to date under this specification.
(b) The remainder of the sum tendered will be paid in equal monthly amounts calculated by dividing the sum tendered (less 30%) divided by the contract period in months.

No additional payment will be made should an extension of the contract period be granted. Penalties for non-compliance will be deducted from payments due to the contractor.

PSA 8.13 Compliance with The Environmental Management Plan and Requirements Included in the Particular Specifications..... **Unit : Sum**

The tendered rate shall include full compensation for compliance with the environmental management requirements and specification included in this tender document.

Payment under this item will be made in equal monthly amounts calculated by dividing the sum tendered divided by the contract period in months.

No additional payment will be made should an extension of the contract period be granted. Penalties for non-compliance will be deducted from payments due to the contractor.

PSA 8.17 **Photographic Record Unit : Sum**

The Contractor must keep a photographic record of the condition of properties and structures within 30 m of the proposed works. Photographs of every structure must be taken prior to construction and must be of high quality (3) mega pixel or higher to ascertain the condition of the property or structure. Structures will include (but are not limited to) boundary walls, fences, road surfaces, kerbing, stormwater structures and the surrounding area along the route of the pipeline. The preconstruction photographs must be handed to the Employer's Agent prior to any excavation is undertaken.

The structures and properties must again be photographed after construction to ascertain any possible damage to the structures or properties due to construction activities. This photographic record must be supplied to the Employer's Agent at the end of the contract and will form part of the record information to be provided by the Contractor.

The tendered sum shall include full compensation for the investigation and supply of the photographic record in electronic and colour hard copy format (standard photo size). Fifty percent of the sum tendered will be payable upon supply and approval by the Employer's Agent of the pre-construction photo record and the remaining 50% upon supply of the post-construction record.

PSA 8.19 **Liaison with residents and the local authority** .....**Unit : Sum**

The tendered rate shall include full compensation for all liaisons with the residents of each area and the Municipality regarding valve closures and issuing of public notices.

Residents must be informed of valve closures at least 48 hours prior to closing of valves.

The tendered rate must include :

- the preparation of an information page which must be delivered to each household to be affected, prior to working in the area.
- the delivery of a notice informing residents of a disruption in the water supply (three days prior to the disruption)

- obtaining a “happy letter” from all residents once the work is completed and gardens re-instated.
- direct liaison with residents should a complaint be received including a written account of the complaint and agreement reached with the resident.

No additional payment will be made for additional notices of disruption which must be issued as a result of failed connection attempts.”

PSA 8.20 **Record of Test Results and Related Administration Unit : Sum**

The tendered rate shall include full compensation for all the requirements stipulated in PS 8.4 for the record keeping, updating of test positions, recording the test results in tabular format and providing additional copies with the marked on reference number on a monthly basis.

Upon completion of the contract a separate full set of test results must also be submitted to the Employer’s Agent before a Certificate of Practical Completion shall be issued.

Twenty percent of the Time Related P&G amount will be withheld should the required information not be provided in the correct format.

PSC SITE CLEARANCE (1982)

PSC 3 **MATERIALS**

PSC 3.1 **Disposal of Material**

Add the following:

"The contractor shall obtain his own dumping sites for the disposal of material and all transport costs shall be included in the rates tendered for site clearance."

PSC 5 **CONSTRUCTION**

PSC 5.1 **Areas to be Cleared and Grubbed**

Add the following:

"Pipeline routes shall be cleared to a distance of 1,5 m on both sides of the pipeline centre line. Route pegs or markers shall not be destroyed or damaged during clearing operations."

PSC 5.2 **Cutting of Trees**

PSC 5.2.3 Preservation of trees

PSC 5.2.3.2 *Individual trees*

Replace the last sentence with the following:

"An amount of ***R500-00*** will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily."

ADD THE FOLLOWING:

(OPTIONAL - PENALTIES FOR DAMAGING INDIGENOUS VEGETATION)

"The following applies to clearing widths:

(a) The width to be cleared for the road shall not exceed 6,0 m.

(b) The area to be cleared for parking zones shall not exceed the specified dimensions by a margin of 0,5 m measured from the perimeter.

The areas to be cleared are categorised as follows:

Area A : The well established fynbos areas.

Area B : The grass covered areas.

Area C : The areas covered with pincushion and fynbos.

Area D : The Port Jackson infested areas with little or no undergrowth.

Penalties: Money will be deducted according to the following rates should the contractor clear, drive on or damage areas in excess of the widths specified (Refer to (a) & (b) above)

Area A : R35.00/m²

Area B : R 5.00/m²

Area C : R10.00/m²

Area D : None"

PSC 5.3 **Clearing**

ADD THE FOLLOWING:

(Select one of the following options. In the first instance amend the thickness as applicable, especially for contracts with vast areas to be filled)

"The thickness of the layer that will unavoidably be stripped during clearing of vegetation will be taken as 100 mm. This implies that levels used in earthworks quantity calculations will be 100 mm lower than the original levels."

Add the following:

"The tenderers attention is drawn to the fact that all items described under subclause 5.3 which are not separately listed in the bill of quantities must be included in the price for item PSC 8.2.1."

PSC 5.5 **Reclearing of Vegetation**

Add the following:

"Where areas have to be re-cleared on the written instructions of the Employer's Agent, such re-clearing shall be carried out at the contractor's own cost and the contractor is advised therefore, not to clear areas at such an early stage that re-clearing may become necessary."

PSC 8 **MEASUREMENT AND PAYMENT**

PSC 8.1 **Basic Principles**

Add the following:

"Levels to be used for earthworks quantity calculations will be surveyed once the clearing operation have been completed."

PSC 8.2 **Scheduled Items**

PSC 8.2.1 Clear and Grub

Replace the first line with the following:

"The area designated by the Employer's Agent to be cleared and grubbed will be measured in m² to the nearest square metre or,"

PSC 8.2.7 Dismantle and remove pipelines, electricity transmission lines, cables, etc.

Replace the contents of this Subclause with :

"The tendered rates shall include full compensation for the detection, disconnection, removal, stockpiling, safeguarding, reinstatement and reconnection of services, including all necessary excavation, bedding, concrete bases and backfilling.

In the event of the contractor damaging any of the services he will replace it at his own cost".

Add the following payment clauses :

"PSC 8.2.11 Remove topsoil to spoil site furnished by contractor ……..... **Unit : m³**

The tendered rate shall include full compensation for removing topsoil to a depth of 150 mm and for loading and transporting the material to spoil sites furnished by the contractor.

The Contractor shall confirm during the clear and grub and topsoil removal operation, in writing with the Employer's Agent any areas where the topsoil exceeds 150mm depth or where the roots of plant material requires deeper ripping for complete removal. The method and scope of additional work will then be confirmed by the Employer's Agent.

Add the following items to Subclause 8.2 :

PSC 8.2.15 Remove and dispose of kerbing..... Unit : m

The rate shall cover the cost of the removal, transport and disposal of existing kerbs to a spoil site furnished by the Contractor, including all necessary excavation and backfill compacted to 100% modified AASHTO density.

PSC 8.2.16 Take down existing fences and deliver to municipal store ..... Unit : m

The rate shall cover the cost of taking down the fences, coiling wire, sorting, stacking and guarding all material, the cost of loading, transporting and delivering to the municipal store and off-loading such material.

PSC 8.2.17 Rip and clear tarred and paved areas..... .... **Unit : m²**

Various items shall be scheduled. The rates shall collectively include full compensation to rip, clear and spoil at a spoil site provided by the contractor of asphalt or block paving.

PSD EARTHWORKS (1988) AS AMENDED 1990

PSD 2 **INTERPRETATIONS**

PSD 2.1 **Supporting Specifications**

Replace subclause 2.1.2 with the following:

"PSD 2.1.2 Any of the other SABS 1200 specifications may form part of the contract documents."

PSD 2.3 **Definitions**

Replace the definition "Borrow" with the following:

"Borrow material: Material, other than material obtained from excavations required for the works, obtained from sources such as borrow pits or the authorised widening of excavations. 'Borrow' shall have a corresponding meaning."

Replace the definition "Specified density" with the following:

"Specified density: The specified dry density expressed as a percentage of modified AASHTO dry density."

Replace the definition "Stockpile" with the following:

"Stockpile (Verb): The process of selecting and, as maybe necessary, loading, transporting and off-loading material in a designated area for later use and a specific purpose."

Add the following definitions:

"Fill: An embankment or terrace constructed from material obtained from excavations or borrow. In roads it includes the earthworks up to below the selected sub-grade level.

Fill (material): Material used for the construction of an embankment or terrace.

Roadbed: The in-situ material on which a fill is to be constructed.

Placing : Placing shall mean spreading of backfilling material, watering, mixing, compacting, final grading, complying with the required tolerances and providing for testing, all in accordance with the requirements of the specification."

PSD 3 **MATERIALS**

PSD 3.1 **Classification for Excavation Purposes**

PSD 3.1.1 Method of classifying

Add the following:

"Classification of material other than 'soft excavation' shall be agreed upon before excavation may be commenced. The contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to the extent that a new classification for further excavation is warranted. Failure on the part of the contractor to advise the Employer's Agent thereof in good time shall entitle the Employer's Agent to classify, at his discretion, such excavation as may have been executed in material of a different nature."

PSD 3.2.3 Material suitable for backfill or fill against structures

Replace the contents of this sub-clause with the following :
"Material used for backfill behind structures shall generally be the material excavated, subject to the following conditions :

(a) The material shall not contain an excessive number of stones retained on a 50 mm sieve; and
(b) The material shall not contain large clay lumps that do not break up under the action of the compaction equipment; and
(c) The liquid limit of the material shall not exceed 40, neither shall the PI exceed 18.
(d) The minimum modified AASHTO density shall be 95%."

PSD 3.3 **Selection**

PSD 3.3.1 General

Replace the second paragraph with the following :

"The Contractor shall deal selectively with materials from all excavations to ensure that no acceptable backfill or bedding material is contaminated by material unfit for use. No additional payment shall be made in this regard and all costs related to the above selection process shall be included in the applicable payment items. Should useful material be contaminated to such an extent that it is regarded as unfit for use the Contractor shall at his own cost dispose of this material and replace it with material of an equivalent standard to the acceptable in-situ material."

Add the following subclause:

PSD 3.3.3 Selection in borrow pits

The approval of a borrow area for a certain purpose does not necessarily mean that all material within the area is suitable for the specified purpose. What it does mean, is that the borrow area contains some suitable material. The onus is on the contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose."

Where the contractor is required to select material from excavations for a specific purpose, the above provisions relating to borrow areas shall apply *mutatus mutandis* to excavations.

The contractor shall not waste or contaminate material that has been elected for a specific purpose.

PSD 4 **PLANT**

PSD 4.4 **Detectors**

Replace the contents of Subclause 4.4 with the following :
"The Contractor shall, for the purposes of detecting and locating underground services in accordance with the provisions of Subclause 5.4 of SABS 1200 A and Subclause 5.1.2 of SABS 1200 D, at its own cost, provide and use detecting equipment which is suitable for the detection of underground cables and pipes."

PSD 5 **CONSTRUCTION**

PSD 5.1 **Precautions**

PSD 5.1.1 Safety

PSD 5.1.1.1 *Barricading and Lighting*

REPLACE "Machinery and Occupational Safety Act, 1983 (Act 6 of 1983)" WITH "Occupational Health and Safety Act, 1993 (Act 85 of 1993."

PSD 5.1.1.2 *Safeguarding of Excavations*

REPLACE "Machinery and Occupational Safety Act" WITH "Occupational Health and Safety Act, 1993 (Act 85 of 1993)."

Add the following to paragraph (B)(1) :

"Payment for supporting the sides of excavations and trenches shall be deemed to be included in the rates tendered for excavations. No separate payment will be made in this regard and it will be the Contractor's responsibility to ensure the safety and stability of all excavations.

Where trenches have to be widened to accommodate manholes, junction boxes, etc., the cost of supporting the vertical sides of such additional excavations will be deemed to be included in the rates tendered for excavation."

Add the following to paragraph (B)(2) :

"The slope of the sides of an excavation of trench may never be steeper than 60° to the horizontal and all costs incurred to slope the sides of an excavation or trench and the reinstatement thereof will, irrespective of the angle of the slope, be deemed to be included in the rates quoted for excavation."

PSD 5.1.1.3 Explosives

Replace the contents of this Subclause with the following :

"The use of explosives is prohibited on this project.

or

PSD 5.1.1.3 Explosives (Optional)

The use of explosives on this project is prohibited.

or

(Note : Not all paragraphs may be applicable - delete and renumber if necessary)

Replace the contents of this subclause with the following :

"The contractor will generally be permitted to use explosives for breaking up hard material during excavations, for demolishing existing structures and for such other purposes where they may normally be required, subject to the following conditions :

(a) The Employer's Agent shall be authorised to prohibit the use of explosives in cases where, in his opinion the risk of injury to person to persons or damage to property or adjoining structures is too high. Such action by the Employer's Agent shall not entitle the contractor to any additional payment for having to resort to other less economical methods of construction.

(b) The Employer's Agent's prior approval shall be obtained in writing in respect of each and every blasting operation carried out. Such approval may be withheld in the event of the contractor not acting responsibly and carefully in his use of explosives.

(c) The requirements of the Explosives Act, Act 6 of 1956, and the requirements of the Inspector of Explosives shall be complied with.

(d) Before any blasting is undertaken the contractor shall satisfy the Employer's Agent that he has established whether or not the insurers concerned require pre- and post-blasting inspections of buildings and structures within a certain radius of the proposed blasting to be carried out. Should such inspections be required, the contractor shall, together with the Employer's Agent and the insurer, examine and measure any buildings, houses or structures in the vicinity of the proposed blasting and establish and record, together with the owner, lessee or occupier thereof, the extent of any cracking or damage that may exist before the commencement of blasting operations. It shall be the responsibility of the contractor to make good at his own expense any further damage to such houses, buildings or structures that is a result of the blasting.

(e) Where there is a reasonable possibility of damage to power and telephone lines or any other property, the contractor shall suitably adapt his method of blasting and the size of charges and shall use adequate protective measures, such as cover-blasting, to limit the risk of damage as far as possible.

(f) All accidents, injury to persons and damage to property shall be reported in detail and in writing to the Employer's Agent as soon as is practicable.

(g) *The Employer's Agent shall be given 24 hours notice by the contractor before each blasting operation is carried out."*

PSD 5 **CONSTRUCTION**

PSD 5.1 **Precautions**

PSD 5.1.2 Existing services

PSD 5.1.2.2 *Detection, location and exposure*

Replace the contents of subsubclause 5.1.2.2 with the following:

"Where no services are shown on the drawings, but the presence of such a service could be assumed within reason, the Contractor must in co-operation with the relevant authorities locate such a service before commencing construction. After locating such a service, it would be regarded as a noted service, and the Contractor will be responsible for any costs arising from damages to the service due to the construction activities of the contractor."

"The exposure by the Contractor of underground services, as required in terms of Subclause 5.4 of SABS 1200 A (as amended) shall be carried out by careful hand excavation at such positions and to such dimensions as are agreed to by the Employer's Agent.

Unless otherwise instructed or agreed by the Employer's Agent, no service shall be left exposed after its exact position has been determined and all excavations carried out for the purposes of exposing underground services shall be promptly backfilled and compacted to the following densities :

(a) In roadways : 98% Mod AASHTO density ; and

(b) In all other areas : 93% Mod AASHTO density.

Where hand excavations to expose underground services have to be carried out in roadways, the Contractor shall reinstate the road layerworks in accordance with the provisions of Subclause 5.9 of SABS 1200DB.

Payment in respect of the exposing of the services by means of hand excavation as described above, will be made in accordance with Subclause PSD 8.3.8.1.

Payment in respect of the reinstatement of layerworks in roadways will be made in accordance with Subclause 8.3.6.1 of SABS 1200DB (as amended).

PSD 5.1.2.3 *Protection of cables*

REPLACE SUBSUBCLAUSE 5.1.2.3 WITH THE FOLLOWING:

"5.1.2.3 *Protection during Construction*

Further to the requirements of Subclause 5.4.2 of SABS 1200A (as amended), major excavating equipment and other Equipment shall not be operated dangerously close to Known Services. Where necessary, excavation in close proximity to Known Services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Should any service not being a Known Service be discovered or encountered during the course of the Contract, the Contractor shall, in addition to complying with the requirements of Subclause 5.4.2 of SABS 1200A (as amended), immediately notify the Employer's Agent thereof and implement such measures as will prevent damage of such service or, if it was damaged in the course of discovery, will prevent and minimise the occurrence of any further damage occurring."

PSD 5.1.3 Stormwater and groundwater

Add the following:

"The contractor shall at the earliest practicable opportunity install the permanent drainage specified or shown on the drawings and shall at his own cost provide such further temporary drainage as may be necessary for the protection of the works, except where other specific items regarding drainage are provided."

PSD 5.2 **Methods and Procedures**

PSD 5.2.2 Excavation

PSD 5.2.2.1 *Excavation for general earthworks and for structures*

Add the following to paragraph (b):

"Where the nature of the material precludes the above procedure, additional excavations shall be made to provide working space for the erection of form work. In general payment will be made for a working width of 600mm, but the contractor may excavate a greater working width at no additional cost to the employer. Excavation for structures shall be measured to vertical planes 0,6m outside the concrete perimeter.

Immediately before any permanent construction is commenced, all loose material shall be removed or thoroughly compacted."

Replace paragraph (e) with the following :

"Where excavations have been carried out below the authorized levels, the contractor shall backfill such excavations to the correct level with approved gravel compacted to 95% of modified AASHTO density or to the density of the surrounding material.

Where excavations for structures in hard material have been carried out, the Employer's Agent may however require the over-excavation to the backfilled with a weak concrete if there is a danger of settlement or differential settlement of the foundations.

Where the sides of excavations against which concrete is to be cast have been over-excavated or have collapsed partially, the contractor shall retrim in the excavations if necessary and, unless other remedial measures are agreed to by the Employer's Agent, shall cast the concrete for the structure, including any additional concrete which may be required as a result of the over-excavation or partial collapse. The cost of the additional concrete or remedial measures shall be for the contractor's account."

PSD 5.2.2.2 *Borrow pits*

Add the following:

"A commercial source shall, for the purposes of this specification, mean a source of material provided by the contractor, not the employer.

Where it is specified that material shall be obtained from commercial sources, the contractor shall be responsible and include in his prices for borrow to fill from commercial sources, for finding a source of suitable material, for making all arrangements for procuring the material with the owner of the source, for the payment of any royalties, charges or damages and, for transporting the material to the site regardless of the distance involved. No payment will be made for the removal of overburden or stockpiling at the commercial source and no extra over payment for excavating in intermediate, hard or boulder material shall apply."

"PSD 5.2.2.3 *Disposal*

Add the following:

"The contractor shall provide the necessary spoil sites and shall make the necessary arrangements with the owner of the site where the material is disposed of and shall include in his rates for all charges in this regard and for transporting the material regardless of the distance involved."

Add the following subclause:

"PSD 5.2.2.4 *Selection and stockpiling*

The approval or designation of a particular borrow area for a particular purpose will not imply that all the material is suitable for the purpose or should be used for that purpose. The contractor shall select suitable material from that source, discard unsuitable material and reserve material for other purposes as necessary. When required and as ordered by the Employer's Agent, material shall be stockpiled for later use when the excavation thereof is unavoidable in order to excavate the material required at the time.

PSD 5.2.3 Placing and Compaction

PSD 5.2.3.1 *Embankments*

Omit "98% in the case of non-cohesive soil" and substitute "100% in the case of non-cohesive soil".

PSD 5.2.4.3 *Grass or other vegetation*

Add the following subclause:

"Hydroseeding

The following materials shall be used in hydroseeding :

(a) Fertiliser

The type of fertiliser to be used shall be 2:3:2 (22 + 2N) and superphosphate.

(b) Grass seed

The following seed mixture at an application rate of not less than 45 kg of seed mixture per hectare, shall be used :

10 kg	Cynodon dactylon
10 kg	Festuca rubra
6 kg	Lolium multiflorum
6 kg	Agrostis tenius
3 kg	Trifolium subterranean
4 kg	Dactylis glomerata
6 kg	Serredella
45 kg	**per hectare**

Cellulose pulp shall be added to the hydroseeding mix at a rate of 25 kg of pulp per kilolitre of water used, except where otherwise instructed in respect of flat slopes.

Hydroseeding shall be carried out with an approved hydroseeding machine at a rate of application of not less than 45 kg of seed mixture per hectare, unless otherwise specified in the project specifications.

The work shall be executed in May, which falls in the 12-month maintenance period.

Straw stabilisation

One bale of hay per 20 m² shall be rotivated or harrowed into the sand. Harrowing or rotivation shall be done in an east-west direction, i.e. across the direction of the prevailing winds."

PSD 5.2.5 Transport for Earthworks

PSD 5.2.5.2 *Overhaul*

Replace the contents of this subclause with the following:

"No overhaul will be paid under sections 1200 D, 1200 DM, 1200 DK or 1200 DB or any other sections. All transport costs irrespective of distance, source and material must be included in the relevant payment clauses."

PSD 7 **TESTING**

PSD 7.2 **Taking and Testing of Samples**

Replace the contents of this subclause with the following:

"The contractor shall carry out sufficient tests on a regular basis as agreed between him and the Employer's Agent to determine whether the degree of compaction, and, where applicable, the quality of materials used, comply with the specification and shall submit the results of these tests to the Employer's Agent in a form approved by him. The Employer's Agent may likewise carry out such tests.

Testing by the Employer's Agent will not relieve the contractor of his obligations to provide materials and workmanship in accordance with the specifications.

The requirements of the density for a particular lot shall be deemed to be satisfied if at least 75% of the dry-density tests show values equal to or above the specified density and no single value is more than five percentage points below the specified value."

PSD 8 **MEASUREMENT AND PAYMENT**

PSD 8.1 **Basic Principles**

Add the following paragraph :

"PSD 8.1.4 Where backfilling is part of the activities described under a payment clause, the word backfilling includes the supply of the approved backfilling (regardless of the source and distance), as well as the placing of the material as described under subclause PSD 2.3."

PSD 8.1.5 Watering or harrowing of material and allowing it to dry out to obtain optimum moisture content before backfilling and compaction of fill material (whether obtained from site or commercial sources) will not be paid for separately and shall be deemed to be included in the tendered rates for Bulk Excavation or Restricted Excavation.

PSD 8.2 **Computation of Quantities**

PSD 8.2.1(a)(2) Add "or residential houses", after "…. rail embankment".

PSD 8.3 **Scheduled Items**

PSD 8.3.3 Restricted excavation

Add the words "harrowing or drying the material" after the words "….. material separate (where relevant)" in the fourth sentence of paragraph (a).

Add the following sub-sub-item :

" (c) Extra over item 8.3.3 (a) for hand excavation ..... **Unit : m³**

This item shall apply to hand excavation ordered by the Employer's Agent or where the Employer's Agent considers that, owing to circumstances, excavation by mechanical excavators is not practicable. It shall not apply to hand excavation for the purpose of trimming or finishing excavation made by mechanical means.

The tendered rate shall include full compensation for the additional cost of excavating by means of hand tools."

PSD 8.3.4 Importing of Materials

Amend subclause '(a)' as follows:

Delete the words "Extra over for" from the heading. Delete the words "additional to 8.3.2 and 8.3.3" and replace with "of the work and items described in payment items 8.3.2 or 8.3.3 and including the cost of".

PSD 8.3.10 Topsoiling **Unit : m³**

Change the unit to "m^3" and replace the contents of this item with the following :

"The unit of measurement shall be the cubic metre and the quantity shall be calculated from the authorized dimensions.

The tendered rate shall include for loading the topsoil from stockpiles, transporting it for the free-haul distance, off-loading, spreading, shaping and lightly compacting."

PSD 8.3.16 Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor .....**Unit : m³**

The tendered rate shall include full compensation for the additional cost of providing a spoil site or other means of disposing of surplus spoil material, for transporting the material, regardless of the distance involved, for any charges for taking such material and for all other incidentals necessary to dispose of the spoil material. No overhaul shall apply.

PSD 8.3.19 Compaction of In-situ Material to a depth of 300mm

a) 93% modified AASHTO density ..... **Unit : m²**

The unit of measurement shall be the square metre.

The tendered rate shall include full compensation for scarifying, watering, shaping and compacting the in-situ material to 93% modified AASHTO density to a depth of 300mm."

PSDB EARTHWORKS (PIPE TRENCHES) (1989(b))

PSDB 3 **MATERIALS**

PSDB 3.5 **Backfill Materials**

Add the following paragraphs:

"(c) Cement stabilised backfilling

Backfilling shall be stabilised with 5% cement where directed by the Employer's Agent. Aggregate shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed with 5% cement and shall be compacted in layers of 100 mm thick to 90% of modified AASHTO density.

(d) Soilcrete backfilling

Aggregate for soilcrete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed in a concrete mixer with the cement and enough water to such a consistency that the mixture can be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

PSDB 3.7 **Selection**

Replace the words "if he so wishes" in the first line of the second paragraph with the words "at his own cost".

PSDB 4 **PLANT**

PSDB 4.1 **Excavation Equipment**

Add the following paragraph :

"All excavations in excess of the specified depth and width, must be backfilled with approved backfilling material. No additional payment regarding this will be made, it will be assumed that payment is included in the tendered rates for the applicable items.

Compaction of sand must be to 100% of modified AASHTO maximum density."

PSDB 5 **CONSTRUCTION**

PSDB 5.1 **Precautions**

PSDB 5.1.3 Accommodation of traffic and access to properties

Replace the semicolon and the word "and" at the end of subclause 5.1.3(a) with a full stop and replace item (b) with the following :

"(b) Where necessary to achieve compliance by the Contractor with his obligations in terms of subclause PS 8.1 of Portion 1 Specifications to provide and maintain pedestrian and vehicular access to properties affected by the works, the Contractor shall construct and maintain to the satisfaction of the Employer's Agent, such temporary access roads around, and/or steel or timber bridges over excavations in roads, pavements, entrances or accesses to properties.

Temporary pedestrian access bridges shall be at least 1,2 m wide and temporary access bridges for vehicles shall be at least 3,6 m wide. All temporary access bridges shall be fitted with handrails as well as protective mesh fencing on both sides.

On completion of the work, the Contractor shall dismantle and remove all such temporary constructions and reinstate these areas to their former condition.

Except only where the Employer's Agent has included in the Schedule of Quantities, particular payment items specifically therefore, the Contractor will not be paid directly for the construction and maintenance of temporary access roads and/or the provision and maintenance of bridges as aforementioned, and the costs thereof shall be deemed included in the Contractor's tendered rates for excavation."

Add the following :

"PSDB 5.1.5 Removal Of Existing Pipelines

Where existing pipes have to be removed, they shall be carefully opened up by machine excavation to 300 mm above the pipes after which the whole pipe shall be fully exposed by means of hand excavation. The excavation width shall comply with Subclause 8.2.3.

The pipes shall be removed from the trench in a manner approved by the Employer's Agent, and brought to the surface for inspection by the Employer's Agent.

Pipes that are declared suitable for re-use and pipes declared unfit for re-use shall be dealt with in accordance with the respective manner described in the specifications, or on the drawings or the Employer's Agent's instructions, as relevant."

PSDB 5.2 **Minimum Base Widths**

Add the following above the table.

"No allowance shall be made for the extra thickness of the collars or couplings."

Add the following after paragraph (b) :

"The above is not applicable to trenches for subsurface drains.

Trenches for subsurface drains shall be excavated to the dimensions and gradients shown on the drawings or directed by the Employer's Agent."

PSDB 5.4 **Excavation**

Add the following :

"All excavation for pipes must be done according to the trench excavation method, and not to the fill method. No additional payment extra over to that listed under item 8.3.3 will be made for pipes, culverts or any other structure that falls within the road or fill layers. Except where otherwise specified, trenches shall be of such a depth that the minimum cover over the pipes shall be 700 mm except at road-crossings where the minimum cover shall be 1 000 mm."

PSDB 5.6 **Backfilling**

PSDB 5.6.3 Disposal of soft Excavation Material

Replace the contents of the subclause with the following:

"Excavated material from the trench that has become surplus because of bulking, displacement by the pipe, and importation, shall be disposed of outside the site boundaries at a spoil site provided by the contractor. No additional payment will be made and all costs related to the disposal of this surplus or unsuitable material will be deemed to be included in the tendered rates for the applicable items."

PSDB 5.7 **Compaction**

PSDB 5.7.1 Areas not Subject to Traffic Loads

Replace "90%" with "95%".

Add the following sentence:-

"All non-cohesive material shall be compacted to 100% MOD AASHTO density."

PSDB 5.7.2 Areas Subject to Traffic Loads:

Replace "93%" with "95%".

Delete "98%" and substitute "100%".

Add the following :

"All pipe trenches that fall within the road reserves shall be regarded as areas subject to traffic loads."

"PSDB 5.11 **Removal of Existing Pipes**

PSDB 5.11.1 Where shown on the drawings or where so instructed by the Employer's Agent, the Contractor shall excavate, expose and remove from the ground, existing water pipelines.

PSDB 5.11.2 If so instructed by the Employer's Agent, the Contractor shall, before commencing with the excavation of the pipeline, expose the pipeline to be removed by means of careful hand excavation at positions agreed with the Employer's Agent, in accordance with the requirements of Subclause PSA 5.4.1 of Portion 1 of the Project Specifications. Measurement and payment for locating the exact positions of the pipelines where required by the Employer's Agent, shall be made in accordance with and under Item PSD 8.3.8.1.

PSDB 5.11.3 Thereafter, the existing pipelines to be removed shall be carefully opened up by machine excavation to a depth of not more than 300 mm above the pipes after which the whole pipeline shall be fully exposed by means of careful hand excavation. The excavation width shall comply with Subclause 5.2.

PSDB 5.11.4 The pipes and all specials encountered (e.g. bends, valves, valve box covers and the like) shall be removed from the trench in a manner as to avoid causing damage and as approved by the Employer's Agent, cleaned sufficiently as to allow inspection of the pipes and specials by the Employer's Agent and stacked in such a manner as will facilitate the inspection of each pipe and special by the Employer's Agent.

PSDB 5.11.5 Pipes and specials that are declared by the Employer's Agent as suitable for re-use shall be transported to the Employer's storeyard; where it shall be off-loaded and neatly stacked to the satisfaction of the Employer's Agent and in accordance to the manufacturer's instructions. The Contractor shall be responsible for obtaining a written receipt of all pipes so delivered to the Employer's storeyard.

PSDB 5.11.6 Pipes and specials which are declared by the Employer's Agent as unsuitable for re-use shall be transported to a spoil site and covered with spoil material to a depth of not less than 300 mm.

PSDB 5.11.7 After removal of the pipelines, the trenches shall be backfilled using the excavated material and compacted to 90% Mod AASHTO density. The provisions of Subclauses 5.6. and 5.7 shall apply."

PSDB 8 **MEASUREMENT AND PAYMENT**

PSDB 8.1 **Basic Principles**

PSDB 8.1.1 Replace the last section of subclause 8.1.1 ".... surplus material along the route of the pipeline within 0,5 km of the source", with ".... surplus material within the freehaul distance of the site boundaries."

PSDB 8.1.2 Add the following:

"In the road prism the ground surface from which depth will be measured will always (irrespective of operation sequenced) be the road bed level at centre-line."

PSDB 8.2 **Computation of Quantities**

PSDB 8.2.3 Add the following to subclause 8.2.3.

"Where two or more pipes/ducts are to be placed in one trench, the specified base width shall be calculated as follows:

The trench width for the deeper service shall be calculated according to above specifications. The effective trench width for the shallower service shall then be the difference between its specified base width and the overlap with the trench width of the deeper service.

The trench width for subsurface drains shall be as shown on the drawings."

PSDB 8.3 **Scheduled Items**

PSDB 8.3.2 <u>Excavation</u>

(a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material.
Replace "of 1, 0 m" in the first sentence of 8.3.2 (a) with "as scheduled in the schedule of quantities."
Replace the words "measured to the bottom of the bedding layer" with "measured from the final road layer or surface to the pipe invert level".

Replace the phrase "within freehaul distances"
with:

"at a spoil site provided by the contractor or municipal dumpsite unless scheduled otherwise"
Add the following after the last sentence and before paragraph (b).

"The tendered rate for excavation of trenches for electrical cables to be supplied and installed by the Electrical Contractor shall include full compensation for liaising with the Electrical Contractor, maintaining the trenches to allow the installation of the cables, supply and installation of warning tape and backfilling once the Electrical Contractor completed the installation of cables."

Add the following after the third paragraph :

"The rate shall also cover the cost of the additional compactive effort required as specified in 5.7.2 (as amended) and the additional selection of materials as specified in 5.6.2 to comply with the requirements for areas subject to road traffic loads. No additional payment will therefor be made under item 8.3.3.3."

(b) Extra-over item (a) above for; and (c) excavate and dispose of unsuitable material from trench bottom

Replace the phrase "within freehaul distances"
with:

"at a spoil site provided by the contractor or municipal dumpsite unless scheduled otherwise"

PSDB 8.3.2 (b) Extra over item (a) for :

Add the following at the end of the existing sub-item 2 :

"No payments will be made under sub-items (1) and (2) in respect of any materials measured and paid for under sub-item 3 below."

And add the following new sub-items in 8.3.2(b) :

"(3) Hand excavation and backfill where ordered by the Employer's Agent :

(a) Soft material .....**Unit : m³**
(b) Intermediate material.....**Unit : m³**

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, or the lesser dimension excavated, which was excavated by hand on the specific prior written instructions of the Employer's Agent; provided always that the Employer's Agent's said instruction shall have stated that measurement and payment for such hand excavation will be in accordance with this item.

The tendered rate shall include full compensation for the additional cost, effort and time resulting from excavating in the respective materials using hand methods only.

The Employer's Agent shall not be obliged to authorise payment under this item in respect of any hand excavation carried out (whether ordered in writing or otherwise), which hand excavation was in any case necessary to achieve compliance by the Contractor of his obligations under the Contract to :

(i) utilise construction appropriate to the nature of the specific parts of the Work and /or
(ii) protect existing structures and/or services; and/or
(iii) comply with all prevailing legislation and regulations.

(4) Backfill stabilised with 5% cement where directed by the Employer's Agent.....**Unit : m³**

The unit of measurement shall be the cubic metre of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Employer's Agent's instructions in accordance with Sub-clause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

(6) Mass concrete Class 15 MPa/19mm in encasing around pipes where directed by the Employer's Agent .....**Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rates for subitem (6) shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete or mass concrete, as well as for the cost of shuttering if required.

(7) Excavation is marshy areas irrespective of depth .....**Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rate for subitem (7) shall include full compensation for all additional costs as a result of excavating in marshy areas, for pumping and draining if required and for vibrating and compacting to the specified density.

(8) Backfill with clean sand compacted to 100% modified AASHTO density ..... **Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rate for subitem (8) shall include full compensation for all additional cost to dispose of excess excavated material at a spoil site provided by the Contractor and to import clean sand from commercial sources to backfill and to compact the clean sand backfill to 100% Mod AAHSTO.

(9) Boulder Excavation

The unit of measurement shall be the cubic metre of boulder material excavated.
(Refer to SANS 1200D, 3.1.2d)

Add the following sub-items in 8.3.2 after sub-item 8.3.2) (c) :

(10) Excavate in all materials for stormwater inlet and outlet structures and for manholes, catchpits, valve chambers and the like, irrespective of depth and backfill around structures..... **Unit : m³**

The unit of measurement shall be the cubic metre of material excavated, measured in place according to the authorised dimensions, and excluding the volume of material excavated and paid for under sub-item (a).

The tendered rate shall include for the costs of excavating in all materials, backfilling, compacting, trimming and tidying of the final surface around the structure, disposing of surplus and unsuitable materials within the freehaul distance and where applicable, selecting and keeping separate, excavated material suitable for use as backfill.

(11) Excavate open drains in all materials ..... **Unit : m³**

The tendered rates shall include full compensation for excavating in all materials within the dimensions specified or authorised by the Employer's Agent and to the specified lines and profiles, for the disposal of surplus and unsuitable excavated material where applicable, and in the case of item (d), for backfilling with suitable approved material compacted to 93% of modified AASHTO density around the structures.

PSDB 8.3.3 Excavation ancillaries

PSDB 8.3.3.1 Add the following to the last paragraph :

"The freehaul distance is unlimited and no additional payment will be made for the transport of the material".

"PSDB 8.3.8 Removal of existing pipes :

(a) Excavate in all materials to 300mm above the pipelines ..... **Unit : m³**

The unit of measurement shall be the cubic metre of material excavated for the removal of pipelines in accordance with PSDB 5.11, measured in place according to the authorised dimensions. Depth shall be measured from the ground surface on the centreline of the pipeline to 300 mm above the pipe barrel.

The tendered rate shall include for excavating by any method in all materials and placing the excavated material alongside the trench.

(b) Hand excavation for removal by hand to expose pipes ..... **Unit : m**

The unit of measurement shall be the linear metre of pipeline finally exposed by hand excavation methods, measured in plan view along the centreline of the pipeline, irrespective of the class of pipe. Separate items will be scheduled for each different diameter of pipe. The pipe volume as well as the volume of all associated structures such as junction boxes, manholes, valve chambers and the like shall be excluded from the volume of excavation measured.

The tendered rates shall be in full and final compensation for excavating by hand methods from a depth of 300 mm above the pipe barrel in accordance with PSDB 5.11.2 to expose the pipe to its bottom, irrespective of the type class of pipe, as well as for excavating by hand around junction boxes, manholes, valve chambers and the like.

(c) Remove pipes from trench and stack for inspection ..... **Unit : m**

The unit of measurement shall be the linear metre of each type and diameter of pipe removed from the trench in accordance with Sub-clause 5.11, measured in plan view along the centreline of the pipeline, without deduction for specials, junction boxes, manholes, valve chambers and the like as may be encountered. Separate items shall be scheduled for each different class and diameter of pipe.

The tendered rates shall be fully inclusive for uncoupling the individual pipes and specials, all additional excavation as may be necessary to facilitate the insertion of lifting slings or the utilisation of other lifting equipment, the provision and utilisation of all such lifting equipment as may be necessary (e.g. cranes, if required), for lifting the pipes and specials out of the trench, cleaning and stacking them along the side of the trench for inspection, attending during the Employer's Agent's inspection and recording the Employer's Agent's decisions on each pipe/special. The tendered rate shall further include for the demolition and removal from the trench of all associated pipeline structures as may be encountered, such as junction boxes, inlet and outlet structures, valve chambers, anchor blocks and the like, and the loading and removal of the debris to spoil.

(d) Deliver pipes and specials declared re-usable

(i) Pipes ..... **Unit : m**

The unit of measurement shall be the linear metre of pipe declared re-usable by the Employer's Agent and delivered to the address specified in Sub-clause PSDB 5.11. Separate items will be scheduled for each different type and class of pipe.

The tendered rates shall be fully inclusive for loading the pipes at the side of the trench, transporting to and off-loading at the location specified in PSDB 5.11, and carefully stacking separately according to the type, class and diameter of the pipes.

(ii) Specials ..... **Unit No.**

The unit of measurement shall be the number of specials declared re-usable by the Employer's Agent in accordance with Sub-clause PSDB 5.11 above, irrespective of the type or diameter of the special, delivered to the address specified in Sub-clause PSDB 5.11.

The tendered rate shall be fully inclusive for loading the specials at the side of the trench, transporting to and off-loading at the location specified in PSDB 5.11, and carefully stacking separately according to the type, class and diameter of the specials.

(e) Dispose of pipes and specials unsuitable for re-use

(i) Pipes ..... **Unit : m**

The unit of measurement shall be the linear metre of pipe declared by the Employer's Agent to be unsuitable for re-use and disposed of by the Contractor in accordance with the requirements of PSDB 5.11.5. Separate items will be scheduled for different types and diameters of pipe.

The tendered rates shall be fully inclusive for loading the pipes at the side of the trench, transporting to and off-loading at the spoil site and dealing with as specified in PSDB 5.11.5.

(ii) Specials ..... **Unit : No.**

The unit of measurement shall be the number of specials declared by the Employer's Agent to be unsuitable for re-use and disposed of by the Contractor in accordance with the requirements of PSDB 5.11.5. Separate items will be scheduled for different type of special.

The tendered rate shall include for loading the special at the side of the trench transporting to and off-loading at the spoil site and dealing with as specified in PSDB 5.11.5.

(f) Backfill and compact trench ..... **Unit : m^3**

The unit of measurement shall be the cubic metre of compacted fill, measured tight according to the authorised dimensions of the trench.

The tendered rate shall be fully inclusive for placing excavated material in the trench and compacting in accordance with Subclauses 5.6 and 5.7.

(g) Make up deficiency in backfill material ..... **Unit : m³**

The unit of measurement shall be the cubic metre of backfill obtained from sources other than the trench excavated for the purposes of removing the pipeline, in order to make up any deficiencies in backfill material resulting from the volume previously occupied by the pipeline.

Except that the volume shall be determined as the external volume of the pipes removed together with the external volume of all ancillary structures removed along the pipeline, measurement and payment shall be in accordance with 8.3.3.1 of SABS 1200DB.

PSDB 8.3.16 Compaction of trench invert in situ material to a depth of 300mm..... **Unit : m³**

(a) 93% modified AASHTO density

The unit of measurement shall be the cubic metre compacted, 300mm deep across the authorized trench width.

The tendered rate shall include full compensation for scarifying (if necessary), watering, shaping and comparing the in situ material to 93% Mod AASHTO density to a depth of 300mm below the trench invert.

PSDB 8.3.17 Testing of trench related works..... **Unit No**

Various test methods and materials to be tested shall be scheduled and only additional tests ordered by the Employer's Agent and which indicate compliant materials and workmanship will be paid for. Apart from DCP tests witnessed by the Employer's Agent all other tests must be undertaken by a registered independent laboratory. DCP tests shall be undertaken to a depth of 0,3m below the invert of the trench or the depth of the layer thickness being tested unless scheduled otherwise.

Tests results shall be tabulated in electronic format with a unique reference number, the position shall be indicated and the test results clearly referenced to the requirements.

PSG **CONCRETE (STRUCTURAL)**

PSG 2 **INTERPRETATIONS**

PSG 2.4 **Explanation of Terms**

Add the following:

“PSG 2.4.4 Precast concrete

Concrete components of the general quality described in this specification, which have been cast and cured either elsewhere or on the site and placed in position to form an integral part of the structure.”

PSG 3 **MATERIALS**

PSG 3.2 **Cement**

PSG 3.2.2 Alternative types of cement

Replace the contents of this subclause with the following:

"Only ordinary Portland cement, CEM 1 42,5 according to SABS ENV 197-1, may be used.

Should the contractor wish to use any other type of cement he shall obtain the Employer’s Agent's prior written approval (see 8.1.3.2 and 8.1.3.3). ”

PSG 3.2.3 Storage of cement

Add the following:

"Cement shall not be stored for longer than 12 weeks without the permission of the Employer’s Agent."

PSG 3.4 **Aggregates**

PSG 3.4.3 Storage of aggregates

Add the following:

"Where aggregates of differing chloride content are stored on the site, the use thereof in the various classes of concrete, shall be strictly controlled."

Add the following subclauses:

"PSG 3.9 **Waterstops**

PVC waterstops shall comply with the requirements of CKS 389."

PSG 3.10 **Roofing Felt**

Three-ply roofing felt shall comply with the requirements of SABS 92 for type 40 felt.

PSG 3.11 **Butyl Rubber Sealing Strips**

The dimensions of the sealing strip for use in the reservoir are shown on the drawings. The strips shall have a factory-applied bonding layer on one side.

The strip shall have an elongation at break of not less than 300% and a tensile strength of 8,0 MPa. The sealing strip shall be permanently bonded to the prepared concrete surface, in accordance with the manufacturer's instructions.

The completed joint shall be guaranteed to be 100% watertight and to be resistant to the long term effects of chemically treated water.

PSG 3.12 Alkali-Aggregate Reaction

Malmesbury hornfels (shale) or other potentially reactive aggregate shall not be used in conjunction with a high alkali cement in concrete in any part of the Works. For the purposes of this clause, a high alkali cement is one in which the equivalent alkali content (Na_2 O equivalent) exceeds 0,60% by mass of cement.

In order to ensure that the above requirement is met, the Contractor may elect to use a non-reactive aggregate, that complies with the requirements of SABS 1083. Alternatively, if the Contractor chooses to use Malmesbury hornfels or other potentially reactive aggregate, he shall comply with the following requirements regarding the cement:

a) Before commencing any particular section of the structure, the Contractor shall ensure that he has enough cement that is not a high alkali cement to complete the section.
b) Certificates stating the alkali content of each delivery of cement to the Site shall be supplied by the Contractor. These certificates shall be based on tests carried out at a laboratory approved by the Employer's Agent. The cost of testing, including sampling, transporting of samples, and issuing of certificates, shall be borne by the Contractor.
c) The Contractor shall be entitled to use an approved brand of cement as a means for ensuring that the permissible alkali content is not exceeded. The Contractor shall make allowance for the higher price of such brand, if he chooses to use this method.
d) High alkali cement delivered to the Site shall be rejected, and the cost of its removal and replacement with cement with an acceptable alkali content shall be borne by the Contractor.

PSG 4 PLANT

PSG 4.1 **General**

Add the following subclause:

"PSG 4.1.1 Minimum plant

The contractor shall have available and in sound working order the following minimum plant for the construction of the concrete reservoir:

(a) Two concrete mixers each of sufficient capacity to complete a circular section of the wall between horizontal construction joints within 4 hours and without interruption.
(b) Two weigh batchers to supply the mixers.
(c) Four concrete vibrators of which at least one shall be powered by an internal combustion engine.
(d) One air compressor.
(e) Suitable and adequate plant to transport and raise concrete and other material and equipment from the ground level to the top of the structure at all stages of construction.
(f) Elevated storage tanks of adequate capacity to ensure that sufficient water will be available before the commencement of every major concrete-placing operation.

Should the plant used for placing concrete for the reservoirs be electrically or mechanically powered, then he shall also provide some other approved, non-electrically powered standby means for the placing of concrete at an adequate rate in the event of a power or mechanical failure of the main plant.

Where the contractor elects to place a crane inside the circumference of the reservoir wall for the duration of the period of construction, he shall communicate with the Employer's Agent in good time to ensure that the design and layout of the panels which form the roof slab and floor allow for such positioning of the crane. Where sections of the roof and floor have to be redesigned to accommodate the crane, the costs of such redesign shall be borne by the contractor."

PSG 4.5 **Formwork**

PSG 4.5.1 Design

Add the following:

"Any or all formwork or scaffolding required for any part of the works shall be designed by the contractor, and before commencing with the erection of any formwork or scaffolding, the contractor shall submit to the Employer's Agent, for approval, the methods which he proposes to use. The Employer's Agent shall have the authority to order any alterations to the design or in the sizes of any part of the formwork or scaffolding which he may consider necessary. The fact that the Employer's Agent approved or has altered any part shall not be construed as to relieve the contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding."

PSG 4.5.3 Ties

Add the following:

"No plugs, bolts, ties or clamps of any description used for the purpose of holding the formwork will be allowed to project into or through the concrete unless with the express permission of the Employer's Agent.

Only approved tie-rods which consist of solid rods (which remain embedded in the concrete) and have removable ends shall be used to hold the formwork of the reservoir walls. The removable tie-rod ends shall be such that they can be removed without damaging the concrete, and no permanently embedded parts of such tie-rods shall have less than 50 mm cover to the finished concrete surface.

The cavities left in the concrete after the tie-rod end cones have been removed shall be soundly caulked with cement mortar to which an approved shrinkage-reducing agent has been added, and shall be neatly finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying the special tie-rods as well as filling the cavities left by the tie-rod cones shall be included in the rates tendered for formwork under the appropriate pay items.

On no account shall formwork be secured to reinforcing bars."

PSG 5 CONSTRUCTION

PSG 5.1 **Reinforcement**

PSG 5.1.2 Fixing

Add the following:

"The Employer's Agent will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences. Welding of reinforcing steel will not be permitted."

PSG 5.1.3 Cover

Add the following:

"The distance between pipes cast into the concrete and the reinforcing shall nowhere be less than:

(a) 40 mm or

(a) 5 mm plus the maximum size of the coarse aggregate, whichever is the largest."

Add the following:

"PSG 5.2.5.6 The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back-propping of beams, slabs, etc. The propping may be required simultaneously on more than one level directly underneath one another. The requirements for continuous propping and/or backpropping shall be calculated to a theoretical model that is acceptable to the Employer's Agent, and details shall be submitted for the Employer's Agent's approval. Data required for such calculations, eg design loads and structural dimensions, will be supplied by the Employer's Agent on request."

PSG 5.3 **Holes, Chases and Fixing Blocks**

Add the following:

"Cover blocks for reinforcing and fixtures may be cast into the concrete provided the strength or any other desirable characteristic (such as the appearance) of the concrete section is, in the opinion of the Employer's Agent, not affected or impaired."

PSG 5.5 **Concrete**

PSG 5.5.1.5 *Durability*

The exposure conditions for concrete are classified as "very severe".

Add the following values to table 5 :

"The maximum water/cement ratio for moderate sections, general reinforced concrete, exterior portions of

mass concrete, as well as for internal concrete in buildings under conditions of very severe exposure, is 0,45".

Notwithstanding the aforementioned, the cement content may under no circumstances be less than :

Structural concrete of □ 25 MPa	- 265 kg/m□
Exposed concrete and trafficable surfaces	- 280 kg/m□

PSG 5.5.1.7 *Strength Concrete*

Add the following:

"The concrete mixes shall be designed by the Portland Cement Institute or similar approved laboratory.

The shrinkage of concrete to be cast in floor systems, shall not exceed 0,02 % tested as per SABS 1085. Three tests shall be conducted on the mix design to confirm compliance. Test results shall be made available before the concrete is used on site."

PSG 5.5.3.2 *Ready-mixed concrete*

Add the following:

"The Contractor shall confirm that sufficient continuous supply of concrete is secured to complete the portion of concrete work in one continuous pour."

PSG 5.5.7 Construction joints

Add the following:

"Horizontal construction joints are permitted in the reservoir walls, but must be clarified with the Employer's Agent in advance."

The wall shall be cast in lifts of such height that each lift can be poured without interruption in one continuous operation during normal working hours.

A payment item is provided to cover the costs (if any) of ensuring the watertightness of construction joints. It is the contractor's responsibility to ensure that such joints are watertight. The contractor's proposed method for ensuring the watertightness of such joints shall be submitted to the Employer's Agent for his approval."

PSG 5.5.8 Curing and protection

Add the following:

"Should a curing compound be allowed by the Employer's Agent then it shall be a resin based curing compound. Curing of columns, shafts and walls shall be done by either retaining the formwork for the required period of time or covering with plastic sheeting. On lesser shafts and walls the Employer's Agent may allow a curing compound for curing."

PSG 5.5.11 *Watertight concrete*

Add the following:

"The minimum cement content for OPC in water-retaining structures shall be 325 kg/m3, while the maximum shall be 400 kg/m3 in reinforced concrete, or 500 kg/m3 in prestressed concrete. Where OPC blended with PFA is permitted, the maximum cement content shall be 450 kg/m3 for reinforced concrete, and 550 kg/m3 for prestressed concrete.

The maximum water:cement ratio for water-retaining structures shall be 0,53 for OPC."

PSG 6 TOLERANCES

PSG 6.2 **Permissible Deviations**

PSG 6.2.3 Specified permissible deviations

Add the following:

"Degree of accuracy II is applicable.

Every permissible deviation is binding on its own. The accumulative effect of permissible deviations will not

be considered. The maximum permissible vertical deviation is subject to the other permissible deviations."

Replace subclause 6.2.3(d)(5) with the following:

	Permissible deviation Degree of accuracy		
	III	II	I
	mm	mm	mm
"Vertically, per metre height	5	3	2
subject to a maximum of	50	30	10

None of the prescribed permissible deviations will be taken as permission for violating any legal boundaries of properties by any part of a structure.

The above permissible deviations also apply to slip-form concrete, unless another set of permissible deviations have first been accepted by the Employer's Agent, in writing. Such amended permissible deviations shall clearly make provision for interfaces between structures erected with the aid of slip-form concrete and those erected with the aid of conventional concrete.

The maximum permissible deviation from a 3 m long straight line connecting two points on the surface of a finished floor is 5 mm."

PSG 7 TESTS

PSG 7.1 **Facilities And Frequency Of Sampling**

PSG 7.1.1 Facilities

Add the following:

"The contractor shall provide the facilities necessary to test the concrete cubes made at the frequency specified in subclause 7.1.2.

The facilities shall consist of sufficient storage capacity and the testing of cubes:

(a) by means of an approved, calibrated cube testing press installed on site in a manner approved by the Employer's Agent, or
(b) by an approved laboratory.

The cost of all testing including the cost of sampling, storage and transport of samples shall be included in the rates tendered for concrete work."

PSG 7.3 **Acceptance Criteria for Strength Concrete**

Add the following:
"Test results obtained from the supplier of ready-mixed concrete will not be accepted for evaluation in terms of subclause 7.3 but samples for testing shall be taken of such concrete at the point of placing."

Add the following acceptance test for watertightness of the tank:

"TESTING FOR WATERTIGHTNESS

The structure shall be filled with water being gradually let in until the top water level has been reached. The water level will then be carefully noted and recorded by the Employer's Agent in relation to a fixed bench-mark, and the structure shall be allowed to remain filled for a period of two weeks to permit complete absorption of water by the concrete. This period may obviously be shorter should an earlier test prove to be successful.

Any loss of water which may have occurred shall then be made up by again filling the structure to the top water level and by allowing to be watertight if the drop in level in 96 hours (less the drop caused by evaporation) does to represent more than 0,06% of the volume of the reservoir.

The evaporation shall be measured by the mean drop in level caused by the evaporation of the water in three flat containers floating in the water, being recorded.

The contractor may attend the taking of all measurements by the Employer's Agent.

In the event of an appreciable leakage being evident or visible at any stage of the filling or testing, or in the

event of the final degree of watertightness being unsatisfactory, the contractor shall, when so ordered by the Employer's Agent, discontinue such filling or testing and shall, at his own expense, take approved steps to rectify the leakage, until a test proves that a sufficient degree of watertightness has been obtained.

The costs of retesting the reservoir for watertightness shall be borne by the contractor."

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.3 **Measurement and Rates**

PSG 8.3.1 & PSG 8.3.2 Reinforcement

Replace the contents of this subclause with the following:

"The unit of measurement for steel bars shall be the ton of reinforcement in place in accordance with the drawings or as authorized by the Employer's Agent.

The unit of measurement for welded steel fabric shall be the kilogram of fabric reinforcement in place and the quantity shall be calculated from the netto area covered by the mesh, excluding laps.

Clips, ties, separators, stools and other steel used for positioning reinforcement shall not be measured, unless shown on the bending schedules.

The tendered rate shall include full compensation for the supply, delivery, cutting, bending, welding, placing and fixing of the steel reinforcement, including all tying wire, stools, supports and waste."

PSG 8.10 **Testing for water tightness** ..... **Unit : No**

Various structures will be scheduled. The rate will include full compensation for the successful water tightness test in accordance with PSG 7.2.

The water tightness test will be paid by a lump sum separately for each structure.

The tendered sum shall make full compensation for all labour, equipment, water and materials to carry out the tests as specified in PSG 7.2, to rectify faults and to achieve a test result to the satisfaction of the Engineer.

The sum shall include for all water required for the successful watertight testing of the structure.

PSG 8.17 **Cast in pipes with or without puddle flanges** ..... **Unit : No**

Various pipe diameters and wall thicknesses will be measured.

The tendered rate shall make full compensation for casting the pipe into the wall including grouting (if necessary), supplying and installing joints as per the detail drawing, adapting of formwork around the pipe and ensuring a watertight seal. Puddle flanges and other couplings are measured elsewhere.

PSHA **STRUCTURAL STEELWORK (SUNDRY ITEMS) (SANS 1200 HA)**

PSHA 3 **MATERIALS**

PSHA 3.1 **Structural Steel**

Add the following:

"Where stainless steel is to be used, the grade of stainless steel shall be grade 304L."

PSHA 5 **CONSTRUCTION**

PSHA 5.2 **Fabrication and Assembly**

PSHA 5.2.4 Welding

The Contractor shall submit with his shop drawings full details of welding procedures. All welds shall be continuous. Unless otherwise approved no longitudinal or overhead welding shall be carried out on site. Under no circumstances will cutting and welding of grid covers and frames be permitted on site.

Welders undertaking manual welding of permanent steelwork shall be experienced and competent artisans.

PSHA 5.2.6 Handrails

Add the following:

"Handrail stanchions shall be spaced at 1 300 mm centres unless otherwise indicated on the drawings or approved by the Engineer in writing. Handrails and stanchions shall be of the material as scheduled and all stanchion anchors shall be 12 mm diameter unless otherwise indicated on the Drawings."

PSHA 5.2.7 Ladder and step irons

Add the following:

"Ladders and step irons shall be galvanised mild steel with corrosion protection coatings as specified."

PSHA 5.2.8 Open grid floors

Add the following subitem:

"PSHA 5.2.8.3 All open grid floors and frames shall be galvanised mild steel with corrosion protection coatings as specified.

All open grid floor panels shall be open-ended as specified, except where bonding is specified on the Drawings. Cut outs shall be provided where indicated on the Drawings"

PSHA 8 **MEASUREMENT AND PAYMENT**

PSHA 8.3 **Scheduled Items**

PSHA 8.3.1 Structural steel

CHANGE "Unit : t" *to* " Unit : t, No or Sum ".

Add the following after the last sentence:

"Alterations to existing structural steelwork will be described in the Schedule and measured in number. Rates for these items shall include full compensation for all labour, tools, storing, additional steelwork, reinstallation, cleaning up, grinding, etc as described in the Schedule and shown on the Drawings."

PSHA 8.3.2 Handrails

Amend the sub-clause as follows:

“Handrails will be measured per running meter, and the tendered rate shall include for all stanchions, closure bends, sloping handrailings etc as shown on the relevant drawing.”

PSHA 8.3.3 Ladders, complete and installed (Drawing number or type and length stated)

Replace this item with the following:

"PSHA 8.3.3 Ladders, complete (installation elsewhere) (Drawing number or type and length stated)

Separate items will be scheduled for ladders of different materials, dimensions and height… ..... **Unit: number**

The tendered rates shall include full compensation for the cost of supplying the specified or scheduled ladders complete, including welding where applicable."

PSHA 8.3.4 Flooring, complete and installed with frames (Drawing number stated)

Replace this item with the following:

"PSHA 8.3.4 Flooring, complete **(installation elsewhere)**

(a) Open grid floors ..... **Unit : m²**

(b) Floor-plate floors ..... **Unit : m² or t**

(c) Frames and kerbs for flooring ..... **Unit : m**

Separate items will be scheduled for grid floors, floor-plate floors, frames and kerbs of different materials, dimensions, weight and different methods of fixing.

The tendered rates shall include full compensation for the cost of supplying the specified or scheduled types of flooring, frames or kerbing complete, including welding where applicable."

PSHA 8.3.6 Corrosion protection

Replace this item with the following:

"PSHA 8.3.6 Corrosion protection ..... **Unit : Sum**

Separate items will be scheduled for different systems of corrosion protection. Separate subitems will also be scheduled for different elements to be coated/protected.

The tendered sums shall include full compensation for all material, preparation, etc, related to the specified corrosion protection system in accordance with the Particular Specification PQ."

PSL **MEDIUM-PRESSURE PIPELINES**

PSL 2 **INTERPRETATIONS**

PSL 2.1 **References**

PSL 3 **MATERIAL**

PSL 3.1 **General**

Add the following paragraphs:

"For each type of pipe to be delivered to the site the individual pipes shall have a standard length, which shall correspond with standard lengths offered by the pipe manufacturer in his catalogue, with a maximum allowable variation in length of+,_ 2%.

A pipe which has a shorter or longer length than the defined standard will be rejected by the Employer's Agent, except where such non-standard lengths are required in terms of the contract and have been specifically manufactured or cut as such by the pipe manufacturer or supplier."

PSL 3.4 **Steel Pipes, Fittings And Specials**

PSL 3.4.2 Pipes of nominal bore up to 150 mm

Add the following:

"The pipes shall be 'normalised' or seamless steel pipes and shall be used with malleable cast iron fittings complying with the requirements of SABS 509."

Add the following:

PSL 3.4.3 Pipes of nominal bore over 150mm

Add the following after the last sentence:

Grade C steel pipe shall be used, and the wall thickness must comply with column 3 of table 2 of SANS 719."

Add the following:

PSL 3.4.5 Stainless steel pipes

"Stainless steel pipes shall be Grade 304, shall comply with ANSI B36.19 and the wall thickness shall comply with schedule 10S."

PSL 3.7 **Other Types of Pipes**

PSL 3.7.1 PVC-U pipes

Replace "uPVC" with "PVC-U" in the heading and first sentence.

Replace "SABS 966" with "SANS 966 : PART 1:2000 (PVC-U).

Add the following:

"All PVC-U pipes shall be class/PN 16 unless otherwise specified using spigot and socket rubber ring joints. All fittings (bends, tee's reducers, etc.) to PVC-U pipes shall be Ductile Iron to EN12842, fusion bonded thermoplastic coated internally and externally with Plascoat PPA 571 HES, to minimum 0.25m coating thickness with EPDM rubber insert seal or stainless steel 304 flanged tees as billed. All Duclile iron and steel fittings must be wrapped."

PSL 3.7.2 Polyethylene pipes

Replace "SABS 533" with "SANS ISO 4427 : 1996 (PE63, 80, 100)".

Add the following:

"All HDPE pipes shall be HDPE PE100 to SANS/ISO 4427 pipes, minimum class/PN16 or as specified in the schedule of quantities and 20 to 40mm dia HDPE pipes shall be PN16 or as specified in the schedule of quantities. All fittings shall be class 16. All bends and tees will be moulded and class 16''.

PSL 3.9 **Corrosion Protection**

PSL 3.9.2 Steel Pipes

Steel pipes shall be mild steel or stainless steel as shown on the drawings or shown in the schedule of quantities.

All mild steel pipes, specials and fittings with nominal diameter up to and including 150mm shall be hot dipped galvanized to SANS 121 and SANS 32 and Carboguard (Product of Carboline) 891 coated or stainless steel 304 as billed. All steel pipes, specials and fittings with nominal diameter greater than 150mm shall be lined internally and coated externally with Protective Epoxy Paint Product Carboguard (Product of Carboline) 891, applied in three coats and minimum 125 microns dft (dry film thickness) per coat to manufacturer's specifications.

Plain ended fittings shall be joined with approved couplings coated with 300 microns of a Polymer Resin product to the manufactures specifications.

1) Specification

The cement mortar lining shall be applied in accordance with the American Water Works Association Specification C205-80 or as amended except where the Specification C205-80 is at variance with the requirements of this specification.

2) Thickness

The thickness of the cement mortar lining shall be 12 mm and shall be subject to a tolerance of 2 mm.

3) Roundness of pipe ends

The pipe ends shall be held truly round during the placing and the setting of the cement mortar lining.

4) Materials

Cement shall be freshly manufactured ordinary Portland cement complying with SABS 471-1971.

Sand shall consist of inert granular material and the grains shall be durable and uncoated. The sand shall be well graded and pass a 1,5-mm mesh screen. Sand shall be free from injurious amounts of clay, lumps, shale, soft or flaky particles, mica, loam, oil, alkali, and other deleterious substances. The total mass of such substances shall not exceed 3 per cent. The source of the sand shall be stated by the tenderer and be approved by the Employer's Agent.

Water shall be clean and free from injurious amounts of mud, oil, organic materials or other deleterious substances. Admixtures may be used provided the additive will not injuriously affect the water quality and written approval has been obtained from the Employer's Agent. The contractor shall submit test data to substantiate admixture performance.

The proportions of the ingredients shall be approved by the Employer's Agent. These proportions shall be determined from the characteristics of the aggregate. Measurement of the materials shall be by weight and the water-cement ratio shall be controlled and kept to a minimum, with an allowance being made as necessary for the most effective machine operation and adhesion of mortar to the pipe."

PSL 3.9.3 Protection against Electrolytic corrosion

Add the following:

"All nuts and bolts for pipes, pipe specials etc must be provided with an approved insulating material to prevent Electrolytic corrosion."

PSL 3.9.5 Joints, Bolts, Nuts and Washers

Add the following:

All bolts, nuts and washers for mild steel pipework shall be hot dip galvanized to SANS 121 and SANS 32 and shall be grade 8.8 to SANS 1700 and ISO 898 or stainless steel 316, as shown on the drawings or as billed.. Two washers shall be used with every bolt connection to prevent damage to coatings. Nuts, Bolts and Washers for

stainless steel pipes shall be stainless steel grade 316 and must be treated with a Nickel based anti-seize compound such as Chesterton 725 or equivalent."

Only stainless steel bolts, washers and nuts shall be used on all fittings such as saddles, flanges, short collar couplings, etc.

Suitable isolation shall be provided between flanges, washers and bolts to prevent galvanic corrosion between dissimilar metals (e.g. between stainless steel and mild steel or cast iron). Shaft thread shall be covered with heat shrink insulation (or similar approved) and 3mm Caf non-conductive washers shall be used with standard washers where dissimilar fittings are joined.

PSL 3.9.6 ***Corrosive soil***

Steel pipes in contact with soil shall be wrapped with Densopol 80 HT or an equivalent approved product, strictly in accordance with the manufacturer's instructions and as described on the drawings.

PSL 3.10 **Valves**

Replace the contents of this subclause with the following:

"Valves shall be the standard cast-iron gate valve for waterworks and shall comply with the following requirements:

(a) Valves shall be left hand closing with a non-rising spindle and spindle cap bolt to spindle with stainless steel 316 bolt.
(b) Valves shall be class 16.
(c) Valves shall comply with the requirements of SABS 664/1974. "AVK" or similar approved.
(d) Valves shall be the resilient seal type.
(e) Valves shall be coated before delivery with a 225 micron Copon EP 2300 epoxy paint applied to all internal services after it has been thoroughly cleaned by grit blasting to SA2½ finish in compliance with SIS 050900.
(f) The direction for turning the valve open or closing must be permanently marked on the valve."

"Fire hydrants shall be the standard cast-iron fire hydrant and shall comply with the following requirements :

(a) Fire hydrants shall be anti clockwise closing with a non-rising cast iron spindle and spindle cap and also fitted with a captop with a stainless bolt to attach the captop to the hydrant spindle. No clips, split pins or screws allowed. Hydrants shall be supplied and installed complete with a flanged extension piece complete with cadmium plated nuts and bolts to ensure depth not greater than 400mm.
(b) Fire hydrants shall be class 16
(c) Fire hydrants shall be a type 65 "AVK or Ainsworth" or any approved by the local authority
(d) Fire hydrants must have London Round thread outlets
(e) Hydrants shall be coated before delivery with a 225 micron Copon EP 2300 epoxy paint applied to all internal services after it has been thoroughly cleaned by grit blasting to SA2½ finish in compliance with SIS 050900.
(f) The direction for turning the fire hydrant open or closing shall be permanently marked on the fire hydrant.

PSL 5 **CONSTRUCTION**

PSL 5.2.2 Welding of HDPE pipes

The HDPE pipes shall be supplied in straight lengths, and not in coils, to avoid the pipe ends from curling and thus hindering the welding process. To reduce the number of welds necessary, pipes should be supplied in the maximum straight lengths available.

The HDPE pipe shall be joined by means of heat fusion using approved butt welding equipment by fully trained operators in accordance with **SANS 10268-1** and the pipe manufacturer's specifications. The Contractor shall ensure that the welds are kept dust free. The Contractor shall confirm with the Employer's Agent of the welding machine and of the welding parameters and tables to be used. Test welds shall be carried out by the Contractor and shall be tested by an independent laboratory and once approved by the Employer's Agent before the welding on site can commence. No additional payment will be made for test samples which are required and allowance must be made for one test weld per pipe diameter applicable to the contract.

The Contractor shall provide a digital thermometer or similar for the accurate measurement of the weld temperatures.

No separate payment shall be made for the welding of pipes and the removal of internal and external beading is not required, except where pipe bursting will be undertaken.

PSL 5.6 **Valve and Hydrant Chambers**

PSL 5.6.1 General

Replace the words "drawing L-1" in the second line with "the drawings".

PSL 5.6.2 Construction of chambers

Replace the words "drawing L-1, L-2 and L-3" in the fourth line with "the drawings".

PSL 5.10 **Disinfection of Potable Water Pipeline**

Add the following :

"d) the pipeline shall also be flushed repeatedly through each saddle, prior to connecting to the existing house connection to ensure each house connection is clean before connecting to the existing house connection.
e) the local authority and Employer's Agent will be given at least 48 hours notice prior to disinfection of the pipeline, to arrange suitable attendance of the procedure.
f) testing of the municipal water from the pipeline after the sterilized water was flushed out."

PSL 5.11 **Standpipes**

Standpipes shall be erected in positions and to details shown on the drawings.

PSL 5.12 **Marker Blocks**

Marker blocks shall be manufactured and positioned as shown on the drawings.

PSL 5.13 **Pipeline Route Markers**

Route markers for the various water pipelines shall be erected in positions and be manufactured according to details shown on the drawings."

PSL 7 **TESTING**

PSL 7.3 **Standard Hydraulic Pipe Test**

PSL 7.3.1 Test pressure and time of test

PSL 7.3.1.2 *Add the following:*

The test pressure for field testing shall be 1.25 times the working pressure indicated by the class of the pipe.

(e.g. Test at 15 bar for class 12 pipe).

"The Employer's Agent may order re-testing of any section of the entire network at any time after the trench is backfilled. The contractor will do the tests and any remedial work required at his own cost.

Any isolating valves and/or end caps, blank flanges, or other isolating devices required for testing mixed types of classes of pipelines which traverse over a wide range of altitudes, will be installed by the contractor at his own cost."

PSL 8 **MEASUREMENT AND PAYMENT**

PSL 8.2 **Scheduled Items**

PSL 8.2.1 Supply, lay and bed pipes complete with couplings

Add the following:

"The tendered rates shall also include full compensation for the cost of all labour, material, plant, chemicals and overheads for the complete sterilisation of the newly installed potable water reticulation system and the disposal of the sterilising solution as approved by the Employer's Agent."

The tendered rate shall also include full compensation for testing the water from the newly installed and sterilized pipeline by an independent laboratory to confirm it conforms to SANS 241:2015 for E.coli, Total Dissolved Solids, Turbidity and pH.

PSL 8.2.11 Anchor/Thrust blocks and pedestals

Add the following:

"The tendered rates shall also include the wrapping of uPVC pipes and fittings with Densopol 80 or similar approved material where the pipes and fittings are in contact with concrete."

Add the following items:

PSL 8.2.15 ***Special wrapping in corrosive soil..... Unit : m***

Add the following:
"The tendered rate shall include full compensation for the construction of the wrapping as specified. The total cost for additional wrapping required for flanges and specials shall be deemed to be included in the rate.

The surface shall be clean, to minimum preparation ST2 according to Sib 055900-1967. The surface shall furthermore be brushed or sprayed with Denso priming solution or Denso SI05 Paste Denso Mastic to create a profile for Denso tape, so as to ensure that there are no air voids taming beneath the Denso tape. Denso tape shall then be wrapped spirally around the prepared area and then double wrapped with polyethelene tape (minimum 300 micron thick)".

PSL 8.2.17 Marker blocks / pipeline route markers

Measurement and payment shall be as per Scheduled item 8.2.9 (SABS 1200 LD).

PSL 8.2.18 Connection to existing watermain..... **Unit : No**

The tendered rate shall include full compensation for the location of the main pipe, excavation, removal of surplus material, cutting into the main pipe supply and installation of all fittings and constructing the connection as shown on the drawings, backfilling with clean sand and compacting to 100% Mod Aashto. The tendered rate will also include all liaison with the local authority and closing of the water supply and notifying affected residents.

PSL 8.2.30 Specific testing of HDPE pipe material as per SANS 4427 and SANS 6269

Carbon Black Content Test..... **Unit : No**

Carbon Black Dispersion Test ..... **Unit : No**

Oxidation Induction Time Test ..... **Unit : No**

Melt Flow Rate Test ..... **Unit : No**

Tensile Test..... **Unit : No**

The tendered rate shall make full compensation to provide the sections of pipe to be tested, arranging with an independent laboratory for testing, performing the tests as per the relevant specification and supplying the results thereof to the Engineer.

Should the results of any test indicate that the quality of the materials utilised/standard of workmanship achieved is not in accordance with the specification, the cost of such test will be for the contractor's cost and no payment will be made through these items.

PSLB **BEDDING (PIPES) (1983)**

PSLB 3.2 **Selected Fill Material**

Add the following:

“Where required, selected fill material used for bedding, is to be stabilised with 5% cement as specified under subclause PSDB 3.5(c).”

PSLB 3.3 **Bedding**

Add the following:

"PVC-U and HDPE pipes are considered to be flexible pipes for the purpose of this subclause."

PSLB 3.4.1 Suitable material available from trench excavation

Replace the words "(but is not required)" in the fifth line with the words "(at his own cost)".

PSLB 5 **CONSTRUCTION**

PSLB 5.1 **General**

PSLB 5.1.2 Details of bedding

Add the following paragraph.

"The dimension "X" for flexible and rigid pipes as indicated on drawing LB-1 will be 150 mm unless otherwise indicated on the drawing. The dimension "X" will be measured from the invert of the pipe."

PSLB 5.1.4 Replace "90%"

with:

"90% (100% for sand)".

PSLB 7 **TESTING**

Add the following :

PSLB 7.3 **Routine Testing**

The Contractor must test the bedding density and grading every 50m. A laboratory grading analysis must be undertaken every 50m. All test positions must be recorded by the Contractor and submitted with test results to the Employer’s Agent within 7 Days of placing the bedding.

PSLB 8 **MEASUREMENT AND PAYMENT**

PSLB 8.1 **Principles**

PSLB 8.1.1 Supply of Bedding Materials measured separately

Insert the following words after the word “placing” in the last sentence : “density testing and grading analysis every 50m,”.

PSLB 8.1.3 Volume of Bedding Materials

Add the following to paragraph (b):

"The depth of bedding as specified in PSLB 5.1.2 is applicable. The volume of bedding material displaced by the pipeline shall not be included in the calculation of the volume of bedding material."

PSLB 8.1.5 Disposal of Displaced Material

Replace the contents of this subclause with the following:-
"Material displaced by the pipeline and by importation of material from sources other than trench excavation, shall be disposed of outside the boundaries of the site."

PSLB 8.1.6 Freehaul

Notwithstanding what is specified in subclauses 8.2.1, 8.2.2.2, 8.2.2.3, 8.2.4 and 8.2.5, the freehaul distance for disposal of all displaced (surplus) material, shall be unlimited."

PSLB 8.2 **Scheduled Items**

ADD THE FOLLOWING:

"PSLB 8.2.7 Provision of stone/geofabric to deal with water ..... **Unit : m3/m²**

If in the opinion of the Employer's Agent, the Contractor complied with the requirements for dealing with water as specified in PSA 8.8.7, the Employer's Agent may instruct the installation of crushed stone and filter fabric. Payment for these items will only be made where instruction was given in writing by the Employer's Agent.

The provision of crushed stone bedding material will be measured by volume based on the specified trench width and a maximum layer thickness of 300 mm unless a greater depth has been specified by the Employer's Agent.

The unit rate shall cover the cost of supplying and laying the crushed stone.

The filter fabric will be measured separately by area based on the specified trench width, a stone bedding thickness of 300 mm and an overlap of 300 mm.

The rate shall cover the cost of the supply, delivery and laying of the filter fabric."

PSLC CABLE DUCTS

PSLC 3 **MATERIALS**

PSLC 3.1 **Ducts**

Replace the subclause and replace with the following :

The construction of ducts shall comply with the following :

Ducting Design Criteria		
Duct to extend beyond kerb line (minimum distance) (Beyond sidewalk)		1.0m
Cover below finished road surface	High voltage cables	1 000mm
	Medium voltage cables	1 000mm
	Low voltage cables	1 000mm
	Telkom and fibre optic	1 000mm
	All other ducts	1 000mm
Minimum trench width		600mm
Minimum side clearance (between trench wall and duct)		200mm
Minimum horizontal clearance between adjacent ducts		150mm
Minimum vertical clearance between ducts		100mm

Draw wires (nylon rope) to be installed in all ducting, with a 2m free length at each end.

Duct ends shall be sealed at end with uPVC end caps with rubber ring.

Ducting for Traffic Signals shall be provided with Cable Inspection Chamber at duct ends as per detailed drawing.

Ducting Pipe Materials

Ducting Pipe Materials		
Service Provider	**Pipe Diameter (mm Ø)**	**Specification**
Telecommunication	110	uPVC Class 34 heavy duty complying with SABS 791 using spigot and socket rubber ring joints.
Electrical: Low voltage	110	uPVC Class 400 KPa complying with SANS 1601 using spigot and socket rubber ring joint.
Electrical: High voltage	160	
Traffic signals	110	
Irrigation (parks)	110	uPVC Class 34 heavy duty complying with SABS 791 using spigot and socket rubber ring joints.

All pipe ends shall have all sharp edges and irregularities removed prior to installation. Pipe ducts are to be arranged as shown on the drawings. The maximum allowed deviation in any direction is 30mm. Before the installation of end caps, all pipes shall be cleaned in accordance with 1200 LC Clause 7.3, shall be checked and proved using a mandrel.

Add the following:

"PSLC 3.1.1 Telkom SA Limited (Telkom) materials

Should material such as ducts, screening wire and draw wire be supplied, free of charge, by Telkom against a receipt signed by the Contractor when the material is collected, then the following will apply.

The Contractor shall notify Telkom at least 2 weeks prior to the date on which the pipes are required.

The Contractor shall use the materials supplied by Telkom in the most economical manner. Materials lost or damaged through neglect on the part of the Contractor or his workmen shall be replaced by the Contractor at his own expense.

It is a condition of this Contract that the Works and all material and equipment handed to the Contractor shall be insured against damage or loss as stipulated in Conditions of Contract.

On completion of the work, the Contractor shall deliver all surplus material to the nearest Telkom engineering yard.

PSLC 3.1.2 Split uPVC pipes

Split pipes shall only be used to provide ducts for existing services that cannot be severed and threaded through the ducts. The pipes shall be cut accurately in the middle, and opposite halves shall be matched as sawn. Split pipes shall be placed around the service, firmly bound by steel straps, and encased in concrete."

PSLC 3.4 **Cable Duct Markers**

Add the following:

"A cable duct marker shall consist of a 300 mm x 300 mm x 100 mm deep, class 20 MPa/19 mm concrete block, connected by means of a non-ferrous metal strip to a temporary plug to seal the end of the duct. The plug shall prevent moisture or soil from entering the duct. The metal strip shall be firmly connected to both the plug and the concrete block. The concrete block shall be positioned not further than 0,5 m horizontally from the end of the cable duct. The face of the concrete block shall be clearly marked to indicate the specific purpose of the ducts."

OR

Duct Marking Details

Electrical duct crossings shall have danger tape installed on top of the concrete duct section just below the pavement structure of a road.

Services Type	Lettering	Colour	Specifications
Ducts			
Telkom	T	Green	Precast recessed kerbs are required.
Electrical	E	Red	
Traffic	R	Yellow	
Parks (Irrigation)	P	Black	
General	D	Black	

PSLC 5 **CONSTRUCTION**

PSLC 5.1 **Excavation Of Trenches**

PSLC 5.1.1 Trench widths and depths

PSLC 5.1.1.2 *Add the following:*

"For telephone services the pipe trench shall have a minimum depth to provide a cover of not less than 1 000 mm between the top pipe and the finished road surface level. Where this depth cannot be maintained due to the nature of the ground, the depth may be altered at the discretion of the Telkom Representative. When the pipe has less cover than 800 mm it shall be covered by concrete slabs with a minimum thickness of 50 mm and a width equal to 400 mm plus the diameter of the pipe they protect, unless otherwise directed by the Telkom Representative. The concrete slabs shall be provided by the Contractor."

PSL 5.3 **Duct Laying**

PSLC 5.3.1 Straight laying

Add the following:

"If the trench is to contain more than one pipe exceeding 75 mm internal diameter, the base of the trench shall slope so that water may drain away from the pipes. The level of the bottom of the trench shall fall at least 75 mm per 30 m."

PSLC 5.3.3 Draw wire

Replace the contents of this subclause with the following:

"A length of 3,05 mm diameter galvanised iron wire (supplied by Telkom) shall be attached to the cleaning-brush and drawn into the pipe and left for use as a draw wire. A surplus of wire of at least 2 m in length, shall be left neatly coiled at each end of each duct. All open pipe ends must be plugged to prevent the ingress of dirt."
Add the following subclauses:

PSLC 5.3.6 Screening

PSLC 5.3.6.1 *General*

Pipe ducts shall be screened against electrical interference by copper wires. All joints in screen wires shall be soldered.

PSLC 5.3.6.2 *Composition of screen for pipe ducts*

The screen shall consist of two strands of 2,50 mm diameter copper wire, bound together by two turns of similar copper wire every 5 m. The binding shall be undertaken by the Contractor. The screen shall be placed approximately 200 mm above the pipe or the top layer of pipes."

PSLC 5.6 **Laying of Cables with Other Services**

Add the following:

"Trenches for telephone ducts shall be excavated so that pipes can be laid at least 300 mm from power cables. Where this is not possible, pipes shall be separated from power cables by vertically placed concrete or paving slabs."

PSLC 5.7 **Crossing of Telephone and Electricity Cable Ducts**

Replace this subclause with the following:

"PSLC 5.7 **Crossing of Telephone Ducts with Other Services**

When a duct crosses an existing service such as an electricity supply cable, a water supply pipe or a sewerage pipe, the telecommunication duct shall, if possible, be laid not less than 50 mm above the existing service. Where the depth of the existing service is insufficient for this to be done, the telecommunication duct shall be laid to pass not less than 50 mm below the other service."

PSLC 5.8 **Road Crossings**

Replace “0,5 m" with "1,0m" in the last sentence.

Add the following:

"Duct ends must be blanked off with endcaps, and all ducts laid are to be provided with galvanized draw-wires for subsequent cable-pulling operations by others."

PSLC 7 **TESTING**

PSLC 7.1 **Access for Employer’s Agent**

Add the following:

"The Telkom Representative shall have free access to the Site at all times. He has the right to inspect work on telecommunication ducts at any stage and may reject any work not executed in an approved, substantial and workmanlike manner and in accordance with the specifications.

No pipes shall be covered before inspection by a Telkom Representative and Employer’s Agent.

Add the following subclause:

"PSLC 7.4 **Final Inspection**

A final inspection will take place on completion of the work. The Contractor shall, at his own cost, expose all pipe ends prior to the final inspection, after which they may be finally plugged and closed."

PSLC 8 **MEASUREMENT AND PAYMENT**

PSL 8.2 **Scheduled Items**

PSLC 8.2.5 Supply, lay, bed, and prove duct:

Replace the payment paragraph with the following:

"Separate items are scheduled for each type and diameter of duct.

The rates shall cover -

(a) for Telkom ducts, the cost of collecting the ducts, draw wire and screening wire and the cost of laying the ducts and screening wire, installing the draw wire, jointing, bedding and providing all as specified, and

(b) for all other ducts, the cost of providing all the material and the cost of laying the ducts, installing the draw wire, jointing, bedding and providing all as specified."

"PSLC 8.2.10 Joining new duct to existing duct ..... **Unit : No**

The rate shall cover all costs for joining the two ducts, including the supply of any necessary couplings."

PSLE STORMWATER DRAINAGE

PSLE 3 MATERIALS

PSLE 3.1 **Culvert Units and Pipes**

(d) Skewed ends

ADD THE FOLLOWING:

*"*Skewed ends for pipe culverts may be cut on Site."

PSLE 3.4 **Manholes, Catchpits, and Accessories**

PSLE 3.4.1 Bricks

ADD THE FOLLOWING:

"Bricks shall be engineering bricks complying with the requirements of SABS 227."

ADD THE FOLLOWING SUBCLAUSE:

PSLE 3.5 **Geotextiles**

The filter fabric to be used below the gabions and matresses, as well as for subdrainage, shall comply with the following requirements:

(a) Composition and manufacturing

The synthetic-fibre filter fabric, or geotextile, shall be manufactured from a synthetic polymer processed into a permeable, homogeneous sheet. On account of the temperature and moisture susceptibility of polyamide, this synthetic product is not considered acceptable

(b) Classification:

The geotextile is classified according to the mechanical properties thereof, viz its penetration load, puncture resistance and the minimum water-percolation rate as measured in the permeability test. The table below gives the values for the properties:

PROPERTY	GRADE 1	GRADE 2	GRADE 3	TEST METHOD
Penetration Load (minimum), N	3800	2400	1500	3.5 of SABS 0221-1988
Puncture Resistance (maximum), mm	14	26	32	Clause 8114 of COLTO Standard Specifications Standard Specifications
Water Percolation (minimum), $l/m^2/s$	20	20	20	3.7 of SABS 0221-1988
Mass per unit area (minimum), g/m^2	320			3.4 of SABS 0221-1988

Notes: - The standard atmosphere for testing and the preconditioning atmosphere for all geotextile tests (SABS tests and others) shall have a relative humidity falling within the range of 0 to 80 per cent and a temperature within the range of 15 °C to 35 °C.

The resistance of a geotextile to puncture is the average diameter of the hole formed when a 45° cone with a mass of 1 kg is dropped through 500 mm onto the geotextile fixed in the holding device.

(c) Durability

A geotextile is required to comply with the following specifications:

- Resistance to chemical attack

The geotextile shall withstand the level of aggressiveness of the soil and ground water given below, without significant loss of its strength and hydraulic properties during its design life of 25 years:

Soil and ground water with a pH in the range of 4 to 12 (pH to be determined by Method A20, TMH1,1986)

- Resistance to ultra-violet light

  The geotextile shall maintain at least 80% of its original strength after direct exposure to sunlight of 1 500 hours.
- Resistance to rot. The geotextile shall be entirely rot proof and shall not support the growth of algae.

(d) Geotextile evaluation and selection

The contractor shall, at least 45 days before the installation of the geotextile, submit to the Employer's Agent samples of the geotextile(s) he proposes to use, together with the relevant test results produced by an approved laboratory.

The Employer's Agent may require additional samples and have these tested by another laboratory at his discretion. Such tests will be paid for under the provisional item allowed for, but only if compliance with the requirements of this specification is confirmed.
No extra payment shall be made for providing the samples

(i) ***For river/ erosion protection works underlying gabions and gabion mattresses***
The requirements for Grade 1 geotextile shall apply.

Geotextile of non-woven construction is preferred, and woven geotextiles will be considered only if published data can be provided which show the satisfactory long-term performance of these geotextiles in an environment similar to that in which they are to be used.

Geotextiles, other than non-woven needle-punched material, will be considered only if actual field performance data for geotextiles which have been in use in river protection works for 15 years or longer, can be supplied.

(A typical product with the required track record is Kaytech's Bidim Grade A6)

(ii) ***For subdrainage***

The requirements for Grade 2 and Grade 3 geotextiles shall apply.

A functional evaluation shall be done of the permeability reduction (flow test)after 400 hours by an approved laboratory as per test method described in COLTO Standard Specifications for Road and Bridge Works: 1998 Clause 8114 (b).

The test is conducted on the geotextile in combination with the characteristic soil sample obtained from the site where the geotextile is required.

The permeability coefficient K_{400} of the geotextile-soil system shall be classified according to the following criteria:

SOIL	**P (%)**	**P< = 1,0**	**1,0 < P < = 7,0**	**7,0 < P < = 50**	**P > 50**
	D_{10} (mm)	**D_{10}> = 0,150**	**0,095 < = D_{10} < 0,150**	**0, 007 < = D_{10} <0,095**	**D_{10} < 0,007**
K_{400}	**HIGH**	**K_{400} > = 46,0**	**K_{400} > = 19,0**	**K_{400} > = 9,0**	**K_{400} > = 6,0**
	MEDIUM	**K_{400}< 46,0 AND K_{400} > = 15,0**	**K_{400} < 19,0 AND K_{400} > = 6,0**	**K_{400} < 9,0 AND K_{400} > = 3,0**	**K_{400} < 6,0 AND K_{400} > = 2,0**

K_{400} = permeability coefficient after 400 hours of testing expressed as a percentage of the permeability coefficient at the start of the test.

P = percentage passing through 0,075mm sieve

D_{10} = the diameter of the grain size, such that 10 per cent by mass is smaller

The geotextile-soil system shall either fall in either the medium or high range of K_{400}. In general the geotextile with the highest value of K_{400} will be specified for use with the particular geotextile-soil combination. In addition actual experience of field performance will also be considered during the selection process.

Installation conditions with regard to depth, nature of sides of excavation, degree of sharpness of drainage stone, and compactive effort used, shall also be taken into account when the final selection is made. (Typically Kaytech's Bidim Grade A4 should satisfy the Grade 2 requirements of this specification, and is suitable for trench depth less than 2m, with rough sides or sharp drainage stone, placed with moderate compaction.)

"PSLE 3.6 **Materials for Subsurface Drains**

(a) Pipes and fittings

Pipes for subsurface drains shall be normal duty, perforated or slotted uPVC pipes complying with SABS 791. Fittings shall be class 34 heavy duty and shall also comply with SABS 791.

The size of the perforations in perforated pipes shall in all cases be 8 mm in diameter ± 1,5 mm, and the number of perforations per metre shall not be less than 26 for 100 mm pipes and 52 for 150 mm pipes. Perforations shall be spaced in two rows for 100 mm pipes and in four rows for 150 mm pipes, as shown on the Drawings.

Slotted pipes shall have a slot width of 8 mm with a tolerance of 1,5 mm in width. The arrangement of the slots is subject to the Employer's Agent's approval, but the total slot area shall not be smaller than that specified for perforations.

(b) Crushed stone

Crushed stone shall be 19 mm single-sized and shall comply with the requirements of SABS 1083.

(c) Geotextiles

Geotextiles shall be a non-woven, spun or thermic-bonded continuous filament fabric consisting of at least 85% by mass of polypropylene, polyester or other approved material and manufactured for civil-engineering applications by a recognised manufacturer."

PSLE 5 **CONSTRUCTION**

PSLE 5.2 **Bedding and Laying**

PSLE 5.2.2 Pipe culverts

ADD THE FOLLOWING:

"The class of bedding required for the various pipe culverts is shown on the Drawings."

ADD THE FOLLOWING SUBCLAUSES:

"PSLE 5.8 **Construction of Subsurface Drains**

After the completion of the excavations, the bottom portion of the trench shall be lined with geotextile sheeting as shown on the Drawings. The top edges of the vertical portions of the geotextile sheeting shall be tacked to the sides of the excavations with nails or by another suitable approved means. An overlap of at least 200 mm shall be provided at each joint. Geotextile sheeting damaged during the installation or construction shall be replaced at the Contractor's cost.

A layer of crushed stone of the thickness shown on the Drawings shall be placed on the geotextile and be lightly tamped and finished to the required gradient.

Pipes of the required size shall be firmly bedded on the permeable material, true to level and grade, and coupled where required. The trench shall then be backfilled with crushed stone to the height above the pipes shown on the Drawings or as directed by the Employer's Agent.

Crushed stone shall be placed in layers of not more than 300 mm at a time and shall be lightly compacted. Care shall be taken to prevent the contamination of crushed stone during construction of the subsurface drains and all material contaminated by soil or silt shall be removed and replaced by the Contractor at his own expense.

Perforated and slotted pipes shall be joined by couplers. Perforated pipes shall be laid with the perforations at the top or at the bottom, as directed. The higher end of subsurface drain pipes shall be sealed off with a loose concrete cap of class 20/19 concrete, as shown on the Drawings and at the lower end of the pipe shall be built into a concrete head wall providing a positive outlet, or it shall be connected to the stormwater pipes or culverts.

After all the crushed stone filter material has been placed, the protruding vertical sections of the geotextile sheeting shall be folded back across the filter material so that the filter material will be completely enwrapped in the geotextile. An overlap of at least 200 mm shall be provided between the portions folded back.

The remainder of the trench shall be immediately backfilled with approved material preferably obtained from the excavations, in layers not exceeding 150 mm and compacted to 90% of modified AASHTO density, unless otherwise ordered by the Employer's Agent. The trench shall be specially protected against the ingress of water, soil and silt until the backfilling has been completed.

Permeable material in subsoil drains shall not be taken to the surface but shall be discontinued at such heights as will be determined by the Employer's Agent.

Any section of a subsurface drain constructed with pipes without perforations or slots shall be backfilled with impermeable backfill material as described above. Suitable excavated material may be used for backfilling.

PSLE 5.9 **Backfilling Around Structures**

Material used to backfill around manholes that fall within the road reserve must comply with SABS 1200 LB subclause 3.1. Material used to backfill around other manholes must comply with SABS 1200 DB subclause 3.5.

Material adjacent to the walls of the manholes must be watered and mixed to its optimum moisture content, and compacted in layers not exceeding 150 mm in the compacted state. Compaction must be minimum 100% MOD AASHTO for non-cohesive material, and minimum 93% of MOD AASHTO density for cohesive materials.

Backfilling around the structure must be carried out in even layers to avoid uneven side forces."

PSLE 8 MEASUREMENT AND PAYMENT

PSLE 8.2 **Scheduled Items**

PSLE 8.2.8 Supply and installation of manholes, catchpits and the like:

REPLACE THE CONTENTS OF THE ITEM WITH THE FOLLOWING:

"Separate items are listed for manholes and catchpits etc. with reference to depths (increments of 1,0 m) and type. The rate shall cover the cost of any excavation in all material (including disposal of surplus) and backfilling with suitable material in accordance with PSLE 5.8 (including importation of material if required) additional to what is measured under the relevant pipe trench item (refer to SABS 1200 DB 8.2.2 and 8.2.3). The rate shall further cover the cost for building the manholes and catchpits complete as shown on the relevant drawings including manhole covers and frames and grids".

The depth category of manholes and catchpits shall be measured as the difference between the cover level and the deepest invert level."

3.4.3: PARTICULAR SPECIFICATIONS

The following Particular Specifications are included and forms part of the contract.

PB : Building work

PB BUILDING WORK

PB 01 SCOPE

This section covers the various construction activities associated with the erection of buildings, which form part of certain civil projects.

Building work shall be carried out in accordance with the National Building Regulations and the information contained in this section.

Work appurtenant to the erection of buildings such as earthworks, concrete work, structural steelwork, etc, shall be carried out as specified in the appropriate sections of these specifications and will be measured and paid for under those sections.

PB 02 BRICKWORK, PLASTER WORK AND FLOOR SCREEDS

PB 02.1 Materials

(a) Bricks

Bricks shall comply with SABS 227 and shall be classified according to their intended use as defined below.

Engineering bricks in both the face and stock categories shall be durable and selected for their uniformity of dimension, with a minimum average compressive strength of 49 MPa. These bricks shall be of clay, and shall be pressed or wire cut and free from cracks, chips or defects.

Face bricks shall not require any further decorative treatment and shall be selected for their uniformity of dimension, colour and texture, with a minimum average compressive strength of 28 MPa. These bricks shall be of clay, and shall be pressed or wire cut and free from chips, cracks, stones or other defects. Water absorption shall not exceed 2%. Special care shall be taken in the loading, stacking and handling of face bricks, as no damaged bricks may be used.

Stock bricks shall be suitable for general building work and shall have a minimum compressive strength of 7 MPa. Special stock bricks shall have a minimum compressive strength of 17 MPa. The water absorption of stock bricks shall not exceed 10%.

Satisfactory proof of the load-bearing capacity of the bricks offered shall be submitted before deliveries are made to the Site.

Air bricks shall be well-burnt terracotta and shall be free from cracks and blemishes and lined with copper mosquito gauze.

Three samples of each type of brick shall be submitted to the Engineer for approval. All subsequent deliveries shall be of a standard equal to or better than that of the approved samples.

(b) Cement

Cement shall comply with the requirements of SABS 471, and shall be stored under cover. The use of Portland blast-furnace cement (PBFC) which complies with the requirements of SABS 626 will only be allowed if so specified in the Project Specifications.

(c) Aggregate

Fine aggregate shall be naturally occurring sand or shall consist of crushed rock or gravel, and shall be hard, clean and free from adherent coatings or other deleterious matter. Sand for plaster and mortar shall comply with the requirements of SABS 1090, whereas the aggregates for normal and granolithic floor screeds shall comply with the requirements of BS 1199 and BS 1201 respectively.

(d) Water

Water shall be clean and free from clay, silt, oil, acid, alkali, organic or other matter which would impair the required strength and durability of the mortar, plaster or floor screed.

(e) Wall ties

Wall ties shall be of the galvanized, crimped, single-wire type with a 3,5 mm diameter, and shall comply with the requirements of SABS 28.

PB 02.2 **Construction of Brickwork**

(a) Cement mortar

Cement mortar shall, unless otherwise specified, consist of 1 part of Portland cement to 4 parts of sand by volume for normal brickwork and 1 part of Portland cement to 3 parts of sand by volume for reinforced brick- work. The ingredients for cement mortar shall be measured in proper gauge boxes on a boarded platform and thoroughly mixed. Alternatively, mixing may be by means of an approved mechanical batch mixer. Only when the dry ingredients have been thoroughly mixed and a mixture of uniform colour has been obtained may the water be added in sufficient quantity to obtain mortar with the required consistency.

Cement mortar shall be used within two hours of adding water to the mix and shall not be used after two hours or if it has begun to set. Mortar shall be turned over frequently until it is used to prevent it from setting.

(b) Brickwork

Dimensions of all the brickwork shall be set out and built as shown on the Drawings. Bricks shall be kept wet before laying and the top of brickwork shall be wetted before any further bricks are laid. Bricks shall be well buttered with mortar before being laid and all joints shall be thoroughly flushed up as the work proceeds. All joints to face brickwork shall be neatly made and key drawn with a 6 mm key.

Brickwork shall be carried up in a uniform manner with no portion being raised more than 1 m above an adjacent portion. All perpends, quoins, etc, shall be kept strictly true and square and the whole properly bonded together.

Brickwork shall be built in stretcher bond or English bond as shown on the Drawings, and bats shall not be used except where required for the bond. All joints shall be 10 mm wide and four courses shall measure 340 mm.

Brickwork for cavity walls and solid walls built in stretcher bond shall be tied with wall ties placed not more than one metre apart in every third course, and shall be staggered vertically or as otherwise specified in the Project Specifications. At openings, the ties shall be positioned not more than 300 mm apart along the periphery of the opening and 150 mm from the opening.

Face brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during heavy rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

(c) Reinforced brickwork

Brickwork over door and window openings shall be reinforced with steel rods, welded or expanded mesh, etc. Reinforcement shall be placed in each course of brickwork for a minimum of 4 courses or as shown on the Drawings. Reinforced brickwork shall continue at least 300 mm on each side of the openings.

Brick lintels shall be built upon rigid temporary supports left in position for not less than 7 days after bricklaying. Prestressed concrete lintels may be used where approved by the Engineer.

(d) Key for plaster

Joints of all brickwork receiving plaster shall be raked out, or the brick surfaces shall otherwise be prepared with an acrylic slurry or any other approved bonding agent.

(e) Damp-proofing

A damp-proof course shall be laid over the full width of all the walls at a minimum height of 150 mm above the final ground level or wherever else it may be required, and it shall be lapped for at least 150 mm at angles and joints. A damp-proof course shall also be laid and stepped up under all external sills.

(f) General

Rough and fair cutting shall be performed as required, and the brickwork shall be fitted around any steel work. Face brickwork shall be carefully cut and fitted to suit fittings.

Chases shall be left or formed for edges of concrete floors, staircases, etc. Chases shall also be provided wherever they may be required for pipes, conduits, switch boxes, distribution boards, and the like. Joints shall be raked out for flashings.

PB 02.3 **Plaster Work**

(a) Plaster coats

A plastered finish may consist of a combination of one or more of the following:

(i) A single coat or first coat, comprising one application of a 1:6 cement:sand mixture with a wood or steel-float finish.

If a first coat, the plaster shall be wood-floated and then scratched, raked or otherwise roughened to provide a mechanical key for the second coat, which shall be applied within 24 hours. Should it be impossible to apply the second coat within 24 hours, the first coat shall be kept moist until the second coat is applied.

(ii) A second coat comprising one application of a 1:6 cement:sand mixture with a wood-float finish.

(iii) A finishing coat comprising a 1:1,5 gypsum:sand mixture with a steel-float finish.

(b) Thickness

The total thickness of the plaster finish shall be 13 mm minimum and 20 mm maximum.

(c) Workmanship

All plaster work shall be finished smooth and ready to receive paint. Plaster shall be flush with the faces of all switch and plug boxes, the interiors of which shall be kept free from plaster. Plastered surfaces shall be plumb and jambs and reveals shall be formed square.

The plasterer shall cut out and make good all cracks, blisters and other defects and leave the plaster work, on completion, in a state which is acceptable to the Engineer.

PB 02.4 **Floor Screeds**

(a) Normal screeds

Normal screeds shall have a mix proportion by mass consisting of 1 part of Portland cement and 3 parts of fine aggregate. A minimum amount of water is to be used, but it shall be sufficient to allow adequate compaction.

Screeds shall be laid on clean hardened bases, prepared as for granolithic screeds, in panels not exceeding 14 m² and shall be steel-trowelled to a true and smooth finish. In monolithic construction the panels shall not exceed 30 m². Joints in screeds shall coincide as nearly as possible with joints in the bases. The thickness of screeds shall be as shown on the Drawings or as directed by the Engineer.

The entire screed surface shall be free from loose or raised particles of aggregate, trowel marks or from any irregularities, humps or depressions exceeding 5 mm when measured from a 3 m long straight-edge.

Screeds shall be cured for 3 to 7 days as may be directed by the Engineer, and shall be protected from damage.

No moisture-sensitive floor finish shall be laid on screeds unless a reliable moisture test shows that the screed is sufficiently dry to receive the covering.

(b) Granolithic screeds

Granolithic floor screeds shall be composed of 2 parts of Portland cement to 3 parts of aggregate with sufficient water added to obtain a consistency as dry as may be practicable. The screed shall be rendered with a wood float and struck off with a steel trowel after set has commenced.

The granolithic mixture shall be floated onto the concrete floor slab within 12 hours of the latter having been laid. Where this cannot be done within 12 hours, the concrete surfaces shall be thoroughly hacked, cleaned, watered and treated with an approved cement slurry or with an approved bonding agent, as may be directed, before the granolithic screed is laid.

Where a tinted granolithic screed is specified, it shall be placed in two layers, a lower layer placed to within 6 mm of the finished level and an upper layer into which the pigment has been mixed. No dusting on of colouring material will be allowed.

The surface of all granolithic screeds shall be kept damp for a period of at least 7 days after laying by covering it with polyethylene sheeting or by thickly covering it with wet sand, sawdust or hessian kept moist by frequently sprinkling it with water.

The granolithic screeds shall be not less than 20 mm thick, finished to falls as shown on the Drawings, and shall be laid in panels not exceeding 6,0 m². Thresholds shall be finished with granolithic screeds 25 mm thick, treads 25 mm thick, and risers 20 mm thick, including rounded nosings and reedings.

Edges next to walls shall be finished with projecting skirting, 75 mm high, with rounded top edges, unless otherwise specified or instructed by the Engineer.

PB 03 **IRONMONGERY**

PB 03.1 **Materials**

(a) General

All steel and iron work shall be delivered clean and free from rust, pitting or other defects. Shop primings shall be applied before delivery and shall consist of a coat of red oxide paint, or any other approved anti- rust paint on all surfaces.
Unless otherwise specified, all materials shall conform at least to the appropriate SABS or BS standards where such standards apply to ironmongery, steel, cast iron or any other related materials.

(b) Pressed steel door frames

Pressed steel door frames shall comply with SABS 1129 and shall be manufactured from 1,6 mm thick mild-steel sheeting, pressed to the required shapes, properly mitred, welded and reinforced, with all welding neatly cleaned off.

Frames shall be of the widths required to suit the thickness of the walls into which they are built and shall be fitted with suitable tie bars and braces at the bottom. Three lugs to be built into the brickwork shall be provided on each jamb.

Rebates in frames and transoms for doors shall be of the widths required to suit the thicknesses of the doors and shall be fitted with a pair of approved steel butt hinges set flush into recesses in the frames. 4,5 mm thick reinforcing plates shall be welded to the backs of the frames at hinge positions.

Heads of frames over double doors shall be drilled where required to form keeps for bolts and shall be fitted with one rubber buffer for each leaf of the door.

Frames for single doors shall be fitted with approved chromium striking plates and an adjustable striking-plate keeper boxed in at the back of the frame by a welded-on sheet-metal box. The frames shall be fitted with a minimum of two rubber buffers.

Frames shall be protected against twisting and damage during transit and erection.

(c) Pressed-steel doors

Pressed-steel doors shall be manufactured from 1,6 mm thick steel plate. The doors shall be of standard design, pressed to shape with 40 mm reveals all round. The doors shall be strengthened with full-length vertical V-shaped or other approved sectional strengthening ribs projecting to the outer face. Two horizontal stiffening rails shall also be welded to the inner face of the doors.

A door shall be hung on a pair of 100 mm long steel butt hinges with loose pins. The leaves of the hinges shall be welded to both the door and the door frame, and a 1,6 mm thick steel plate shall be welded to the inner face of the door to protect the lock.

One leaf of double doors shall be fitted at the top and bottom with approved 150 mm cast brass barrel bolts in an approved manner and the other leaf shall be fitted with a lock, the striking plate of which shall be fixed to the first leaf.

Where indicated on the Drawings, doors shall be fitted with louvred ventilation grills of approved design, backed with insect and vermin-proof gauze screening.

(d) Steel window frames

All steel window frames shall comply with SABS 727 and shall be of the types and sizes shown on the Drawings.

Standard industrial types of steel window frames shall be constructed from rolled mild-steel industrial sections, 35 mm wide by 3 mm thick, with opening sections constructed from standard residential sections, 25 mm wide by 3 mm thick, welded at angles and properly jointed at intersections.

Window frames shall be formed perfectly flat, truly square and properly jointed at all angles, and the opening portion shall fit properly on all faces and shall open and close freely.

Glazing bars shall be continuous with jointed intersections, the ends being neatly tenoned into the frame and securely welded in position.

Frames shall be fitted with standard fixing lugs.

Opening sections shall open as indicated on the Drawings, and shall be fitted with steel hinges with brass pins. Pivots shall be fitted with bronze ring centres.

Side hung or top hung opening sections shall be fitted with brass handles and friction stays. Bottom hung sections shall be fitted with friction pivots and spring catches.

Weather bar drips shall be attached to the fixed frames for the complete width of the window at the head of outward opening sections.

Composite windows may either be delivered completely assembled with mullions and transoms or as separate units for assembly on the Site.

(e) Door locks and handles

All door locks shall comply with the requirements of SABS 4 and shall be of approved manufacture and pattern. All locks shall be supplied with two keys. Keys shall be distinctly numbered with consecutive numbers and each key shall be stamped with the same number as that of the lock which it controls. No two locks in any one building may have the same key.

External doors shall be fitted with four-lever heavy-duty mortice locks, which shall be master-keyed.

All locks shall be properly installed and, after completion, striker plates shall be adjusted and the locks serviced.

Door handles shall be of cast zinc of approved manufacture and pattern.

(f) Miscellaneous fittings

All retaining devices for doors and windows as well as fittings such as coat hooks, retaining hooks, etc, shall be of solid brass. All fittings shall be secured by screws or set screws of the same material and finish as the fitting.

Fittings to be fixed to plastered walls, masonry or floors shall be fixed direct by means of patent plastic or fibre plugs fitted into drilled holes.

Door stops shall be provided at every door and shall be 40 mm diameter rubber stops.

PB 03.2 **Installation of Doors and Windows**

All built-in door and window frames shall be set straight, plumb and level, and shall operate to the satisfaction of the Engineer after fixing has been completed.

Fittings shall be either removed, or wrapped and protected from damage, until all rough trades have been completed.

PB 04 **CARPENTRY AND JOINERY**

PB 04.1 **General**

(a) Materials

All timber used for structural purposes shall be of merchantable grade and shall comply with the requirements of SABS 563 and SABS 1245. Structural timber shall be carefully selected and of the best quality, free from large or dead knots, shakes, waney edges or other defects. Purlins and brandering shall comply with the requirements of SABS 653. Finger-jointed structural timber shall comply with the requirements of SABS 096 and laminated timber with the requirements of SABS 1089.

Hardwoods and softwoods for joinery shall comply with SABS 1099 and SABS 1359 respectively and suitable species shall be used for the various purposes.

Unless otherwise specified, all materials shall conform to the appropriate SABS or BS specification where such standards exist for nails, screws, bolts, adhesives, etc.

(b) Preservative treatment

All structural timber shall be given a preservative treatment suitable for the duty for which the timber is intended in accordance with SABS 05, and no untreated timber shall be used. The preservative treatment shall not impair the final finish. The timber shall be impregnated throughout. When surface coating is specified, the compounds applied on the surfaces of the timber shall form an unbroken film.

(c) Priming

The jointing surfaces of all joints exposed to the weather and built-in portions of frames shall be thickly primed except where adhesives are specified.
Carpentry and joinery items which are prepared for painting by the manufacturer, shall be knotted and primed before being dispatched to the Site.

Primed surfaces shall be touched up where necessary during the progress of the work or where Site adjustments have been made.

PB 04.2 **Carpentry Work**

(a) Scope of work

Carpentry work shall be carried out in a manner consistent with good workmanship and in compliance with the Drawings.

The carpenter shall perform all cutting away and making good in attendance upon all other trades and he shall provide and maintain temporary coverings required for the protection of any finished work that might be damaged if left unprotected during the progress of the work.

(b) Dimensions

Unwrought timber shall be as sawn and shall be to the dimensions and within the tolerances specified in the relevant SABS Standard Specifications mentioned in subclause PB 04.1(a).

(c) Jointing

Unless otherwise specified, all joints shall be secured by means of a suitable type and a sufficient number of approved connectors. All joints shall be carefully made in such a way that they will not impair the strength and stiffness of the beams or members.

(d) Timber roof construction

The plates, joists, rafters, purlins, brandering and other pieces used for the construction of the roof and trusses shall be of the dimensions, spacing and construction, as shown on the Drawings.

All the joints in the framework shall be of the most appropriate type, accurately formed and adequately secured with fasteners as specified.

PB 04.3 **Joinery Work**

(a) Scope of work

Joinery work shall consist of the manufacture, delivery to the Site, and fixing in the buildings, of all joinery shown on the Drawings.

Except where a special finish is specified, the Contractor shall have all stairs, landings, doors, shelves and other joinery work cleaned and scrubbed down and shall leave all his work in a good order to the satisfaction of the Engineer.

(b) Dimensions

All wrought timber shall be sawn, planed, drilled or otherwise machined or worked to the correct sizes and shapes shown on the Drawings.

Reasonable tolerance shall be provided at all connections between joinery works and the building structure to compensate adequately for any irregularities, settlements or any other movements.

(c) Fabrication

The joiner shall perform all the necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all the other works necessary for correct jointing. He shall also provide all metal plates, screws, nails and other fixings that may be necessary for doing the specified joinery work properly.

(d) Joints

Where joints are not specifically indicated, they shall be the recognised forms of joints for each position. The joints shall be so made as to comply with part 2 of BS 1186.

(e) Doors and frames

Door frames, linings, panel doors, framed, ledged and braced doors, flush doors, sliding doors, etc, shall be supplied or made by the joiner and shall be installed, fitted or hung as detailed on the Drawings.

All timber shall be wrought and prepared for oiling, staining, varnishing or painting.

(f) Skirtings, cornices, etc

Skirtings, cornices, etc shall not be installed until after the wall coverings have been applied, the flooring laid and ceilings installed, unless otherwise specified.

(g) In situ joinery

In situ joinery work shall not be executed until after all floor, wall and ceiling surfaces have been formed or constructed, unless otherwise instructed.

(h) Ceilings

Ceilings shall consist of plaster board or fibre-cement panels as shown on the Drawings and shall be nailed to the brandering or suspended from the roof structure. The panels shall be separated by exposed tees and insulated with a 50 mm thick fibreglass wool blanket where shown on the Drawings.

PB 05 DOORS AND WINDOWS

PB 05.1 Materials

(a) General

All steel and iron work shall be delivered clean and free from rust, pitting or other defects. Shop priming shall be applied before delivery and shall consist of a coat of red oxide paint, or any other approved anti-rust paint on all surfaces.

Unless otherwise specified, all materials shall conform at least to the appropriate SABS or BS standards where such standards apply to ironmongery, steel, cast iron or any other related materials.

(b) Pressed steel door frames

Pressed steel door frames shall comply with SABS 1129 and shall be manufactured from 1,6 mm thick mildsteel sheeting, pressed to the required shapes, properly mitred, welded and reinforced, with all welding neatly cleaned off.

Frames shall be of the widths required to suit the thickness of the walls into which they are built and shall be fitted with suitable tie bars and braces at the bottom. Three lugs to be built into the brickwork shall be provided on each jamb.

Rebates in frames and transoms for doors shall be of the widths required to suit the thicknesses of the doors and shall be fitted with a pair of approved steel butt hinges set flush into recesses in the frames. 4,5 mm Thick reinforcing plates shall be welded to the backs of the frames at hinge positions.

Heads of frames over double doors shall be drilled where required to form keeps for bolts and shall be fitted with one rubber buffer for each leaf of the door.
Frames for single doors shall be fitted with approved chromium striking plates and an adjustable striking-plate keeper boxed in at the back of the frame by a welded-on sheet-metal box. The frames shall be fitted with a minimum of two rubber buffers.

Frames shall be protected against twisting and damage during transit and erection.

(c) Pressed-steel doors

Pressed-steel doors shall be manufactured from 1,6 mm thick steel plate. The doors shall be of standard design, pressed to shape with 40 mm reveals all round. The doors shall be strengthened with full-length vertical V-shaped or other approved sectional strengthening ribs projecting to the outer face. Two horizontal stiffening rails shall also be welded to the inner face of the doors.

A door shall be hung on a pair of 100 mm long steel butt hinges with loose pins. The leaves of the hinges shall be welded to both the door and the door frame, and a 1,6 mm thick steel plate shall be welded to the inner face of the door to protect the lock.

One leaf of double doors shall be fitted at the top and bottom with approved 150 mm cast brass barrel bolts in an approved manner and the other leaf shall be fitted with a lock, the striking plate of which shall be fixed to the first leaf.

Where indicated on the drawings, doors shall be fitted with louvred ventilation grills of approved design, backed with insect and vermin-proof gauze screening.

(d) Door locks and handles

All door locks shall comply with the requirements of SABS 4 and shall be of approved manufacture and pattern. All locks shall be supplied with two keys. Keys shall be distinctly numbered with consecutive numbers and each key shall be stamped with the same number as that of the lock which it controls. No two locks in any one building may have the same key.

External doors shall be fitted with four-lever heavy-duty mortice locks, which shall be master-keyed.

All locks shall be properly installed and, after completion, striker plates shall be adjusted and the locks serviced.

Door handles shall be of cast zinc of approved manufacture and pattern.

PB 05.2 **Installation of Doors and Windows**

All built-in door and window frames shall be set straight, plumb and level, and shall operate to the satisfaction of the engineer after fixing has been completed.
Fittings shall be either removed, or wrapped and protected from damage, until all rough trades have been completed.

PB 06 **ROOF SHEETING AND ACCESSORIES**

Roof sheeting and accessories shall comply with and will be measured and paid for under SABS 1200 HC.

PB 07 **PAINTING**

PB 07.1 **General**

No paint shall be applied to any surface containing traces of dust, grit, grease, oil, loose rust, millscale or corrosion products of any kind or to any surface that is not free from moisture. Where necessary, surfaces shall be thoroughly washed to remove all traces of soluble salts and/or corrosive air-borne contaminants prior to painting, and the surfaces shall be dried and painted immediately thereafter.

Welding shall be completed in so far as it is possible before painting commences, but in cases where welding can be done only at a later stage, no paint shall be applied to within 75 mm of the proposed weld position unless otherwise specified. Welds and adjacent parent metal shall be abrasive blasted and/or ground and all contaminants such as flux shall be removed prior to painting.

Surfaces of members which are to rest on concrete or other floors or which will be otherwise inaccessible after erection shall receive the full paint system prior to erection.

Damaged paint areas on metal surfaces shall be cleaned, rust spots removed where applicable and the surrounding paint which is still intact shall be feathered for a distance of 20 mm beyond the damaged area.

Spot priming and repair shall consist of all the coats previously applied and shall overlap the damaged area.
Damaged galvanized areas shall be cleaned and any rust spots and any flakes of the coating surrounding the damaged area removed. The coating shall then be restored by zine spraying or soldering, or painting with a zinc-rich paint, as may be approved by the Engineer.

Where the shop coat is allowed to age for a few months before the final painting is done, light sanding or rubbing with steel wool or scrubbing with clean water using a bristle brush shall be carried out.

Steel to be embedded in concrete shall not be painted below 50 mm from the final level of the concrete.

Each priming coat and each undercoat of paint shall be inspected and approved by the engineer before any subsequent undercoat or finishing coat is applied.

All finishing colours shall be as shown on the drawings, or as directed by the engineer.

PB 07.2 **Materials**

Paints shall comply with the requirements of the appropriate specifications below:

(a) Primers

SABS 678 : For wood
SABS 679 : Zinc chromate for steel
SABS 723 : Etch-wash primer for metals
SABS 912 : Calcium plumbate for galvanized iron

(b) Undercoats

SABS 681 : For all undercoats

(c) Finishing coats

SABS 515 : For interior use, flat and egg-shell finish
SABS 630 : For interior and exterior use, high-gloss enamel
SABS 631 : For interior and exterior use, oil gloss paint
SABS 633 : For interior use, emulsion paint
SABS 634 : For exterior use, emulsion paint
SABS 684 : For exterior use on structural steel
SABS 801 : For interior and exterior use, epoxy-tar paint
SABS 802 : For interior and exterior use, bituminous aluminium paint
SABS 887 : For interior use, glossy and egg-shell varnish.

The contractor shall furnish the engineer with the following information and details regarding the paints and decorative materials for the painting system he proposes to use, for written approval:

(i) The name of the manufacturer and trade name.

(ii) The brand, type or grade of paint and the appropriate SABS specification.

(iii) Manufacturer's data sheets, colour references, instructions for use, including surface preparation, sealers, primers, undercoats, finishing coats, coat thicknesses and curing periods, which shall all be considered as being part of these specifications if approved by the engineer.

(iv) Safeguards to protect the applied paint from damage until the work is accepted by the engineer.

(v) The shelf or pot life of materials, if applicable.

(vi) An undertaking that the proposed paint system is suitable for its intended use and that the various coats of paint are compatible with one another.

Where proprietary brands are used, the manufacturer's priming and all subsequent coats of paint suitable for that particular brand shall be employed in accordance with the manufacturer's instructions.

No other materials of a similar nature and quality or from another manufacturer may be used instead of those approved unless permission to do so has been obtained from the engineer, in writing.

All materials shall be brought onto the site in containers scaled by the manufacturer. Paints shall not be mixed with another paint of a different quality, type, brand or colour, or thinned or adulterated in any way, but shall be used as supplied by the manufacturer. Any mixing or tinting required shall be carried out by the manufacturer.

Tinting of paint on the site by the contractor will only be allowed with the written permission of the manufacturer and the engineer.

PB 07.3 **Inspection and Preliminary Work**

Before commencing paintwork, the contractor shall carefully inspect the surfaces to be painted to satisfy himself that the surfaces are in a satisfactory or acceptable condition to receive the paint system specified.

All metal fittings and fastenings shall be removed where applicable before the preparatory processes are commenced. On completion, the metal fittings and fastenings shall be cleaned and refitted in position.

PB 07.4 **Workmanship and Finishes**

Paint may be applied by spray, brush or roller depending on the materials used, the surface to be painted, and the manufacturer's instructions.

Every coat of paint, irrespective of the method of application, shall be adequately and permanently keyed or bonded to the base material or previously applied coat, and shall be evenly distributed, continuous, free from sags, runs, brush marks, pin holes or other imperfections, and shall dry to a smooth finish.

An approved water trap and air-regulating valve shall be furnished and installed on all equipment used in spray painting.

Before painting the interiors of buildings they shall be cleaned and the floors shall be washed and kept free from dust during the progress of the interior work.

The contractor shall protect all nearby surfaces against disfigurement by spatters, splashes and smirches of paint or paint materials. The contractor shall be responsible for any damage by paint or dirt caused by his operations to vehicles or property or injury to persons and he will be required to provide protective measures to prevent any such damage or injury and make good, where required, at his own expense.

If passing traffic creates dust, which may harm or spoil the appearance of external painted surfaces, the contractor shall sprinkle the adjacent areas with water, at his own cost, for a sufficient distance on each side of the location where painting is being done.

Undercoats shall be tinted by the manufacturer to distinguish between successive coats.
The final coats or finishing coats of paint shall be applied after all the other work in the vicinity has been completed.

The painter shall keep some of the final paint in reserve in the event of his having to make good any patching which may be required as a result of damage or unforeseen circumstances.

Upon completion, the contractor shall, in the case of buildings, clean all glass, remove all paint spots from walls, floors and fittings, and leave the premises clean and fit for occupation.

All inflammable materials, comprising solvents, thinners, wiping cloths, etc, shall be placed in tightly closed containers and properly disposed of.

PB 07.5 **Painting of Metal Surfaces**

(a) General

Wherever possible, all painting shall be done at the fabricator's works, but where this is not feasible, the engineer may permit the application of the undercoat and finishing coats to be carried out on the site, in which case a prime coat shall be applied at the fabricator's works prior to the members being despatched to the works.

(b) Surface preparation

The preparation of metal surfaces shall comply with SABS Code of Practice 064 and shall receive the greatest care to ensure rust-free conditions prior to the paint system being applied.

All surfaces shall be prepared by loose paint, rust plaster, scale, dust, dirt, grease, etc, being removed and by the defective paint surfaces being repaired or patched before painting or repainting. Damaged shop-primed surfaces shall be thoroughly cleaned of rust and patched with a prime coat.

(c) Paint application

(i) Iron and steel work

All iron and steel work shall be properly primed with a red-lead-based primer where steel work is likely to be exposed to the elements for longer than 30 days. Zinc-chromate primer may be used where overpainting will be completed within 30 days of priming. Metal-etch wash primers may be used under dry conditions where overpainting will be completed within 24 hours of priming. The dry-film thickness of the prime coat shall not be less than 0,300 mm.

After priming, one coat of universal undercoat shall be applied. If necessary, the undercoat shall be tinted to a shade just lighter than the desired finish with approved liquid stainers. The dry-film thickness shall not be less than 0,250 mm.

The two finishing coats shall either be of alkyd resin-based synthetic enamel, gloss or matt oil paint, or as specified elsewhere. The dry-film thickness shall not be less than 0,250 mm per coat.

When mating surfaces are brought together, both surfaces shall have been given the full treatment specified, but where this cannot be done, each surface shall be given a copious coating of primer and the surfaces drawn together while the paint is still wet.

The surfaces of steel and cast-iron articles, such as floor gratings, grids and manhole covers, shall, after a thorough brushing to remove loose rust, be painted with two coats of epoxy-tar paint, each at least 0,230 mm thick.

(ii) Galvanized iron and steel

All traces of protective coating shall be removed with galvanized iron cleaner, and two coats of calcium plumbate primer shall be applied. One coat of tinted universal undercoat and two finishing coats of alkyd resin-based synthetic enamel gloss paint shall be applied.

PB 07.6 **Paint Thickness**

Unless otherwise specified, all coats of paint, whether prime coat, undercoat or finishing coat, shall have a dry-film thickness of not less than 0,200 mm, irrespective of the method of application.

PB 07.7 **Inspection**

The contractor shall provide the necessary equipment to establish whether the primers, undercoats and finishing coats have been applied to the correct thickness and at the correct applications. The engineer may take samples of the paints during painting operations for testing and quality control.

PB 08 **MEASUREMENT AND PAYMENT**

PB 08.1 **Brickwork**

(a) (Thickness, type and class indicated) ..... **Unit : m²**

(b) Etc for other thicknesses, types and classes

The unit of measurement shall be the square metre of each type of brickwork built, calculated from the leading dimensions of the brickwork. Areas of pipes, etc, built into brickwork shall not be included in the areas measured. At corners and intersections common to more than one brick wall, the areas shall be measured only once.

The tendered rates shall include full compensation for the construction of the brickwork complete as specified, including pointing, the building-in of conduits, beams, lintels, pipe sleeves, doors, windows, the raking-out of joints, damp-proof course, brickforce reinforced as specified, etc.

PB 08.2 **Plaster Work**

(a) (Thickness of plaster and finish indicated) ..... **Unit : m²**

(b) Etc for other thicknesses and finishes

The unit of measurement shall be the square metre of each type of coat completed as specified.

The tendered rates shall include full compensation for the construction of the plaster work, including the supply of all materials, mixing, applying, finishing, forming reveals, joints, narrow widths, rounded angles, v-joints, etc, complete as specified.

PB 08.3 **Doors and Windows**

(a) (Type and size indicated) **Unit : No**

(b) Etc for other types and sizes

The unit of measurement shall be the number of doors and windows installed complete as specified.

The tendered rates shall include full compensation for the manufacturing and installation of the steel doors, windows, and frames complete with hinges, handles, locks, barrel bolts, retaining devices, door stops, stays and any other work necessary to complete the work as specified or as shown on the drawings. The tendered rate for windows shall also include full compensation for glazing, window sills as specified, and damp-proof sheeting.

PB 08.4 **Structural Timber**

(a) Plates (sizes indicated) ..... **Unit : m**

(b) Rafters (sizes indicated) ..... **Unit : m**

(c) Purlins (sizes indicated) ..... **Unit : m**

The unit of measurement shall be the metre of individual types of timber elements or number of complete trusses installed.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, jointing and installation of the timber as shown on the drawings.

PB 08.5 **Miscellaneous Work**

(a) Paintwork ..... **Unit : sum**

The tendered sums shall include full compensation for supply all materials, for transport, for storage, for all equipment and labour, for all temporary work and safety precautions, for replacing defective work, for protecting completed work and for cleaning up after completion.

(b) Refurbishment work of structure as shown on drawings ..... **Unit : sum**

The tendered sums shall include full compensation for supply all materials, for transport, for storage, for all equipment and labour, for all refurbishment work of existing structure as shown on the drawings complete.

(c) Supply of miscellaneous items ..... **Unit : sum**

Various items shall be scheduled

The tendered rate shall make full compensation to provide the item scheduled (or as shown on the drawings) complete.

3.4.4. MECHANICAL SPECIFICATIONS

MECHANICAL SPECIFICATIONS FOR THE McGREGOR WTW UPGRADE

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Chapter 1

1.1 GENERALLY APPLICABLE SPECIFICATIONS

1.1.1 Detail Design and Drawings

As part of the tender document, contractors must provide high-level General Arrangement drawings of equipment offered, with their tender submission. Sufficient detail must be provided to modify the civil drawings to fit the mechanical equipment offered.
The Contractor shall allow in his rates and program for doing the detail design and drawings of the proposed equipment and the installation thereof. General arrangement drawings, detailed equipment specifications, Technical Write-ups of the and method statements of the installation shall be provided to the Engineer for approval, before the Contractor intends to place an order or commence manufacturing.

Also take note of the requirements set out in 1.2.29 regarding Contractor's Drawings.

The Contractor shall make available to the Engineer his design calculations upon any request to do so. No calculations shall be considered propriety information.

1.1.2 Installation Method Statement & Programme

The Mechanical (& Electrical) Contractor shall have access to site for installation of equipment as per the conditions below:

i) The Contractor shall supply his detailed design drawings, calculations, equipment data sheets and quality assurance documentation for approval to the Engineer within 60 days of the Commencement Date.

ii) The Civil Contractor (others) may require details of the mechanical and electrical designs within 60 days of the Commencement Date of this contract to allow him time to complete all civil modifications within his contract period;

iii) Access to the structures for installation shall be granted **1 month** after the Commencement Date. Partial access may be given to certain portion at the discretion of the Engineer.

The Engineer retains the right to change the sequence of installations as required to coordinate it with the civil works. The Mechanical Contractor shall be flexible (within reason) to adapt his programme to be in synchronization with other contracts on site. No claims will be entertained for changes to the programme.

Where equipment is installed in relation to existing or new infrastructure, the Contractor shall verify all dimensional data provided by the employer in the specification, schedules and drawings prior to commencing with manufacturing or sourcing of equipment to ensure the proposed equipment is compatible with the actual state of the existing infrastructure. This shall be done by conducting a detailed dimensional survey of all existing structures that impact on the design of mechanical and electrical equipment.

The Contractor shall allow in his rates and program for installation and all temporary works required. Method statements shall be provided for approval by the Engineer and the Operator whenever an activity is foreseen that will affect the normal operation of the WTW.

Also take note of the requirements set out below in the Mechanical Specification: 1.2.5 Installation and 1.2.30 Contractor's Responsibility With Regard To Civil Works.

1.1.3 Performance Testing

Performance Requirement/Test

Equipment shall be tested for its ability to operate and perform as specified and for its performance on its own and in relation to the complete system. Equipment-specific performance tests are included in some of the detailed equipment specifications.

Failures to Pass Tests on Completion

When the equipment supplied and/or installed by the Contractor does not meet a specification or does not pass a performance test, clause 9.4 *Failures to Pass Tests on Completion* of the FIDIC General Conditions of Contract shall apply.

Works testing

Prior to shipment to site, equipment shall undergo an inspection at the factory:

i) To ensure material and welding / jointing compliance;

ii) To ensure corrosion protection compliance;

iii) Visual and final inspection before shipment;

iv) Performance test (as far as possible at factory).

Before commissioning

i) Contractors shall take note of Sections 1.2.35.1 to 1.2.35.4 in the Mechanical Specification, prior to starting commissioning;

ii) Tests for correct operation of all motors;

iii) Tests for correct operation of control gear;

iv) Submit all certification, motor test certificates, material certificates;

v) Submit all operating and maintenance instructions.

Commissioning tests

Generally, the equipment will be considered acceptable at commissioning when all of the following conditions are satisfied:

i) The equipment meets the duty requirements as defined in this Section of the Specification;

ii) Any other specific performance tests defined in this Section prove acceptable operation of the equipment;

iii) The power absorbed by each motor at duty point does not exceed the values stated in the Technical Data Sheets by more than 5%;

iv) The vibration measured at each point does not exceed the level prescribed in BS 4675 Part I – 1976 for the appropriate class of machine;

After commissioning

Check equipment for proper functioning and monitor process performance during the Test Period and the Operational Acceptance Period (see Sections 1.2.35.5 to 1.2.35.7 of the Mechanical Specification). For the purposes of this contract, the Test Period shall be deemed to be 72 (seventy-two) hours continuous trouble-free running and the Trial Operation Period (which shall commence after the Test Period) shall be 28 days. The performance of the equipment will be considered acceptable when the requirements as specified have been achieved consistently during the Trial Operation Period.

During Defects Liability Period

Check all equipment for correct operation and functioning at 3 months, 6 months, 9 months and 12 months after plant take-over.

i) Check and provide lubrication for equipment where required;

ii) Check corrosion protection of equipment and repair any damages not attributable to misuse;

iii) Adjust equipment and or settings, after consultation with and approval from operators in order to optimise equipment performance;

iv) Correct and/or repair any faulty equipment, switchgear, programming etc., within 48 hours of being notified.

Provide reports of the maintenance and testing done at these time intervals, within 2 weeks after the required inspection.

1.2 STANDARD SPECIFICATIONS

1.2.1 General

The Standard Specification for Mechanical Works (this Section) shall apply wherever it is relevant to the Contract unless it is superseded in accordance with the precedence stated and, in particular, by the Detailed Mechanical Specification.

1.2.2 Environment

The site shall be considered as coastal with some industrial pollution. For the purposes of this Specification, the site shall be regarded as a severe marine environment with some industrial pollution.

Besides being coastal, treatment works have large open liquid areas which are aerated and/or agitated and the environment is damp. The high prevailing winds can also carry spray and foam not only from the plant but in some areas also from the sea.

This environment is very corrosive to ferrous metals and, where the use of such metals cannot be avoided, the metals must be adequately protected, such protection systems being designed for a life of at least 15 years.

1.2.3 Climatic Conditions

Barometric Pressure	101.3kPa
Summer	
Max. dry bulb temperature	36°C
Relative Humidity	20-30%
Wet bulb temp.	0°C
Max. dry bulb temperature – 24-hour average	22°C
Max. wet bulb temperature	23°C
Wind	Predominantly east to southeast
Max. hourly average	67km/h
Gusts up to	137km/h
Winter	
Minimum. dry bulb temperature	0°C
Relative Humidity	100%
Wet bulb temp.	0°C
Wind	Predominantly west to northwest
Max. hourly average	74km/h
Gusts up to	126km/h

1.2.4 Design

1.2.4.1 General

This Specification lays down the performance, quality and overall system requirements of the Works. Deviation from the Specification will only be considered if the Engineer considers such deviation an improvement.

1.2.4.2 Safety

Safety shall be an all-important and overriding consideration and proper attention shall be paid to this aspect at the design stage. The regulations of the Occupational Health and Safety Act, Act 85 of 1993, as amended, shall be strictly observed.

Equipment which is potentially dangerous shall be designed in accordance with a relevant South African or international Standard.

The following must be noted:

i) Hazards must be avoided or guarded. Nip points shall be guarded; sharp corners shall be rounded off; operating handles, supports and protrusions shall be kept clear of access ways; and so forth.

ii) The Contractor's Drawings and specifications shall clearly specify the structural requirements of the Works and the Contractor shall be responsible for covering all unsafe gaps and openings left in structures after installation.

iii) Moving parts shall be properly guarded to the satisfaction of the Engineer.

iv) An emergency stop button shall be installed in a convenient position next to each machine.

The installation shall be designed to provide immediate access without the danger of accidental operation. In addition, trip wires which will stop the driving motor when pulled shall be provided along the accessible side/s of moving conveyor belts, chains and the like irrespective of operating speed and irrespective of guards provided.

Installations considered unsafe by the Engineer shall be corrected by the Contractor at no cost to the Employer.

1.2.4.3 Design Aspects

A high quality standard is required and reliability, long life, trouble free operation, efficiency, ease of maintenance and operation, and neatness are essential.

All plant and equipment shall be of robust construction and the design shall, as applicable, be based on:

i) the full range of duties which can be reasonably anticipated;

ii) the power and torque transmitted by the driver system under full load and stalled conditions;

iii) the maximum pressure or vacuum which can be produced by pumps, blowers and compressors under all conditions including blocked or closed inlet and outlet circuits;

iv) conservative service and safety factors based on approved standards or laid down in the printed specifications of reputable and approved manufacturers;

v) a safety margin of at least 20 % in addition to any service or safety factors which apply;

vi) twenty four hour per day operation;

vii) a minimum life of 100 000 hours before repair or major part replacement;

viii) prevention of serious damage from normal operational problems such as blockages, blinding, jamming, seizure, malfunction and, as far as is practical, maloperation; if these occurrences cannot be avoided by good design.

Machines with non-overloading characteristics shall be selected wherever possible; eg: motors shall be sized so that they cannot be overloaded by the driven machine.

1.2.4.4 Fail-Safe Operation and Protections

Where damage can occur from normal operational or other foreseeable problems, plant, equipment and systems must be designed to be fail safe; i.e. must have built-in redundant elements, or be fail-to-safe; i.e. must return to a safe condition where no further damage can be done in the event of a failure, malfunction, maloperation, overload and, as far as practical, misuse. All reasonable and economically justifiable protections to prevent or limit damage to plant and equipment, particularly in high risk situations, must be incorporated. Protections shall:

i) be directed at the source of the problem, limit forces to safe levels and act quickly enough to prevent damage (electrical thermal type overloads are inadequate);

ii) stop or prevent from starting all equipment at risk;

iii) activate an alarm with a labelled indicator on the control panel whenever a protection operates;

iv) not permit unauthorised tampering;

v) operate reliably after long inactive periods exposed to corrosive and dirty conditions.

Tenderers shall highlight equipment limitations which can be exceeded during operation and cannot be guarded against.

1.2.4.5 Moving Parts

The following general requirements apply not only to machines but to all equipment with moving parts such as headstocks, extension spindles, swivelling davits, heavy duty hinges, pivots and the like:

i) All rotating or swivelling shafts, pins and the like, shall be adequately supported, guided and restrained by lubricated or self-lubricating bearings, collars and/or bushes.

ii) Swivelling joints on linkages and the like shall be of the "universal" or fork and rod type with bearings or bushes fitted to the eyes or forks.

iii) On abrasive applications abrasion resistant materials and slow speed operation shall be utilised. Raw sewage and sludge shall be regarded as very abrasive.

iv) All applications associated with wastewater shall be regarded as corrosive and materials of construction shall be selected to suit.

v) Susceptibility to fatigue failure shall be minimised by proper design and manufacturing procedures. In particular, changes in section shall be radiused and care must be taken to avoid the use of welded components in areas of fluctuating stress.

vi) The locking of nuts and pins in position shall be done to the approval of the Engineer.

vii) Wearing parts shall be designed for interchangeability and ease of removal and replacement.

1.2.4.6 Arrangement and Mounting

The arrangement and general design shall take the following requirements into consideration:

i) Lifting eyes, lugs, hooks, etc., shall be provided on heavy or large items to facilitate handling.

ii) Castings or fabrications shall have machined pads for seating and be mounted on either soleplates or baseplates as appropriate.

iii) Where accurate alignment is required, positioning pins and/or jacking screws shall be provided.

iv) The needs of operation and maintenance including neatness, access, working space, safety, cleaning, adjustment, handling, assembly, alignment, disassembly, removal, etc.

v) With plant and equipment to be mounted on or against concrete or brick structures built by others, provision shall be made for adjustment in the mechanical design. Any special accuracy requirements must be specified on the Contractor's Drawings.

1.2.4.7 Prevention of Corrosion

The Contractor shall review all designs from a corrosion protection point of view prior to commencing work. Any details which might have a negative effect on the corrosion protection and the future application of coatings are to be brought to the Engineer's attention for a ruling prior to commencement of work.

1.2.5 Installation

1.2.5.1 General

The Works shall comply with the following:

i) When erected and installed, the plant and equipment shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper working order.

ii) The requirements of Sub-clause "Arrangement and Mounting" (see Clause "Design") must be noted.

iii) The Contractor shall provide all foundation bolts, supports, hangers, brackets, etc. required for the support and fixing of equipment.

iv) The Contractor is not responsible for grouting puddle pipes which pass through liquid retaining walls or slabs but shall be responsible for all other grouting necessary for all plant and equipment.

v) The use of more than three shims in the alignment of equipment will not be permitted. Machined spacers shall be prepared where necessary. Shims and spacers shall be of a corrosion resistant material such as stainless steel.

vi) Corrosion protection requirements shall be carefully attended to and the relevant paragraphs of Sub-clause "Paint Application" (see Clause "Corrosion Protection : Paint Coatings) must be noted. All mating faces must be coated before and sealed after assembly.

vii) A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

viii) Crevices which are formed between two metal surfaces shall, prior to final fastening, be filled with a suitable formable packing, Denso tape or equivalent, or with a suitable mastic or sealant.

1.2.5.2 Alignment of Shafts

Shafts for drives, such as motors, with an output above 150 kW shall be aligned to the driven shaft as follows:

i) Final alignment shall be done after installation and before commissioning and shall be checked in the presence and to the approval of the Engineer. Alignment shall be sufficiently accurate to ensure that no initial pre-load is placed on the shaft coupling.

ii) Each motor shall be aligned to its pump by alignment specialists using laser aligning equipment with real time computer display.

iii) The use of pourable epoxy resin chocks (Epocast 36, Chockfast or equivalent) shall be acceptable. If pourable chocks are used, the baseplate feet do not have to be machined but each machine foot shall be provided with a screw for vertical alignment. The chock thickness shall not be less than 20 mm.

1.2.6 Materials

1.2.6.1 General

All materials used in the manufacture and construction of plant and equipment shall be new, unused and shall be the best of their respective kinds. The Contractor shall ensure that the materials are selected in accordance with the best engineering practice to suit the working conditions and the extremely corrosive environment.

1.2.6.2 Steel

All structural steel shall comply with the requirements of SANS 1431 grade 300W and shall be legibly marked with the maker's name or trade mark and identification marks.

1.2.6.3 Stainless Steel

The AISI grade of stainless steel to be used will normally be specified in the Detailed Mechanical Specification. Unless otherwise specified, rolled material shall be supplied with a matt, annealed and pickled or otherwise de-scaled surface finish. For wrought steels, the equivalent BS 970 grade may in each case be used.

The common applications are as follows:

Application	AISI	BS 970
Treatment Works (All applications)		
Welded	316L	316S12
Not welded	316	316S16
Low Corrosion Interior		
Welded	304L	304S12
Not welded	304	304S15
Exterior and Corrosive Interior		
Welded	316L	316S12
Not welded	316	316S16

A manufacturer's test certificate shall be provided for each batch of stainless steel giving details of the material analysis and any mechanical tests carried out on the material. Each stainless steel item

supplied shall be clearly and permanently marked with the grade of stainless steel and cross-referenced to the applicable test certificate.

Where grades 316 and 304 are mentioned in the Tender Documents:

i) these shall be taken synonymously with grades 316L and grade 304L, respectively.

ii) Contractors may offer grade EN 1.4162 in place of grades 316 and 304.

1.2.6.4 3CR12

This is the titanium stabilised, 12 % chrome steel as produced by Columbus Stainless, South Africa.

3CR12 shall always be supplied with an annealed and pickled finish. 3CR12, in cases where it is to be coated, shall be suitably abrasive blasted to ensure adherence of the prime coat.

1.2.6.5 Plastics

Thermoplastics and fibre reinforced polymers shall be UV resistant, have adequate tensile strength and high impact strength and generally suit the application.

PVC is regarded as too brittle and shall not be used unless called for in this Specification or approved in writing by the Engineer before supply.

1.2.7 Castings

Castings shall comply with the relevant South Africa or British Standard for the material used, including the following:

Grey Cast Iron	SANS 1034	BS 1452
S. G. Iron	SANS 936/7	BS 2789
Steel (General Purpose)	SANS 1465	BS 3100
Aluminium	SANS 989/992	BS 1490
Copper and Copper Alloy	SANS 200	BS 1400

Particular attention shall be paid to cleanliness, soundness and neat fettling and dressing of castings. Surfaces shall be smooth and irregularities caused by mould washaways, and the presence of porosity and sand and slag inclusions will not be tolerated. Areas under bolt heads, nuts and washers, shall be machined or spot faced to ensure a flat and smooth pressure bearing area, and sufficient space shall be provided for the use of ring or socket spanners.

All pressure retaining castings shall be hydrostatically tested to not less than 1,5 times the maximum working pressure after machining and shall be pressure tight.

No repairs shall be undertaken to castings without the written permission of the Engineer and **welding will not be permitted on cast iron castings.**

Castings shall be heat treated to provide optimum corrosion resistance and toughness combined with reasonable machinability. In particular stainless steel castings shall be heat treated so as to ensure that all carbides are in solution, to ensure optimum grain size, and to provide maximum corrosion resistance.

The Contractor shall provide a test certificate for each casting or batch of castings, except for those made of grey cast iron, giving details of the material analysis, the heat treatment and any mechanical tests carried out.

1.2.8 Fabrication of Carbon Steels

Steelwork shall be constructed, fabricated and erected in accordance with SABS Standard Building Regulations, Chapter 6, "Structural Steelwork", and with SANS 1200 H where applicable.

1.2.8.1 Finish

Edges shall be rounded to a radius of at least 2 mm.

Weld spatter and other protrusions shall be removed.

1.2.8.2 Requirements for Corrosion Protection

In addition to finishing requirements, the requirements of corrosion protection application shall be taken into consideration. Surfaces must be accessible for surface preparation and coating.
Inaccessible pockets and open hollow sections and similar hidden surfaces shall not be permitted unless the corrosion protection system specified for the fabrication is hot-dip galvanizing without painting.

Pits, undercuts, indentations, etc. which would prevent access to blast material are unacceptable.

1.2.8.3 Drawings

General and detailed fabrication drawings shall be submitted by the Contractor for approval by the Engineer. Full details of the welding procedures and standards which he proposes to use shall be shown on these drawings.

1.2.8.4 Inspections

The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop and prior to corrosion protection.

1.2.9 Fabrication of Stainless Steel

The requirements regarding the fabrication of carbon steels applies to the fabrication of stainless steel as well. In addition, the following requirements apply to the fabrication of stainless steels:

i) Fabrication of stainless steels and 3CR12 shall follow the recommendations in "The Stainless Steel User Manual" and "The 3CR12 Fabrication Guide" issued by Columbus Stainless. Only fabricators experienced with stainless steel will be considered acceptable. Such fabricators shall use permanently dedicated storage and fabrication areas and shall use machines, tools and handling equipment suited and permanently dedicated to this type of material.

ii) Surfaces which become contaminated with steel or otherwise stained or otherwise marked so as to be of uneven colour, shall be cleaned by pickling or electro-cleaning rather than by grinding.

iii) The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop.

1.2.10 Welding

1.2.10.1 General Welding Requirements

Standards

Standards complying with good modern practice, and acceptable to the Engineer, shall be adopted. These include the following:

BS EN 1011 - Arc welding carbon and carbon manganese steelwork.
BS 4677 - Arc welding austenitic stainless steel pipework.
BS 2633 - Class 1 Arc welding of steel pipework.
BS 2971 - Class II Arc welding of steel pipework.
BS 806 - Design and construction of ferrous piping in connection with land boilers (used for arc welding specification of all pipe flanges).

Welders shall be experienced competent artisans approved in accordance with BS 4872.

Continuous Welding and Elimination of Crevices

Welding shall be continuous on all sides of any joint. All crevices, including those arising from welding on one side only, shall be eliminated. This requirement applies to the welding of all metals and, in this respect, it should be noted that welding deformation results from incorrect welding procedure rather than from continuous welding.

In special cases only, non-continuous welding might be approved in writing by the Engineer. The resulting crevices shall be sealed with either a coal tar product which can be applied at thicknesses of up to 1 000 µm such as Carboline Bitumastic 50 or equivalent; or a two part solvent free epoxy which can be applied at thicknesses of up to 600 µm such as Sigmaline 523 or equivalent.

Weld Appearances

Welding shall be free of blowholes, projections, pinholes, splatter and undercuts and all welding flux shall be removed. All weld spatter and other sharp imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. Weld grinding must not be performed on 304L or 316L stainless steel, however, unless unavoidable and in approval by the Engineer.

Site Welding

Site welding shall be kept to a minimum and shall only be undertaken with the approval of the Engineer.

1.2.10.2 Welding of Stainless Steel and 3CR12

The following applies in addition to all of the above.

Stainless Steel Welding

Stainless steels shall be welded strictly as recommended in "The Stainless Steel User Manual" issued by Columbus Stainless.

3CR12 Welding

3CR12 shall be welded strictly as recommended in "The 3CR12 Fabrication Guide" issued by Columbus Stainless.

Stainless Steel Type

Austenitic stainless steels to be welded shall be of the low carbon grade (i.e.: 304L, 316L, etc.).

Welding Rods

The welding rods used shall be the most suitable for the metal and purpose. Type 309 stainless steel welding rods shall be used for welding 3CR12 unless otherwise approved in writing.

Welders

Only welders experienced with welding stainless materials shall be used.

General

All possible steps shall be taken to ensure maximum corrosion resistance and strength of the welds and welded material. Special care shall be taken to avoid prolonged heating. Welds shall be passivated. Discolouration and steel contamination must be removed by pickling or electro-cleaning as approved by the Engineer but should rather be avoided by taking the appropriate measures.

1.2.11 Fasteners

1.2.11.1 Standards

Bolts and nuts shall be hexagon head type complying with SANS 1700 with threads of the coarse pitch series. Allen head screws of any type shall not be used without the Engineer's written consent.

1.2.11.2 Fasteners M12 and Smaller

All fasteners M12 and smaller shall be of grade 316 SS, or better.

1.2.11.3 Fasteners Larger than M12 - in Corrosive Areas

All fasteners in corrosive areas shall be of 316 SS, or better. Corrosive areas shall be taken to include any moist or wet area such as in and above settling tanks, in or in the vicinity of open channels, where a continuous spray can be expected and all internal and external areas in the vicinity of the inlet works of a wastewater treatment works. All fasteners embedded in brick, concrete or soil shall also be of 316 SS, or better.

1.2.11.4 Fasteners Larger than M12 - Non-Corrosive Areas

Fasteners larger than M12 which are in non-corrosive areas shall, except when specified otherwise, be hot-dip galvanized.

1.2.11.5 High Tensile Bolts

Where high tensile bolts are required by the design, they shall be hot-dip galvanized and painted.

The bolt holes and crevices shall be filled and sealed prior to painting.

1.2.11.6 Material Compatibility

Fastener material shall always be of equal or better corrosion resistance than the items being fastened, e.g. 316 SS bolts must be used to fasten together 316 stainless steel fabrications or flanges.

1.2.11.7 Washers

Washers of similar material to the bolts shall be provided under each nut and setscrew head. Multiple washers or shims shall not be used. Spring washers or other approved locking arrangement shall be used on all fasteners subject to vibration.

1.2.11.8 Anti-Seize Compound

Before assembly, threads shall be treated with a nickel based, anti-seize/corrosion protection compound; Chesterton 725: Nickel Anti-Seize Compound, or equivalent. The Contractor shall note:

i) Copper-based compounds are not acceptable and, if used, shall be cleaned off before the correct compound is applied.

ii) If it is found during inspection that compound has not been applied, the Contractor shall disassemble all fasteners and comply with this requirement.

iii) A small amount of compound shall be applied along the full length of the thread before the nut is applied. Excessive compound visible on the thread after the nut has been applied shall be cleaned off.

1.2.11.9 Thread Projection

Bolt threads shall project between 1 and 6 mm from the head of the nuts when fixed. Longer projections will only be allowed if the Contractor can show that bolts of a more suitable length are not manufactured.

1.2.11.10 Corrosion Protection

After installation the exposed surfaces of bolts not made of 316 SS or of EN 1.4162 shall be coated as for the items being fastened. If the use of Allen head or similar fasteners has been approved by the Engineer, the recessed heads shall be filled with a suitable non-hardening sealing compound.

1.2.12 Anchor Fasteners

1.2.12.1 Type and Material

All anchor fasteners shall be of grade 316 SS, or better.

Anchor fasteners for water retaining structures and for brickwork shall be of the chemical anchor fastening type. Anchor fasteners for other applications may be of the expanding type or chemical anchor type.

1.2.12.2 Hook Bolts

Grade 316 SS, or better, hook bolts shall be supplied and grouted by the Contractor into pockets which will be provided in the concrete structure in accordance with the information to be supplied by the Contractor. The grouting products shall be used strictly in accordance with the manufacturer's instructions.

1.2.12.3 Alternative Anchor Bolts

The use of 316 stainless steel "Hilti Kwik Bolt" stud bolts or equivalent may be used as an alternative where approved by the Engineer. If steel reinforcing bars are encountered while the holes are being drilled, the Contractor shall knock a hole in the concrete around the steel and grout in a stainless steel hook bolt as described above.

1.2.12.4 Through-Bolt Anchors

Where machinery is anchored by studs or bolts which extend through the supporting structure and is therefore fastened down with the use of nuts from both sides, these, together with associated washers and brackets, shall also be of grade 316 SS, or better.

1.2.12.5 Anti-Seize Compound

A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

1.2.13 Grid FLOORING

All platforms and stairways shall be constructed with a non-slip profile or finish.

Consideration may be given to use glass fibre grating only in applications of non-elevated heights and where theft is a potential problem. The grating shall be of open grating type and not less than 38mm in depth. The mesh size shall not be less than 38mm x 38mm and the resin shall be Vinyl Ester.

All elevated walkways and stairways shall be Mild Steel Hot Dipped Galvanised construction.

The depth of bearer bars in steel grid flooring shall not be less than 30 mm with a bearer bar pitch of not greater than 40 mm. The bearer bars shall be across the shorter span.

Panels shall be set level and fixed to angle frames to prevent rocking.

Cut-outs in grid flooring for pipes, valve spindles, etc. are to be made and banded before any corrosion protection is done. The edges of removable grid access covers must also be banded.

Grid flooring and frames shall be hot-dip galvanized after fabrication. Alternatively, a glass flake resin which is applied by dipping the flooring in catalysed resin, is acceptable; such as Power Blast's Vitaglass or equivalent. The grating shall be of open grating type and not less than 38mm in depth. The mesh size shall not be less than 38mm x 38mm and the resin shall be Vinyl Ester. All GRP type grating shall include an anti-slip coating. Painted coatings will not be acceptable.

Where grid flooring rests on painted surfaces, strips of rubber insertion material shall be secured under the grid to protect the paint.

The fixing clip set (saddle clamp and locking plate) shall be of hot-dip galvanised steel or stainless steel. All fasteners shall be of grade 316 SS, or better.

1.2.14 Guard Railing

1.2.14.1 General

Guard railing shall be provided in accordance with legislated requirements and shall be provided generally in positions where the vertical change in level is 1 000 mm or greater.

Guard railing shall comply with SANS 10104.

Fabrication and installation requirements are specified elsewhere in this Standard Specification for Mechanical Works (including General Works).

1.2.14.2 Guard Railing for Equipment Installations

Guard railing for equipment installations shall comply with the following specific requirements:

i) Guard railing shall be of grade 316 stainless steel and shall comprise hand and knee rails not less than 32 mm diameter and stanchions spaced at not more than 1,8 m except where specifically directed otherwise in writing by the Engineer.

ii) On platforms, walkways, landings or around dangerous areas the vertical height, measured from the top of the hand rail to the floor or surface, shall be at least 1 000 mm.

iii) On stairways and fixed ladders the rails shall be parallel to the strings, and the vertical height, measured from the top of the hand rail to the nosing of the tread, shall be at least 900 mm.

iv) For applications covered by this Specification, the rails and stanchion shall withstand, without permanent deflection, a proof force of 890 N and 1780 N respectively, applied at any point and in any direction. This requirement is in addition any strength requirement specified in SANS 10104. Contractors shall provide proof that their guard railing has been tested and withstands these loads.

v) No opening between rails shall allow the passage of a ball of diameter 600 mm.

vi) Stanchions and rails shall be smoothly finished and free from sharp corners, edges and projections which may injure persons or damage clothing. Stanchion bases shall have the corners rounded or sheared off.

vii) Welded guard rail installations are preferred. Installations which incorporate jointed sections shall be secure and without relative movement of the components under loading. “Pop” riveted installations will not be acceptable. Joints shall be smoothly finished, without corners.

viii) Railings shall be ended off with positively fixed closure bends. At corners, short radius bends with stanchions on both ends shall be employed or, alternatively, stanchions specifically designed for such a position shall be employed. No sharp endings will be permitted.

ix) Stanchions shall generally be base-mounted to suit the arrangement requirements and shall be of solid or welded construction. Welding shall be continuous and shall be smoothly finished and then passivated.

x) Stanchions which are hollow shall be self-draining.

xi) Stanchion feet which are attached to metallic surfaces shall have minimum dimensions of 150 mm X 60 mm X 8 mm. Two fasteners, of minimum size M16, shall be used to secure each foot. Neatly fitting packing, Denso tape or equivalent, shall be fitted under stanchion feet to prevent the formation of crevices.

xii) Stanchion feet which are attached to non-metallic surfaces shall have minimum dimensions of 150 mm X 150 mm X 10 mm. In instances where the horizontal surface to which the foot is to be fastened is less than 150 mm wide, the foot shall be designed to be seated on at least two surfaces. Four fasteners, of minimum size M16, shall be used to anchor the foot. Non-shrink, cementitious grout shall be applied under the foot just prior to final tightening of nuts.

xiii) A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

xiv) All components shall be supplied in the pickled and passivated condition which may also be polished. All surfaces must be uncontaminated and unmarked to ensure maximum corrosion resistance. A manufacturer's test certificate shall be provided for each batch of stainless steel giving the chemical analysis of the material.

xv) Where kickplates are required by legislation, these shall extend to 150 mm above the walkway level.

1.2.14.3 Guard Railing in Public Places

The requirements for guard railing at equipment installations shall also apply for guard railing for public places. The following specific requirements must also be complied with:

i) The structural design shall be done in accordance with the requirements of SANS 10104.

ii) No opening in guard railing installed in public places shall allow the passage of a ball of 100 mm diameter.

1.2.15 Permanent Ladders And Stairs

1.2.15.1 General

Permanent ladders shall comply, primarily, with the requirements of the OSH Act and, secondarily, with BS 5395. Stairs shall comply with BS 5395, Part 3.

Unless other materials are specified, ladders and stairs shall be of carbon steel and hot-dip galvanized after all fabrication has been completed.

Unless other materials are specified, bolts shall be hot-dip galvanised but anchor bolts in concrete and brickwork shall be of grade 316 SS, or better, and shall be no smaller than M16.

1.2.15.2 Permanent Ladders

Ladders shall comply with the following detail design aspects:

i) Access points to the head of ladders from platforms and walkways shall be protected by self-closing gates or by chains.

ii) No part of the ladders shall project into the passageway.

iii) The width between strings shall be between 380 mm and 450 mm.

iv) A minimum clear space of 230 mm must be allowed behind the rungs.

v) The diameter of the rungs shall be approximately 25 mm and these shall be formed from HT steel reinforcing bar.

vi) Additional rungs shall be provided in the same horizontal plane as the top rung in order to close the gap between the platform and the ladder. Sufficient rungs shall be provided to ensure a maximum gap of 75 mm. These top rungs shall be at the same level as the floor or platform to which access is being provided.

vii) Strings shall be formed from flat bar.

viii) The vertical distance between the ladder support brackets shall not exceed 1 800 mm.

ix) The strings shall extend to 1 100 mm above the floor or platform and shall be matched with any guard rail protections at this level. Connections between hot-dip galvanized steel ladders and stainless steel guard railing shall be bolted. Unless laterally supported by the guard rails, these strings shall be supported by vertical structural sections (not flat bar) whose footings shall comply with this Specification for guard rail stanchion feet.

x) All rises in a flight shall be uniform and the surface of the top rung shall be level with the top platform or landing. The height chosen for the rise shall be between 225 mm and 255 mm.

xi) Except on chimneys, the height of a ladder should not exceed 6 000 mm. Greater heights shall be provided with intermediate landings between each 6 000 mm ladder section.

xii) If the height between start and end levels is over 4 000 mm, the ladder shall be fitted with a safety cage. The safety cage shall extend at least 1 000 mm above the higher landing. The cage ”shall afford firm support along its whole length for the back of the person climbing the ladder, and for which purpose no part of the cage shall be more than 700 mm away from the level of the rungs.” (as per OHS General Safety Regulations). The cage shall comprise no fewer than seven vertical elements.

xiii) Strings, rungs and support members shall be of solid structural sections (e.g. flat bar, round bar, square bar, angles, etc.) and no hollow sections will be accepted for any part of the ladder.

1.2.15.3 Stairs

Stairs shall comply with BS 5395.

1.2.16 Baseplates

1.2.16.1 Baseplate Configuration

Both direct-coupled and belt-driven machines shall be mounted with their drivers on common cast iron or fabricated steel baseplates of rigid construction.

In applications where baseplates are not practical, machined soleplates, suitably fixed and grouted to the concrete plinths, shall be provided. No machine may be mounted directly onto a concrete base without the use of either a baseplate or soleplate.

1.2.16.2 Corrosion Protection

Steel baseplates shall be hot-dip galvanized unless specified otherwise in the Detailed Mechanical Specification.

1.2.16.3 Drainage

Baseplates shall be configured to prevent pooling of water. Baseplates shall be either fully grout filled or provided with drain holes in all side members.

1.2.16.4 Machined Mounting Pads

The baseplate shall incorporate machined mounting pads at the support and fixing positions of each item of plant and equipment to be mounted on the baseplate. On fabricated baseplates this machining shall be done after fabrication, stress relieving (if applicable) and hot-dip galvanizing are complete. The thickness of the mounting pads shall be not less than 1,25 times the diameter of the holding down bolts. The pads shall not be provided with threaded holes for machine screws but shall be drilled for inserting through-bolts and adequate provision shall made for reaching the nut with a suitable spanner. In the period between machining and installation of the equipment, the machined surface shall be protected against corrosion by a removable coating. After installation, a non-hardening compound, Tectyl or equivalent, shall be applied to exposed machined surfaces and to the crevice formed at the foot of the equipment.

The above design may be suitably modified if the Contractor uses a pourable resin based chocking system. Such chocks shall be at least 15 mm thick.

1.2.16.5 Shimming

Not more than three shims may be used at any point and these must be made of a corrosion resistant material.

1.2.16.6 Jacking Arrangement

At least two diagonally opposed jacking screws shall be provided for belt tensioning in the case of belt-driven units. Direct-coupled motors above 10 kW shall be provided with jacking screws for horizontal alignment and direct-coupled motors above 150 kW shall be provided with jacking screws for vertical alignment as well. Jacking screws shall be of grade 316 SS, or better.

Drilled and tapped flat plate is not acceptable for jacking points. A jacking point shall consist of a suitable hot-rolled steel section welded to the baseplate and with a captured machine nut to accept the jacking screw.

1.2.16.7 Grouting

Baseplates shall be designed and grouted to eliminate collection points for water or dirt. Except where otherwise approved in writing by the Engineer, all baseplates on concrete plinths shall be fully grouted in. Grouting holes must be provided on baseplates having a continuous top plate. Tapped holes and fixing setscrew protrusions shall be suitably protected.

The material used for grouting shall be a non-shrink, cementitious grout (ABE Duragrout 1000, or equivalent). ABE Epidermix 324, or equivalent, is acceptable if the Contractor’s design requires an epoxy grout to be used.

The initial grouting shall be overseen by the grout supplier's technical representative.

1.2.16.8 Fasteners

Anchor fasteners shall be of grade 316 SS, or better.

small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

1.2.16.9 Alignment

Preliminary alignment of equipment mounted on baseplates shall be done at the factory to ensure that the baseplate has been correctly manufactured, but final alignment shall always be done on Site after installation and grouting has been completed. Alignment shall be accurate and to the approval of the Engineer and a final alignment check witnessed by the Engineer must be carried out by the Contractor prior to start up.

1.2.17 Guards

Guards shall comply in all respects with the Occupational Health and Safety Act of 1993 as amended and the following points shall also be noted:

i) Guards are required to cover all moving or revolving components of machinery. Guards which do not adequately cover moving protrusions such as keys, lock-nuts, lockwashers, setscrews, etc., or irregularities such as keyways, will under no circumstances be accepted.

ii) Guards shall be neatly and rigidly constructed and fixed and shall not vibrate or cause noise during operation.

iii) Where expanded metal or similar mesh is used, the mesh opening shall not permit a circular object 10 mm or larger to penetrate.

iv) Mesh shall not be used for chain guards but on belt drives the side of the guard most conveniently sited for inspection shall be constructed of expanded metal or similar. Mesh should similarly be used in other situations where inspection or ventilation is required.

v) Guards shall completely enclose drives and shall entirely prevent a person from touching any moving protrusion.

vi) Allowance must be made for adjustment on belt guards or where adjustment will be required.

vii) It shall be possible to remove the guard easily for maintenance purposes.

viii) Guards shall preferably be fabricated of 316 stainless steel (uncoated) but may also be hot-dip galvanized, hot-metal zinc-sprayed or hot-metal aluminium-sprayed carbon steel, coated to Specification in all these cases. Fasteners shall be M10 or larger and shall be of 316 stainless steel.

1.2.18 Power Transmission

1.2.18.1 Shaft Couplings

Shaft couplings shall be selected to reduce transmission of misalignment forces and of torsional oscillations between the driving and driven machine. Couplings shall, wherever practical, be of the rubber-tyre or rubber compression type, keyed to the shafts.

Elastomeric elements shall be urethane based. Flexible metallic elements shall be of stainless steel. Couplings shall not require lubrication.

Spacer couplings shall be used in all cases where this will assist maintenance.

Coupling guards shall comply with the requirements of the OHS Act and shall be to the approval of the Engineer.

After installation, the alignment of all couplings shall be checked by the Contractor in the presence of the Engineer or a person delegated by him. Alignment shall be accurate and to the approval of the Engineer.

1.2.18.2 Vee Belt Drives

Vee drives shall be designed to suit the power rating of the motor using service factors appropriate to the driving and driven machinery. Drives shall be designed, manufactured and installed in accordance with BS 3790 and ISO 4184, utilizing taperlock pulleys with taperlocks keyed to the shaft.

Where alternative pulley diameters can be selected, preference must be given to the larger pulley diameters to minimize the belt loading on bearings.

Tenderers shall ensure that the bearing arrangements of driving and driven machinery are designed to cope with the loads imposed by vee-belt drives and shall incorporate lay shafts where necessary. Lay shafts shall be supported by bearings mounted in bearing housings which are adequately sealed and fitted with grease nipples. Bearing units incorporating open, shielded bearings are not acceptable. Tenderers shall submit their design calculations and drawings for lay shaft arrangements for acceptance by the Engineer. Bearings shall be designed for an L10 life exceeding 100 000 hours.

1.2.18.3 Motor Driven Gearboxes

Gearboxes shall, unless otherwise specified, be supplied with environmental protection to IP 55.

Gearboxes shall be selected using a service factor of 1,75 based on the drive rating and shall have an efficiency of not less than 96 % on two stage reduction and 95 % on three stage reduction.

Gears shall be case hardened, profile ground and lapped, helical and spiral bevel gears.

Roller bearings shall be used throughout. Bearings shall be designed for an L10 life in excess of 100 000 hours.

The gearbox housing shall be of rigid cast iron construction preferably split in the horizontal plane.

A breather designed to prevent moisture from entering shall be fitted.

Oil-bath gearboxes shall have suitable oil level indicators or dipsticks. Unless otherwise decided by the Engineer, the drain from the gearbox shall be extended beyond the base so that the oil can be easily collected. The drain line shall be of grade 316 stainless steel and shall be fitted with a ball valve and square-head plug. Each gearbox shall be mounted on machined sole plates fitted with jacking screws to assist with alignment.

1.2.19 Condition Monitoring

1.2.19.1 General

Condition Monitoring comprises actions of collecting regular information about machinery condition to detect failures or deterioration of machinery. Measurements and observations shall be carried out during operation of the equipment at various sites within Employer's jurisdiction. A full technical report with corrective measures should be issued upon completion of the work and feedback should be given to the responsible person / people involved.

The purpose of machine condition monitoring is to monitor the state of a machine and detect any deterioration in condition, to determine the cause of this deterioration and predict when failure can be expected. The result is to maximize the availability and utilization of equipment.

1.2.19.2 Scope

This specification provides for the supply of computerised condition monitoring services within Employer's sites. The service shall be provided by suitably qualified and experienced individuals and shall include labour, material and travel costs.

Data shall be collected by the Contractor onsite with hand held tools and equipment. The captured data shall then be downloaded into a database for trending and analysis.

It will remain the responsibility of the Contractor to co-ordinate his site visits with the relevant personnel prior to visiting the site. On arrival the Contractor must liaise with the relevant personnel and obtain the necessary approvals and permits before proceeding to monitor any equipment.

The Contractor must submit a full report on all data collected. Colour coding shall allow for easy differentiation of trends and data points outside normal accepted parameters.

1.2.19.3 Vibration Analysis

The mechanical vibration of newly installed machines measured at strategic predetermined points shall be lower than that specified as "good" for that class of machine in ISO 10816 and ISO 2372. The table below shows the classification of vibration severity zones along with the relevant colours.

Table below: Classification of vibration severity zones

<table>
<tr><th colspan="6">VIBRATION SEVERITY (ISO 2372)</th></tr>
<tr><td colspan="2">Macine</td><td>Class I
(<15kW)</td><td>Class II
(15-75kW)</td><td>Class III
(>75kW)</td><td>Class IV
(>75kW)</td></tr>
<tr><td rowspan="12">Vibration Velocity V_{RMS}</td><td>mm/s</td><td rowspan="2">A</td><td rowspan="3">A</td><td rowspan="4">A</td><td rowspan="4">A
(Good)</td></tr>
<tr><td>0.28</td></tr>
<tr><td>0.45</td><td rowspan="2">B</td><td rowspan="3">B</td></tr>
<tr><td>0.71</td></tr>
<tr><td>1.12</td><td rowspan="2">C</td><td rowspan="3">C</td><td rowspan="3">B</td></tr>
<tr><td>1.8</td></tr>
<tr><td>2.8</td><td rowspan="6">D</td><td rowspan="5">D</td><td rowspan="3">C</td><td>B
(Allowable)</td></tr>
<tr><td>4.5</td></tr>
<tr><td>7.1</td><td rowspan="4">D</td><td>C
(Tolerable)</td></tr>
<tr><td>11.2</td><td rowspan="3">D
(Not permissible)</td></tr>
<tr><td>18</td></tr>
<tr><td>28</td></tr>
<tr><td>45</td></tr>
</table>

These evaluation zones are defined to permit a qualitative assessment of the vibration of the given machine and provide guidelines on possible actions.

Classifications:

Class I: Small (up to 15kW) machines and subassemblies of larger machines.

Class II: Medium size (15kW to 75kW) machines without special foundations or machines up to 300kW rigidly mounted on special foundations.

Class III: Large rotating machines rigidly mounted on foundations which are stiff in the direction of vibration measurement.

Class IV: Large rotating machines mounted on foundations which are flexible in the direction of vibration measurement.

Plant to be monitored:

Analysis may be performed on each individual rotating machine component rated larger and equal to 15kW within an operating speed of 120 rpm and 3000 rpm. Machines to be monitored may include:

- Blowers and Fans
- Electric Motors
- Gearboxes
- Generators
- Pumps
- Turbines

For each point on the motors, gearbox and blower shaft bearings the Fast Fourier Transform (FFT) frequency range must be set correctly to monitor frequencies of interest i.e. bearings and gears. Vibration readings must be recorded on all machine-bearing points in the Radial, Vertical and Axial planes where permissible.

Experience and Qualifications:

Inspection personnel engaged in the execution of this contract shall be adequately qualified and trained. Minimum training requirements for individuals shall be in accordance with ISO 18436-2:2014 Vibration and Condition Monitoring – Category 2 (or equivalent). The Contractor shall submit copies of CV's and training certificates upon request.

Contractors shall state their experience with this type of work by completing the appropriate schedules.

Detailed Vibration Analysis Reports:

Refer to 1.2.19.6

1.2.19.4 Thermography

The Infra-Red camera shall be designed for Preventative Maintenance (PM) use by indicating areas with excessive heat build-up for mechanical and electrical equipment. This shall include electrical switchgear, transformers, motors, pumps, etc. The camera shall be capable of viewing the heat dissipated by equipment in order that preventative maintenance may be undertaken prior to damage of the particular equipment.

Minimum IR Camera Requirements:

- Full analysis and reporting software
- Calibration Certificates
- Minimum IR resolution 160 x 120
- Minimum NETD thermal sensitivity 0.1℃ at 30℃
- Minimum temperature measurement range -20℃ to 150℃
- Temperature measurement accuracy ±2% at 25oC
- Visible camera resolution 2 megapixels
- File formats JPEG, BMP

Detailed Thermography Reports:

Refer to 1.2.19.6

1.2.19.5 Oil Analysis

Category	Key Analysis
Machine Wear	Fine wear metal
	Large wear metal elements
Contamination	Sand and grit
	Dilution
	Water/Moisture
	Alien fluid
	Carbon
Degradation	Oxidation, Nitration, Sulfation
	Viscosity
	Acid number (AN)
	Base Number (BN)
	Additive package

Oil Sampling Best Practices:

Referring to Original Equipment Manufacturer (OEM), workload of machinery as well as Project Plan where applicable, both vibration testing and oil sampling should be conducted on the same day to minimise site visits and machine lockout.

Pertinent questions to consider when arriving at a sampling interval include:

- Hazard Identification and Risk Assessment
- Criticality of equipment (or lack of redundancy)
- Environment (is it wet, dry?)
- Operating conditions (load, speed)
- What is the failure history?
- How costly is a failure? In repair cost?
- Have operating conditions changed to put more stress on the machine?

In general, a quarterly or monthly sample interval is appropriate for most important industrial machinery, but will be determined by the Project Plan for each individual facility

A representative oil sample should be taken at the same location using the same method each time, as the following table indicates:

Equipment	Sampling Point
Engine Crankcases	- Through dipstick holder
	- Sample valve on crankcase sump wall
	- Return line before filter
Hydraulic Systems	- Sampling Valve on return line before filter
	- Reservoir - mid-point, away from reservoir walls
Compressors	- Crankcase: about midpoint away from crankcase walls
	- Return line after oil separator
Gearboxes	- Sump: mid-point. Avoid sump floor sludge and side wall deposits
Turbine Systems	- Reservoir – mid-point, keep away from sidewalls and baffle plates
	- Main bearing return line
	- Secondary points-after bypass filtration system

Sampling shall take place under the following conditions:

- While the machine is operating
- Samples shall always be taken from the same point
- Individual clean specimen bottles to be supplied for each sample
- Samples taken shall be immediately labelled in detail to prevent mix up
- Sample accessories (tubes, pipes etc) to be clean & free from contamination o Drain off dead leg oil/water/debris before sampling
- Vacuum extraction of oil samples to used where permissible
- Samples to be taken from “free flow oil” when permissible to avoid latent contamination

Oil sampling shall not be done immediately after an oil change or makeup.

Facility Accreditation:

Equipment for oil sampling and facilities for testing must be accredited by SANAS according to ISO 17025.

Appropriate Standards:

Appropriate safety standards need to be adhered to such that the Employer’s obligations in terms of the OH&S Act NO. 85 OF 1993 and associated regulations are adequately catered for.

The Service Provider shall provide a health and safety plan which could include written safe work procedure. Material safety data sheets (MSDS) to be provided for all chemicals, oils detergents, solvents and cleaning agents.

ISO 4406:1999 Fluid Cleanliness Standard

Contamination classes guideline as per ISO Classification Table:

Turbines ISO Class 14/11, Compressors ISO Class 14/11, Hydraulic Systems ISO Class 15/12, Gearboxes ISO Class 16/13, Engines/Pumps ISO Class 15/12.

Detailed Oil Analysis Reports:

Refer to 1.2.19.6

1.2.19.6 Detailed Reports

All detailed reports shall include:

- Photograph of the monitored equipment nametag
- Existing fault levels
- Existing alarm levels
- Findings and recommendations
- Data capturing and analyses equipment calibration certificates

Vibration Analysis Reports

- Photographs of the monitored equipment depicting drive end (DE) and non-drive end (NDE)
- Vibration amplitude (mm/sec) – assessed against zones as described in the table D37.3
- Frequency (Hz) – refer to ISO 2954
- Plot trends and dynamic data points – Trend, spectrum and wave form
- Trend display and overall vibration levels

Thermography Reports

- IR versus visible image side by side

Reporting Oil Analysis Reports

- A detailed analysis report is required with every sample taken

All material which the successful Contractor is required to prepare or develop in the performance and completion of this contract, including exception reports, trend plots, dynamic data plots, notes and reports shall become the sole and exclusive property of the Employer without limitation when made or prepared, whether delivered or not. The Contractor shall however retain the right to use the same to perform the work under this contract.

It will remain the responsibility of the Contractor to ensure that all data is backed up onto a reliable storage medium.

1.2.19.7 Condition of Measurement Roots and Points

Before any data may be collected or processed the plant to be monitored must be configured in software to define the points to be monitored. All available machine data, parameters, alarm levels, and known fault frequencies must be noted.

The Contractor shall at all times utilize the most cost efficient and technically reliable technology to accurately diagnose and report on the machine health, identifying any possible defects.

The Contractor shall comment on visual inspections (oil leaks, cleanliness, loose items, blocked vent, open wires, safety issues etc) and general machine as well as factory condition.

1.2.20 Noise Control

1.2.20.1 General

Noise emitted by equipment shall be kept to a minimum and shall not exceed the noise levels specified in these documents.

1.2.20.2 Noise Levels

The sound power of any equipment shall not exceed 89 dB(A) (referred to 10-12 Watts) unless specifically approved by the Engineer. This is approximately equivalent to a sound pressure level of 81 dB(A) at a radius of one metre from the acoustical centre assuming uniform hemispherical propagation in a free field on a hard floor. In certain instances, a lower noise level may be called for in the Detailed Mechanical Specification.

Where the Contractor is unable to restrict the noise level of the machines to the maximum specified by the appropriate selection of suitable equipment; e.g. by selecting slow speed or silent type machines, quiet type cooling fans, suitable silencers, etc.; this shall be clearly pointed out by the tenderer so that appropriate steps can be taken at the design stage to counteract the effects of noise.

1.2.20.3 Acoustic Treatment

Acoustic enclosures are not acceptable unless specifically called for. Acoustic treatment of high noise sources must, however, be included where applicable where this can be done without greatly interfering with operation or maintenance.

When acoustic lagging is called for in the Detailed Mechanical Specification this shall consist of a 100 mm thick layer of rockwool having a density of 60 kg/m3, suitably fixed in place and reinforced to prevent collapse, and covered with 25 mm thick asbestos free plaster having a density of 1 000 kg/m3 (I.P. Insultex AF720, or equivalent). The outer surface shall be finished off with scrim cloth before being painted.

It is not necessary to lag flow meters and cast iron valves on acoustically lagged pipelines.

Components which can move, such as those associated with expansion bellows or mechanical couplings, shall be enclosed by an effective acoustic enclosure designed to prevent sound transmission but able to cope with movement without damage.

1.2.20.4 Measurement

Noise levels will be verified by taking impulse weighted Leq readings in dBA over ten minutes at the specified positions. Readings so achieved shall not exceed the specified level by more than 2 dBA. Should the noise exceed the specified level or should the level be in dispute, the Contractor will be responsible for obtaining certified sound pressure levels across the full octave band mid-frequency range in order to establish the precise A-weighted level.

1.2.21 Thermal Lagging

Thermal insulation shall only be carried out after successful pressure testing of the equipment.

The efficiency of the insulation system shall exceed 90 % and the insulation cold face temperature shall not exceed 40 ºC.

Pipe insulation shall consist of pre-formed insulation material having a thermal conductivity of approximately 0,040 W/mK at 60 ºC. The insulation material shall not have any corrosive effect on the pipework and, in particular, it must be noted that fibreglass may not be used on stainless steel.

Inside buildings, or in other protected areas, pipe insulation shall be supplied with a canvas covering having a 50 mm lap at one end and along the longitudinal seam. The laps shall be sealed using a suitable lagging adhesive. On bends the insulation material shall be neatly mitred and covered with canvas. At all flanges the insulation shall be closed off. Flanges, couplings, tees and valves shall be insulated using a removable canvas blanket or jacket fastened in place with brass hooks and eyes.

All insulation shall be coated with a suitable sealer and then painted in accordance with the colour code. The manufacturer shall advice regarding the paint types and system to be used.

Outside buildings or in other exposed areas pipe insulation shall be fixed in position using three bands per section or a suitable adhesive and then clad with aluminium. All longitudinal and circumferential joints shall incorporate a 50 mm lap with each edge grooved. The longitudinal joints shall be positioned in the "twenty past" position with the lap and groove downwards. All ends next to couplings or flanges shall be closed off and sealed before fitting muff type insulation and cladding over the couplings and flanges. All bends, tees and other fittings shall also be insulated and clad but valves need not be insulated. All joints shall be primed and sealed using a silicone or other appropriate sealer and the contractor shall generally ensure that the lagging is weatherproof with particular attention being paid to all joints and pipework support or anchor points.

With large exposed items such as vessels mounted outside, the Tenderer shall recommend a suitable system incorporating a 20 mm thick, smooth layer of weatherproof, reinforced plaster covered with a scrim cloth and overcoated with at least two coats of fibre reinforced resin sealer.

1.2.22 Bearings

1.2.22.1 General

Bearing systems shall be designed to provide safe start-up and shut-down, under normal stoppages as well as electrical supply failure, without damage.

Unless prevented from running in a particular direction, rotational bearings shall be designed to support shaft rotation in both directions.

1.2.22.2 Bearing Choice

Bearings shall be chosen primarily to suit the equipment manufacturer's requirements and the plant's design conditions but the following guidelines shall be considered:

i) Greased lubricated bearings are generally acceptable for units with power ratings up to 100 kW.

ii) Units with power ratings between 100 kW and 1 000 kW shall preferably be provided with rolling element bearings.

iii) Units with power ratings above 1 000 kW and with high speed shafts shall preferably be provided with plain bearings (oil-film type). Plain bearings shall be provided with oil ring lubrication or positively fed lubrication.

1.2.22.3 Design Life for Rolling Element Bearings

Ball and roller bearings shall generally be selected for a design life of 100 000 – 200 000 hours; i.e. the bearing manufacturer's category for machines required to work with a high degree of reliability 24 hours per day.

1.2.22.4 Thermal Alarms

Thermal alarms on bearing systems shall be set in accordance with the specific instructions of the equipment manufacturer or, if it necessary for these to be set on Site, such alarms shall be set after no less than 24 hours of operation have occurred.

1.2.23 Lubrication

1.2.23.1 Grease Lubrication

Where greasing points are not easily accessible, grease lines shall be piped to an easily accessible position for manual greasing. Each grease point shall be provided with completely separate pipework.

A distributor shall be provided where motorised lubrication is provided to more than one destination. The distributor shall be a positive displacement device which ensures equal, successive lubrication to all destinations.

Pipework for grease distribution shall be of stainless steel or non-ferrous metal.

1.2.24 Flow Meters

1.2.24.1 Electromagnetic Flow Meters

Meters

Electromagnetic flow meter sensors shall be full-bore, in-line, double-flanged units with remotely mounted transmitters. The transmitters shall provide local flow indication and 4-20 mA output. Sensors shall, unless otherwise specified, have IP 68 protection and transmitters shall have IP 67 protection.

Electromagnetic flow meters shall have polyurethane lined stainless steel tubes with either Titanium or Hastelloy C electrodes. Accuracy shall be ± 1 % of flow or better. Rubber linings are acceptable for treated water applications.

Calibration shall be in litres per second unless otherwise specified.

For applications other than for treated water, flow meters shall be provided with an electronically operated electrode cleaning device. Automatic, timed cleaning shall be provided.

Installation

The equipment shall be correctly installed, connected, adjusted and calibrated by competent persons. Calibration shall be done in the presence of the Engineer. The operation and signal transmission of meters against electromagnetic interference shall be provided.

The meter shall be installed with a straight pipe length of at least 5 pipe diameters upstream of the sensor and a straight pipe length of at least 2 pipe diameters downstream of the meter. If this is not possible, specific measures shall be taken to provide flow straightening. The complete meter installation shall comply with the manufacturer's instructions.

Grounding rings shall be supplied and installed if the application requires these.

Testing

A factory test calibration certificate shall be provided for each flow meter.

The flow meter shall be provided with a simulation test unit for field verification of the measuring system without removal of the sensor. If more than one identical model flow meter is installed, two simulation test units shall be provided.

1.2.24.2 Visual Flow Meters and Indicators

General

Visual flow meters or flow indicators shall be provided if specified in the Detailed Mechanical Specification. These are normally used for auxiliary circuits such as cooling and lubrication circuits and for flushing of mechanical seals.

Design and Materials

The units shall be of the double window type with a graduated indicating flap. Flow indicators which utilize a moving spinner or ball will be acceptable in some applications.

The body shall be double flanged and shall incorporate easy dismantling to allow cleaning of the windows.

Bodies shall be of stainless steel.

1.2.25 Gauges

1.2.25.1 Gauges – General

Gauges shall comply with the following:

i) Gauges shall be of durable, industrial construction. Case and bezel shall be of stainless steel unless this material is unsuitable.

ii) Scale markings shall be radial, plain, straight, black lines on a white background and shall be spaced so that one scale division represents approximately 1 % - 1,5 % of the maximum scale value in values of 1, 2 or 5 multiplied by any power of 10 to suit the maximum operating rating.

iii) On circular gauges the scale shall be concentric and the maximum and minimum scale values shall be near the bottom of the gauge, with the scale symmetrically disposed about the vertical centre line of the gauge.

iv) The tip of the pointer shall be of the knife edge type extending across the scale divisions and shall be as close as practical to the dial.

v) Wherever applicable, gauges shall be clearly strip marked in green to indicate the normal operating range and in red to indicate the non-permissible range of values. Such markings shall always be on the inner scale face and not on the glass face.

vi) The units of measurement shall be clearly marked on the dial. A printed label of approved non-corrosive material indicating the duty of the gauge shall be neatly fixed on or near the gauge.

1.2.25.2 Gauge Installation and Mounting

Gauges shall be installed and mounted in accordance with the following:

i) Gauges shall be mounted vertically and in such a position that they can be easily read from floor level.

ii) Flanged nozzles for gauge tappings shall be provided on the parent pipework. Nozzles shall comply with the requirements of the Clause "Pipework”.

iii) Gauges for permanent equipment installations, such as for centrifugal and reciprocating pumps, shall not be mounted directly on pipework but shall be mounted on a wall or on a pedestal stand so as to minimise vibration. Gauge cocks shall be provided at each end of the connecting pipework.

iv) Pressure gauges shall be fitted with an isolating and air bleed cock.

v) Pressure gauges used on sewage, sludge, powder, chemical or other applications where blockage or corrosion of the gauge is possible shall be fitted with a diaphragm type chemical seal, both being liquid filled. The portion of the seal in contact with the process liquid shall be of a suitable non-corroding material and, when solids are handled, shall have a large threaded socket connection not smaller than 1" BSP.

vi) Gauges for liquids containing solids shall have the nozzle on the side of the parent pipe and the configuration shall allow easy cleaning of the passageways.

1.2.25.3 Pressure Gauges

Pressure gauges shall comply with the following:

i) Pressure, vacuum or compound gauges shall comply with SANS 1062. Gauges shall be of Accuracy class 1.6 and Durability grade A unless otherwise specified. The gauges shall bear the Standards South Africa mark.

ii) Gauges shall have a scale diameter of not less than 100 mm.

iii) Calibration shall be in kiloPascals with the full scale reading between 1,5 and 2 times maximum actual operating pressure except where otherwise specified. The full scale reading for a gauge on the discharge leg of a centrifugal pump shall be higher than the pump shut-off head.

iv) All gauges shall be suitable for continuous operation and shall be liquid filled on all pump applications and where fluctuations in pressure may cause damage.

v) Gauges shall not be mounted directly on equipment subject to vibration. Gauges in pump stations shall not be mounted directly on the pipework and shall be connected to the pressure tapping point by small diameter stainless steel pipework.

vi) For dry locations indoors, the casing may be reinforced plastic or epoxy coated aluminium and the elastic element and shank of stainless steel. For damp indoor locations, particularly in any location where sewage is flowing, and for all locations outdoors, the gauges shall be weatherproof and have the cases and other metal components of grade 316 stainless steel.

vii) When used on steam lines a siphon shall be fitted between the steam line and the gauge which shall be filled with water before putting the gauge into service

1.2.25.4 Temperature Gauges

Temperature gauges shall comply with the following:

i) Temperature gauges shall have dials not less than 120 mm diameter. Accuracy shall be + 1 % of reading or better.

ii) The gauges shall be fitted vertically into removable 316 stainless steel wells and the gauges shall be removable without leakage from the pipe or vessel. Protrusion into a pipeline shall be kept to a minimum. When handling sludge, sewage or other abrasive liquids the protrusion shall not exceed 15 mm and in this case the wells shall also be of a heavy duty abrasion resistant type.

1.2.25.5 Thermometers

Thermometers shall be of the liquid column type and the complete tube shall be protected by a sturdy pocket of stainless steel or brass.

1.2.26 Pump Performance Testing

1.2.26.1 Performance Test

The pump units including the pump coupled to the motor, shall be tested at the manufacture's works in the presence of the engineer or his representative. The cost of carrying the work performance tests shall be deemed to be included in the overall cost of the plant. Tolerance limits and acceptable regulations shall be ISO 9906: Grade 1. The test results should be supplied to the Employer Branches within two weeks.

Works tests includes:

i) Balancing of the complete impeller and shaft at the manufacturers place

ii) Flow head curves shall be generated at the manufactures premises and checked against the manufacture's listed pump curves for any major discrepancies

1.2.26.2 Testing On Site

The testing of the pumping plant shall be carried out strictly in accordance with ISO 9906 Grade 3 or according to the conditions of contracts where specified in the Detailed Mechanical Specification. During the testing of each unit careful examination will be important and the records are to be kept. The examination records should incorporate the following:

- Differential pressure rise across the pump
- Pressure (suction and discharge)
- Flow (instantaneous and totalized)
- Electrical power consumption
- Efficiency
- Bearing temperatures and vibration analysis

The pumping unit shall be calculated to determine whether these are in compliance with the guaranteed figures submitted by the contractor at the time of tendering.

After commissioning, checks should be carried out for proper functioning, direction and speed of rotation, and power consumption over the Trial Operation Period. Equipment performance will be considered acceptable when the requirements as specified have been met consistently during test period. The performance of the equipment shall be examined and tested at 1, 3, 6, 9 and 12 months intervals during Defects Notification Period. At each test intervals performance reports including items of examination should be submitted to the engineer.

1.2.27 Spares

Spares which are specified in the Detailed Mechanical Specification shall be packed individually in wooden boxes with the lids unattached. Each box shall be labelled with the Contract number, manufacturer, contents, relevant part/model numbers and the supplier's address. The boxes shall be brought to Site and the lids shall be secured to the boxes immediately after the Engineer has approved the spares and the packaging.

1.2.28 Control Systems

1.2.28.1 General

Control systems shall comply with the following:

i) Control shall function as an integrated, coherent system.

ii) Protection systems shall be designed to prevent damage to equipment. Failing to start, tripping or stopping of any item of equipment shall prevent the start-up or shall initiate the appropriate shut-down procedure of related equipment in cases where damage could occur.

iii) Emergency stop stations shall be provided near to each motor driven unit.

iv) Digital indicators shall provide no fewer than three significant places (and, preferably, no more than three).

1.2.28.2 Design

The design of the control system, including drawings, functional specification, control panel layout, circuit diagrams and protection systems, shall be submitted to the Engineer for acceptance.

1.2.28.3 Testing and Commissioning of Control Systems

Setpoints for equipment and process parameters which are required for the operation of control systems shall be obtained once the equipment is operational.

The Contractor shall submit a schedule of all control functions to be checked on Site during testing and commissioning. This shall be submitted for acceptance by the Engineer. The format shall be as follows, or similar:

COMMISSIONING - CONTROL SYSTEM TESTS				
Date	Test Function	Test Method	Result (e.g. SCADA message, etc)	Proposed Corrective action

1.2.28.4 Technical Details

Control Panels

Where the details of motor starter panels have not been specified in the electrical specifications, every 400 V starter panel shall include the following standard equipment:

i) Circuit breaker (complete with auxiliary contacts for control circuits).

ii) Contactor.

iii) Overload relay with manual reset

iv) Ammeter (CT based, if above 40A).

v) Starter alive indicating light (Red).

vi) Motor running indicating light (Green).

vii) Running hour meter.

viii) Selector switch.

ix) Stop push button.

x) Start push button.

PLC/SCADA Systems

Control systems utilising PLC/SCADA systems shall incorporate the following:

i) The PLC/SCADA system shall be configured for equipment to be PLC controlled such that the installation will be able to operate following a failure of the SCADA system.

ii) Mimic screens provided for SCADA systems shall include the following (unless inapplicable):

- Overview of scheme; including the process flow diagram and indicating all electronically monitored parameters which are not included in a sub-system.
- Overview of each plant grouping.
- Individual unit (Centrifuge, compressor, pumpset, etc.).
- Equipment sequence selection.
- Equipment start interlocks.
- For each motor larger than 55 kW, motor status and, where applicable, motor protection relay diagnostic.
- Electrical reticulation schematic.
- Hardware diagnostic.
- Alarms.
- Set-points for alarm, trip and control loop functions (including password protected alteration facility).
- Record of equipment and process parameters at instant of equipment trip and station trip (see also below).
- Event log.
- Trending of monitored system parameters (see also below).
- Communication status of control system hardware.
- SCADA security system current settings, including personnel names.
- Ancillary equipment status; e.g. security, fire detection, UPS.
- Printing.

iii) Trend screens shall be as follows:

- Screens may include logical operational groupings.
- Points of inflection of measured parameters shall be recorded.
- Trend screens shall be provided for 3 hours, for 7 days and for 3 months (unless the nature of the parameter demands different scales).

iv) At least one colour printer (for graphs, mimics, etc.) and one line printer (for alarms) shall be provided in accordance with the detailed specifications.

v) The control system shall provide an alarm on the SCADA screen if an instruction to an item of equipment to start or stop does not cause that item to start or stop.

- Alarm conditions which lead to the control system executing an equipment trip shall be logged. Subsequent alarms which occur as a result of the tripping action shall be logged as subordinate alarms. The condition **which caused the trip** shall be described with respect to the:
- Item of equipment.
- Trip setpoint reached.
- Description of parameter; i.e. flow, temperature, etc.
- Time of event.

vi) A time delay following an alarm condition leading to a control system trip shall be incorporated in order to prevent tripping actions caused by electrical disturbances or similar occurrences. The time delay chosen shall match the functional needs and shall be decided in conjunction with the Engineer.

vii) Three significant places shall be used for representation of values on SCADA systems.

1.2.29 Contractor's Drawings

The Contractor’s drawings shall comply with the following:

i) Drawings shall be provided in electronic data of AutoCAD format or compactable version indicating the true reflection of as built design.

ii) Drawings shall be prepared in accordance with the latest issue of SANS 10111. The equivalent BS code of engineering drawing practice will also be acceptable.

iii) Drawings shall be to A1 or A0 size.

iv) Drawings shall be to scale, with both the scale and the drawing being large enough to clearly show all relevant components of the plant and equipment.

v) In addition to the usual plan and two side elevations, sufficient additional sections shall be included to clearly show the arrangement of all plant and equipment.

vi) Item lists shall be provided on the drawing or on a separate parts list.

vii) Item descriptions shall include the material of construction, quantity and full identification information, including, as applicable, brand name, manufacturer’s reference number, model number, size, rating, source, duty, quantity, etc.

1.2.30 Contractor's Responsibility With Regard To Civil Works

Buildings and concrete structures will form part of a separate civil contract which will include all plinths, foundation blocks, rebates, pockets, holes, thrust blocks and so forth to accommodate the installation of the plant as must be detailed on the drawings and other information to be submitted by the Contractor in terms of the Contract.

While the building and civil work will be done by others under a separate contract, the Contractor shall, prior to taking possession of the Site and before delivering any equipment to site, inspect and check the related building and civil works for accuracy and suitability of construction and for conformance with the Contractor's drawings. No payments shall be allowed for additional costs to the Contractor resulting from a failure to check such works timeously.

Ensuring that holes through walls and floors have been done correctly will be the responsibility of the Civil Contractor however the supply and installation of all foundation bolts and grouting of bases, supports or any other mechanical equipment shall be the responsibility of the Mechanical Contractor.

1.2.31 Training

1.2.31.1 General

During the Trial Operation Period, the Employer's site staff will assist the Contractor in operating the plant and the Contractor shall train these staff in the starting, operating and stopping of the plant and shall train the Employer's maintenance staff on the maintenance requirements and procedures. Unless otherwise called for in the Detailed Mechanical Specification, the Tenderer shall price for the on-Site personal tuition of 10 operational staff members and 5 engineering staff members depending on the nature of the project.

The Contractor shall also provide the trainees with printed copies of the Operating and Training Manual which forms part of the Operation and Maintenance Manual.

1.2.31.2 Operational Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

i) Start-up, shut-down and operating instruction for all operational modes for the Works shall be provided. This shall be comprehensive and shall include actions to be taken in the case of all alarm conditions and basic fault finding.

ii) A layout drawing of the installation, a process flow diagram, and a P&ID shall be provided for each Operator. The instructions described in (a) above shall also be provided in printed form for each Operator.

iii) If the specified control system is SCADA based, the tuition shall include instruction on the SCADA system.

1.2.31.3 Electrical Engineering Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

i) Control system software instruction.

ii) Detailed overview of 11 kV protection and settings.

iii) Tuition on setting of 11 kV protection.

iv) Motor protection relay and settings.

v) Overview of PLC programming for the purposes of making changes and re-loading programs if PLCs are replaced.

vi) Overview of SCADA system.

1.2.32 Spares

Spares which are specified in the Detailed Mechanical Specification shall be packed individually in wooden boxes with the lids unattached. Each box shall be labelled with the Contract number, manufacturer, contents, relevant part/model numbers and the supplier's address. The boxes shall be brought to Site and the lids shall be secured to the boxes immediately after the Engineer has approved the spares and the packaging.

1.2.33 Operating Instructions And Signage

Operating instructions and signage, if specified in the Detailed Mechanical Specification, shall comply with the requirements below.

1.2.33.1 Operating Instructions

Wall mounted operating instructions shall comply with the following:

i) Start-up, Shut-down and Operating instructions shall be provided. These shall be comprehensive and shall indicate actions to be taken in the case of all alarm conditions. These shall be written from the point of view of the plant operator.

ii) A layout drawing of the equipment installation, a process flow diagram, and a P&ID shall be provided.

iii) Instructions shall be laminated with hardboard backing. All instructions shall be included in Safe Operating Procedure format and form part of the O&M Manuals.

1.2.33.2 Signage

Signs, photo-luminescent, 3mm white Perspex UV resistant, shall be provided by the Contractor in appropriate places on the walls of the plant room and include the following:

i) All statutory and special safety warning instructions.

ii) Course of action during / after electrical shock.

iii) Any operating restrictions for equipment.

iv) Operating instructions in cases of plant trip and electrical supply failure.

Symbolic signs shall comply with SANS 1186.

The wording of the signs shall be approved by the Engineer prior to final printing. All signs shall cross refer, where applicable, to the relevant portion of the Manual.

All signs shall be installed prior to commissioning.

All signs 200mm x 200mm or larger in a wash down area shall be mounted on the wall using chemical mortar and secured with stainless steel ready bar and stainless steel nuts.

Non-wash down areas and signs smaller than 200mm x 200mm shall be secured using PVC fisher plugs with stainless steel coach screws.

For correct selection of mounting fasteners, preventing Bimetallic Reaction/Galvanic Corrosion, refer to: Design and Contracts – Quality Control Procedure 15: Bimetallic Corrosion Prevention.

1.2.34 Operation And Maintenance Manuals

1.2.34.1 Submission of Manual

Three draft copies of the Manual shall be submitted to the Engineer prior to commissioning the Works. One copy will be returned to the Contractor with comments. The second copy will be used by the operational staff on Site.

Four copies of the final version of the Manual, as accepted by the Engineer, shall be provided prior to the start of the Defects Notification Period.

1.2.34.2 General Requirements

The Manual shall comply with the following:

i) The Manual shall be for the complete Works and shall be of a standard acceptable to the Engineer. It shall be in English and shall be practically and neatly presented.

ii) One Manual shall contain original documents and this set shall be marked "Original". The other 3 Manuals shall contain all the information in the original and shall be marked "Copy 2" to “Copy 4".

iii) Binders shall have hard, plastic protected covers utilising four-ring, spring-clip holders. Binders shall not be overloaded. One spare, empty binder shall be provided for every three used. A title label shall be affixed to the spine of all binders. This shall indicate Contract number, title, Contractor's name, Site/Plant name, volume number and contents.

iv) Sections and sub-sections shall be titled, uniquely numbered and provided with separator sheets.

v) Printed matter which is inserted in the Manual shall be arrowed (indelibly) to indicate the equipment installed.

vi) Drawings shall be to a scale which makes details clear. Large drawings shall be held in plastic envelopes in the Manual. A4 and A3 drawings may be bound as normal pages. Drawings shall also be provided on electronic data storage in AutoCAD, or equivalent, format.

vii) Location map, street address as well as GPS co-ordinates to be provided.

viii) Cross-referencing within the Manual is acceptable where duplication occurs.

1.2.34.3 Format and Contents

The Manual shall be in accordance with the following (the Contractor shall modify, elaborate and repeat this format as required):

Electronic Format

All information in the hard copy O&M manuals to be provided in soft copy on a USB flash discs (x6) with separate folders for each section including all material related to the particular section. Each section shall be saved as a separate PDF file, with a hyperlinked index sheet for sub-sections. This shall include drawings and maintenance schedules as separate files. In addition, the “Summary equipment and maintenance template” shall be saved in Excel format under Section 1. Contractor to ensure the latest Excel template is requested, used and completed.

All necessary software programs and passwords to be provided.

No.	Heading	Content
1	**GENERAL**	
1.1	Contents List	Contents List for complete Manual.
1.2	Description of the Works	The description of the Works shall include a description of; firstly, the process; secondly, the design parameters and; thirdly, a detailed description of the equipment installation supported by drawings and process flow diagrams.
1.3	Equipment List	Equipment list containing each item of mechanical, electrical, instrumentation and control equipment. The equipment list shall include the make, model, serial number, description, size, range, performance data, motor and drive details, supplier's name, address and phone numbers, all as applicable. The design duty, the position of each unit's installation and its purpose in the system shall be given. Additional information which shall be provided for instruments includes the normal operating reading, maximum or minimum permissible readings, set-points (activation, warning and trip), etc. A separate list of all spares provided in terms of this Contract shall also be provided.
1.4	Drawing List	Drawing list of all the Contractor's drawings and the Tender drawings.
1.5	Cable Schedule	Cable schedule for power, data, control and instrumentation cables. This shall include the cable construction, conductor material, insulation, protection, voltage rating, start and finish points, route length, duty, load, voltage drop, core area, no. of cores, no. of cores used and gland size. For cable voltages above 400 Volts, the schedule shall also include the purchase details, specification and date of manufacture.
1.6	Documents	As-built system, layout and GA drawings. Plant circuit, flow diagrams and/or P&IDs. Control panel layouts. I/O list, program listing, loop and logic diagrams for each PLC. Colour prints of SCADA mimic screens, control faceplates and sequences. System control diagram and logic sequence chart. Copy of certificate of electrical compliance.
2	**Operation**	
2.1	Control System	Description of control system; including all manual and automatic controls. This shall include controls, instruments, protection list, settings, indications, alarms, trips, etc.
2.2	Commissioning	Commissioning Instructions. Commissioning report.
2.3	Operating and Training Manual	Operating and training manual. This shall include normal start-up, adjustment, operating and shut-down procedures and any emergency operating

No.	Heading	Content
		procedures. All specific safety aspects as well as settings, adjustments, observation, etc. shall be provided.
3	**Maintenance Schedules**	
	Maintenance and Lubrication	Schedule of routine maintenance, by time period, for all mechanical, electrical, instrumentation and control equipment. This shall be all-inclusive but reference to manufacturer's standard manuals in other parts of the Manual is acceptable. The schedule shall incorporate a lubrication schedule of recommended lubricants, capacity, lubrication periods, etc.
4	**MECHANICAL EQUIPMENT** *(This section shall be repeated for each item of equipment)*	
4.1	Identifying Information	Identifying information for the item; copied from the Equipment List.
4.2	Nameplate	A photograph of the nameplate and a table containing the unit's nameplate information.
4.3	Design and Operation	Details of operating principles, construction and operating instructions.
4.4	Maintenance Information	Technical and maintenance information including instructions for installation, assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc.
4.5	Spares	A spares list giving the item number, part number, description, quantity and materials. A list of spares recommended to be held on Site.
4.6	Test Results	Factory and Site test results.
4.7	Corrosion Protection	Corrosion protection systems used, coating supplier's data sheets and coating repair procedures.
4.8	Documents	Performance curves. Large scale, dimensioned, cross sectional and arrangement drawings of the item for assembly and spares recognition purposes, cross-referenced to the spares list. Dimensioned drawings of fabricated equipment. Circuit layout of any auxiliary systems
5	**ELECTRICAL EQUIPMENT** *(This section shall be repeated for each item of equipment)*	
5.1 to 5.6	Same as for 4.1 to 4.6 for Mechanical Equipment (see above).	
5.7	Control Details	Control and electrical details, including logic sequence, circuit diagrams and software, as applicable.
5.8	Documents	Electrical reticulation drawings. Equipment overall dimensions. Wiring diagrams. Switchboard layout

No.	Heading	Content
		drawings and SLDs. Electrical panel construction drawings.
6	**INSTRUMENTATION EQUIPMENT** *(This section shall be repeated for each item of equipment)*	
6.1 to 6.6	Same as for 4.1 to 4.6 for Mechanical Equipment (see above).	
6.7	Documents	Circuit diagrams of instrumentation systems and of individual instruments. Installation arrangement.
7	**CONTROL EQUIP.; ETC.**	
7.1	Identifying Information	Identifying information for PLCs, transmitters, HMIs, computers, etc.; copied from the Equipment List.
7.2	I/O List	Cross-referenced listing of all I/Os used.
7.3	SCADA	Colour prints of SCADA mimic screens, control faceplates, sequences and trend screens. Schedule of alarm messages and TAG lists. File structures, lists and naming conventions.
7.4	Program	Flash disk containing all software. An annotated program listing.
7.5	Documents	Schedule of cable terminals. Copy of SCADA hardware diagnostic mimic.
8	**DRAWINGS**	
	Drawings	All drawings not filed elsewhere shall be filed in this section.

1.2.35 Starting, Site Testing And Commissioning Of Plant

1.2.35.1 General

The Contractor shall advise the Engineer when instructions may be given to the Building Contractor to execute any necessary screeding and finishings around the Works. Tenderers shall allow a reasonable period in their installation programme for this work to be done and no compensation for delay in the commencement of testing and commissioning shall accrue to the Contractor during such period.

1.2.35.2 Preparation

Installation work shall be complete and accepted by the Engineer prior to commissioning.

Before starting up any section of the Works, the Contractor shall make all necessary checks to ensure that the installation has been correctly carried out, that all ducts, pipework, tanks, etc., are clean, that all equipment is correctly aligned, lubricated and connected up, and is in all respects ready to start with safety. The Contractor shall provide initial fill requirements, such as lubricating oil.

1.2.35.3 Starting-Up and Testing

The Contractor shall arrange for the Engineer to be present at initial start-up and also for any electrical and control instrumentation sub-contractors to be present.

The Contractor shall start up and test each section of the Works. These tests shall be carried out to certify that the Works is operating in accordance with the requirements specified and must be witnessed by the Engineer. All necessary modifications and rectifications shall be carried out during this period.

Set points for equipment and process parameters which are required for the operation of control systems shall be confirmed and recorded.

1.2.35.4 SCADA System

During commissioning of a new installation which incorporates SCADA as part of the control system, each control system alarm and interlock shall be tested and the resulting alarm messages shall be modified by the Contractor to be acceptable to the Engineer.

A schedule of alarm messages and their full explanations shall be inserted in the Manual.

1.2.35.5 Commissioning

When all tests have been completed to the satisfaction of the Engineer, the Works shall be commissioned. Unless the Engineer states otherwise, the complete plant, including all control functions and control systems shall be commissioned as a unit and the process performance requirements shall be achieved during normal operation.

Once the Works has been commissioned to the satisfaction of the Engineer, the operational acceptance period shall start and shall consist of a continuous period of operation free from trouble. Unless otherwise stated, this period shall be four weeks. During the operational acceptance period, the Contractor shall carry out all necessary servicing and any adjustments required. The plant staff will assist the Contractor in operating the Works during this period. The Contractor shall train the operational staff in the starting, operating and stopping of the Works, and shall train the maintenance staff on the routine maintenance requirements.

1.2.35.6 Commissioning Report

A comprehensive commissioning test report, including the SCADA system commissioning procedure and schedule of alarm messages, shall be submitted by the Contractor prior to issue of the Certificate of Completion and shall be inserted in the Manual.

1.2.35.7 Inspection

At the end of the Trial Operation Period, an inspection shall be done by the Contractor and the Engineer for the purpose of taking over the Works in terms of Clause 10 of the General Conditions of Contract.

1.2.35.8 Defects Notification Period

Refer to the General Conditions of Contract and the Detailed Mechanical Specification for requirements regarding maintenance during the Defects Notification Period.

Chapter 2 DETAILED MECHANICAL SPECIFICATIONS

2.1 CHEMICAL MIXERS

2.1.1 General

2.1.1.1 Chemical Mixers

Suitable mixers shall be chosen for the liquor to be mixed. This applies to both the design of the mixing action for the percentage total dry solids, precipitation potential and to the choice of motor and gearbox rating.

Motor and gearbox ratings for continuous operation shall provide a 20 % margin higher than the maximum mixer shaft input requirement.

Vertical shaft mixers shall incorporate stainless steel 316L shafts and impellers. Suitable means of removing and re-installing the mixers during normal operation shall be provided.

The mixer impellers shall be designed to prevent fouling.

2.1.1.2 Mounting

Mixer motors and gearboxes shall be mounted on rigid, boxed baseplates which shall be secured using a minimum of four anchors.

2.1.1.3 Motors

Motors shall feature a cowl, or similar device, which shall be designed to prevent rain reaching the motor shaft.

2.1.1.4 Mixing Design Requirements

In general the mixers are required to thoroughly mix the contents of the tank or chamber, to keep solids in suspension throughout the volume and to prevent a crust forming on the surface or scale precipitation to form at the bottom.

The mixers shall be sized to maintain an effectively constant suspended solids concentration throughout. The mixer shall not draw a vortex in the duty range of operation.

2.1.1.5 Mixing Performance Tests

The mixer units including the impeller coupled to the motor, shall be tested at the manufacture's works in the presence of the engineer or his representative. Mixing performance testing shall be as for Pump Performance Testing, clause 1.2.26.

2.1.2 Scope

The Chemical Mixers required as part of this Contract includes:

Equipment Number	Description
20MX01	Soda-Ash Mixer
20MX02	Soda-Ash Mixer
20MX11	Polyaluminium chloride mixer

2.1.3 General Description

Mixers 20MX01 and 20MX02 will be positioned in mixing tanks. These tanks will receive soda ash in powder form poured from a bag manually into the make-up tank. The tanks will be full of water with a potable water feed. The mixers are required to mix soda ash with the water so that it does not precipitate in the tank and remains pumpable. These mixers will operate continuously (up to 24 hours per day).

Mixer 20MX11 will be operated manually. This mixer will be used to mix the coagulant that is decanted from 25 litre drums into the day tanks. In some cases the coagulants will be mixed with water prior to dosing. The mixers will be switched on manually by process controllers to ensure that the tank contents are thoroughly mixed before it is pumped with the dosing pumps.

2.1.4 Equipment Data and Duties

Equipment Number	Description	Tank Volume	Operation
20MX01	Soda Ash Mixer	600 litres	Continuous/auto
20MX02	Soda Ash Mixer	600 litres	Continuous/auto
20MX11	Polyamine mixer for river water	300 litres	Intermittent/manual

2.1.5 Electrical Motors

Refer to Detailed Mechanical Specification:2.13 Electric Motors.

2.1.6 Baseplates

Refer to Detailed Mechanical Specification: 1.2.16 Baseplates.

2.1.7 Materials of Construction

Impellers: SS316L
Shafts: SS316L
Baseplates: SS316L

2.1.8 Corrosion Protection

All Motors: IP 55 or painted to specification 2.18.7.1
Gearboxes/Actuators: Painted to specification 2.18.7.3
Base Plates: Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:
Painted to specification 2.18.7.2

2.1.9 Specific Performance Testing

Mixers 20MX01 and 20MX02 shall be able to keep the tank clear of soda ash deposits without operator intervention for 28 days trouble free operation.

2.2 FLOCCULATION MIXERS

2.2.1 General

2.2.1.1 Flocculation Mixers

Mechanical Flocculation Mixers are required to gently mix the coagulated river water after the rapid mixing step. The mixers shall be designed to gently agitate the water to cause inter-particle collisions and attachments so that the floc sizes are increased for enhanced removal in the subsequent DAF and filtration processes.

Motor and gearbox ratings for continuous operation shall provide a 20 % margin higher than the maximum mixer shaft input requirement.

Vertical shaft mixers shall incorporate stainless SS316L steel shafts and paddles. Suitable means of removing and re-installing the mixers during normal operation shall be provided.

2.2.1.2 Mounting

Mixer motors and gearboxes shall be mounted on rigid, boxed baseplates which shall be secured using a minimum of four, 16 mm anchors.

Provision shall be made in the mounting to prevent the leakage of gearbox oil into the water.

2.2.1.3 Motors

Motors shall feature a cowl, or similar device, which shall be designed to prevent rain reaching the motor shaft.

2.2.1.4 Mixing Design Requirements

The flocculation mixers shall be vertical shaft mixers with vertical paddles in parallel to the shaft.

2.2.1.5 Mixing Performance Tests

The mixers shall be able to operate continuous and trouble free for 28 days. The speed of the mixers shall adjust automatically in proportion to the inlet flow meter readings.

2.2.2 Scope

The Flocculation Mixers required as part of this Contract includes:

Equipment Number	Description
21MX01	Flocculation mixer 1
21MX02	Flocculation mixer 2
21MX03	Flocculation mixer 3

2.2.3 General Description

Mechanical Flocculation Mixers are required to gently mix the coagulated water after the rapid mixing step. The mixers shall be designed to gently agitate the water to cause inter-particle collisions and attachments so that the floc sizes are increased for enhanced removal in the subsequent settling and filtration processes. The mixing in the first flocculation zone will be slightly more intense than the mixing in the subsequent zones. As the floc size builds this prevents that over agitation does not break the flocs up again.

Gate-type flocculation mixers shall be provided. The Contractor shall submit his calculations as proof that the design will achieve the required G-values.

2.2.4 Equipment Data and Duties

Equipment Number	Description	Tank Volume	Drive	Tip Speed	G - value	Operation
21MX01	Flocculation mixer 1	12960 litres	VSD	<0.6 m/s	70 s^{-1}	Continuous/auto
21MX02	Flocculation mixer 2	12960 litres	VSD	<0.5 m/s	35 s^{-1}	Continuous/auto
21MX03	Flocculation mixer 3	12960 litres	VSD	<0.4 m/s	15 s^{-1}	Continuous/auto

For all blades: **D/T > 0.35**
where D is the mixing blade diameter and T is the tank equivalent diameter.

2.2.5 Electrical Motors

Refer to Detailed Mechanical Specification:2.13 Electric Motors.

2.2.6 Baseplates

Refer to Detailed Mechanical Specification: 1.2.16 Baseplates.

2.2.7 Control Philosophy

The speed of the mixers shall adjust automatically in proportion to the inlet flow meter readings.

2.2.8 Materials of Construction

Paddles: SS316L
Shafts: SS316L
Baseplates: SS316L

2.2.9 Corrosion Protection

All Motors: IP 55 or painted to specification 2.18.7.1
Belt Guards: Painted to specification 2.18.7.2
Gearboxes/Actuators: Painted to specification 2.18.7.3
Base Plates: Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:
Painted to specification 2.18.7.2

2.2.10 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.3 SODA ASH DOSING

2.3.1 General

The McGregor WTW will use soda ash [Na_2CO_3] for pH adjustment. The chemical is delivered as dry powder in 25 kg bags. Two batching make-up tanks are required (duty/standby). Two dosing pumps are required, one will pump to the head of works for pH Adjustment, and the other will pump to the end of the chlorine contact channel for stabalisation. Both pumps will also be pumping from the same make-up tank.

Each of the two dosing pumps shall be designed to dose 1-25 kg/hr soda ash.

The system shall be designed for ease of operation and safety.

2.3.2 Equipment Data and Duties

Equipment Number.	Description	Features Included	Specifications
21TK01, 21TK02.	Mixing Tank	*Water inlet with ball float*	
		Minimum 600 litres	
20LT01 20LT02	*Level sensor*	*Level sensors with interlocks to pumps to prevent pumping when level is low*	*Radar or Ultrasonic*
20MX01 21MX02	*Mixers*	*Mixer*	*Described in Section 2.1.1.1.*
21PS01 21PS02	Dosing Pumps	*End suction slurry pump*	*Anti-clogging design*

2.3.3 Electrical Motors

Refer to Detailed Mechanical Specification:2.13 Electric Motors.

2.3.4 Baseplates

Refer to Detailed Mechanical Specification: 1.2.16 Baseplates.

2.3.5 Control Philosophy

Dosing pump 20PS01 will dose soda ash to head of works at the preconditioning chamber. Dosing pump 20PS02 dose soda ash to the end of the chlorine contact channel. Each dosing point will be equipped with an pH analiser to monitor the pH at the dosing points.

Dosing can be controlled in two manners and both should be programmed into the control system:

1. The dosing of each pump will be automatied and will dose proportionally to the flow meter readings.
2. The dosing of each pump will be automated to target a certain pH setpoint at the pumps' respective pH sensor.

The dosing rate (mg/l) will be an operator input. The actual dosing rate (kg/hr) will adjust as the inflow rate to the plant changes. The pH analisers will be used for monitoring only, to determine whether the target pH is achieved.

2.3.6 Materials of Construction

Mixing Tank	GRP or PP suitably rated for high concentration of Soda Ash

2.3.7 Corrosion Protection

All Motors:	IP 55 or painted to specification 2.18.7.1
Valves:	Painted to specification 2.18.7.2
Belt Guards:	Painted to specification 2.18.7.2
Aluminium Frames:	Painted to specification 2.18.7.2
Gearboxes/Actuators:	Painted to specification 2.18.7.3
Pump Casings:	Painted to specification 2.18.7.3
Base Plates:	Painted to specification 2.18.7.7
Acoustic Enclosures:	Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:	Painted to specification 2.18.7.2

2.3.8 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.3.9 Specific Performance Testing

The dosing system shall be able to dose soda ash without operator intervention (apart from bag unloading) for a period of 7 days.

2.4 COAGULANT DOSING

2.4.1 Scope

The following coagulant dosing systems shall be designed, supplied and installed under this Contract:

Item	Specifications
Polyaluminium Chloride Dosing System	
Dosing Pump 21PS11	*Mechanical diaphragm dosing pumps with external motor.* ***Q = 50l/hr @ 5 bar***
Day Tank 20TK01	*Min 300 litres – suitably rated for chemical*
Mixer 20MX11	*Vertical shaft, mounted. SS316*
Level Sensor in day tank 20LT11	*Radar or ultrasonic*
Dosing pipework to dosing point	*Flexible hose*
Dosing Point manifold	*Distribute chemicals evenly above rapid mix point: 800mm long dia. 80mm SS316 half-pipe with perforations*

2.4.2 General Description

One coagulant dosing system is provided for under this Contract. This is for polyaluminium chloride dosing. These shall be designed, supplied and installed as a complete system.

Potable water connections and valves shall be provided to dilute the chemicals where required.

A complete safety shower shall be installed.

2.4.3 Control Philosophy

The flow rate into the WTW is measured with an electromagnetic flow meter. Process controllers will enter a dosing rate (ml/l) of the coagulant. The dosing pump will pump the set volume (ml) per litre of flow that enters the plant.

The mixer will be used by process controllers when they fill the day tank. It will be switched on and off manually.

The level sensor will display the level in the coagulant tank to the HMI/SCADA and alarm operators when the level is low. The dosing pumps will be stopped when the tanks are nearly empty to prevent air entrainment in the dosing pump suction lines.

2.4.4 Materials of Construction

Mixer shaft & Impellor : SS316L
Dosing Point Manifold: SS316L

2.4.5 Corrosion Protection

All Motors: IP 55 or painted to specification 2.18.7.1
Valves: Painted to specification 2.18.7.2
Belt Guards: Painted to specification 2.18.7.2
Aluminium Frames: Painted to specification 2.18.7.2
Gearboxes/Actuators: Painted to specification 2.18.7.3
Pump Casings: Painted to specification 2.18.7.3
Base Plates: Painted to specification 2.18.7.7

Acoustic Enclosures: Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:
Painted to specification 2.18.7.2

2.4.6 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.5 RAPID GRAVITY MEDIA FILTERS

2.5.1 Scope

This section covers the following new filters and associated equipment and should be read in conjunction with the P&IDs:

Rapid Gravity Media Filters

- Three (3) declining rate, media filters, including filter media, backwash troughs, outlet orifices, all overflow weirs and covers over filter outlet chambers.

2.5.2 General Description and Technology

Rapid gravity filtration implies deep bed filtration, where suspended particles are not strained out of suspension at the media surface but penetrate the media bed to be captured some distance below the media surface. The filters operate on a declining rate, variable level basis with a common water level in all the filters. The cleanest filter will take the highest flow and the dirtiest filter the lowest flow. A control weir in the filter outlet boxes shall maintain a minimum water level in the filters.

2.5.3 Equipment Data and Duties

2.5.3.1 Design Criteria

The design criteria for the new filters are listed in the table below:

Characteristic	Design Criteria	Comments
Filter rate with N filters	2.65 m/h	
Filter rate with N – 1 filters	3.98 m/h	
Filter rate with N – 2 filters	7.96 m/h	
Air backwash rate	55 m/h @ 50Hz	Air cycle (adjustable down to 35Hz on SCADA)
Water backwash Rate 1	20 m/h with 1 pump	Water-only Rate 1 (adjustable down to 35hz)
Water backwash Rate 2	40 m/h @ 50Hz with 1 pump	Water-only Rate 2 (adjustable down to 35hz)
Air backwash time	See Blowers	Adjustable on SCADA
Water backwash time @ Rate 1	See Backwash pumps	Adjustable on SCADA
Water backwash time @ Rate 2	See Backwash pumps	Adjustable on SCADA
Number of beds per filter	1	
Length	3.76m	
Width/bed	2.6m	
Total Area per filter	9.78m^2	

2.5.4 Control Philosophy

2.5.4.1 Normal Operation

Flow is divided among all the filters by means of a common inlet pipe that splits and discharges into a filter inlet box. Each filter is fitted with an actuated isolation valve before the inlet box to stop flow to each filter.

Water filters through the media into the flume area, passing through the dual parallel lateral underdrains which retain the media, but allow the filtered water to pass. The filtered water passes through the (open) filtered water outlet valve towards the filter outlet control weir. The weir maintains a minimum water level in the filter and is situated in the filter outlet box. Under the range of plant

flows the following water levels shall be shown and monitored on the SCADA system by two level sensors in the inlet channel:

1. Level 1: The level that would exist if all the filters were clean and in service at the commissioning of the works at design flow (Theoretical level)
2. Level 2: This is the lowest level reached by all the filters after all filters are backwashed and returned to service.
3. Level 3: The maximum level just before initiation of the backwash of the dirtiest filter. Level 3 must be set to satisfy two goals simultaneously: a. High enough to overcome the clogging head of the dirtiest filter at the end of the filter cycle;
4. Level 4: This is the maximum permissible water level that the online filters can reach when one filter is out of service for backwashing. This level must be just below the emergency overflow level of the filters.

As the filters gradually clog during operation, the level will rise in all operating filters to provide the necessary head to overcome the clogging head. The level gradually rises from level 2 to level 3. At level 3 a signal must notify the operator that a backwash must be initiated. When the backwash is initiated the remaining online filters, each receive a non-equal share of the load previously carried by the filter removed for backwashing. As they pick up the additional load their levels will rise more rapidly than before the backwash was started. The levels of the online filters will continue to rise between levels 3 and 4 until the newly backwashed filter is returned to service. The newly backwashed filter then becomes the highest rate filter and reduces the rate handled by the dirtier filters.

At level 4 a high-high alarm on the SCADA system must notify the operator that the level in the filters is critically high.

2.5.4.2 Backwash Cycle

Each filter shall be controlled from a filter control panel located in the control room overlooking the filter. Provision must be made for the filter to be operated automatically and manually with the aid of a selector switch marked “Auto/Off/Manual”.

In the automatic mode, the backwash cycle must be initiated by the Level 3 water level in the filter. The filter inlet isolation valve must automatically close after which, the valve on the discharge pipe must automatically close if the water reaches a pre-determined low level.

Once the discharge pipe outlet valve has closed, the actuator on the air scour line must open and the blowers must start and scour the filter bed for a set period (adjustable as per design criteria) after which the actuator must close automatically when the blowers are stopped. If the suppliers of the underdrain system require an air valve to release excess air from the flume and laterals, it must be provided.
The backwash wash-out chamber outlet valve must then be opened automatically to allow the backwash channel to clear.

After air scouring, the filter backwash inlet actuated valve on the backwash line at the filter must open and the backwash pumps must start. Backwash water is drawn from the backwash suction sump and pumped by the new backwash water pumps to the flume below the filter and into the dual parallel lateral underdrains. Water shall be equally distributed through the flume and underdrain to wash the media. Backwash water moves over the wash-out (backwash) trough, into the inlet chamber and through the backwash isolation valve to the backwash water collection pipeline that

drains to the backwash collection sumps. The filter shall be backwashed for a set period (adjustable as per design criteria) at Rate 1 and then for another set period (adjustable as per design criteria) at Rate 2. After backwashing at rate 1&2 the pumps must slowly ramp down, switch off and then the actuated inlet backwash valve (at the outlet box) must close automatically.

On completion of the backwash cycle, the backwash drain valve (at the inlet box) must close, and the inlet valve open automatically. This sequence of events shall be limited to an hour.

The above sequence must repeat itself for the second filter.

In the manual mode, the pumps, blowersand valves must be started and stopped with push buttons on the filter control panel. The low-level safety switch in the treated water reservoir must be active in the manual mode, to prevent the pumps from running dry.

2.5.5 Underdrain System

The Dual Parallel Filter Underdrains are specified in specification 2.6.

2.5.6 Filter Media

The filter media shall consist 800 mm of sand.

Each filter cell shall be cleaned thoroughly before any filter media is placed. Each cell shall be kept clean throughout the placement operation. Layers shall be placed at a maximum depth of 300 mm, after which they will be washed to remove excess fine materials. Allowance shall be made for a minimum of 5 minutes of washing, with water flowing into the backwash channel. After washing, the water shall be drained, and any remaining dirt shall be skimmed off.

After every layer is rinsed, a bubble test must be conducted on the layer. The bubble test must show an even distribution of bubbles across the media. This must be witnessed by the Engineer and it is the Engineer's sole discretion to approve or reject the layer. After the rinsing is complete and the bubble test is passed, the next layer can be installed. After placing the full sand level, the sand shall be backwashed three times Rate 2 and the top 5 mm of very fine material carefully removed and disposed of offsite. The quantity of sand to be supplied shall be 10% in excess of that necessary to form the original bed.

The contractor shall make provision for all water and pumping equipment necessary to wash and rinse filter media and conduct the bubble tests.

The filter media properties are described in the following two sub-sections.

2.5.6.1 Sand

Characteristic	Sand
Type	Quartzitic
Bed Depth – L (m)	0.8
Media Density - ρ_s (kg/m3)	>2500
Fixed loose-bed Porosity - ε_0	0.45
Sphericity – Ψ	0.78
Coefficient of uniformity – UC (m)	1.4
Effective size – EC (mm)	0.7

The sand shall be quartzitic, clean, hard, durable, free from clay and any other organic matter and obtained from an approved source. The sand shall have a hydrochloric acid solubility of less than 5% when tested in accordance with AWWA Standard B100-53.

The Contractor shall be required to provide certificates of compliance with the above with each bag of media provided.

2.5.7 Backwash (wash-out) Troughs and Overflow Weirs

Each filter shall be equipped with a fiberglass-reinforced plastic (FRP) backwash trough that spans the entire length of the filter from the inlet box to the outlet box (3.76m). The trough will convey backwash water towards the inlet box for discharging backwash water to the backwash collection sump. The trough shall be the same width as the concrete opening at the filter inlet box or at least 440mm wide. The side walls (depth) of the trough shall be at least 440mm deep.

Wash-out troughs shall have one closed end and one open discharge end with a waterstop. Proper support of the trough shall be provided to prevent sagging of the trough over time. Wash-out troughs shall be supplied with stainless steel 316 stabilizers to ensure troughs don't bend or buckle. After installation, the backwash water shall discharge freely and evenly across the whole surface area of the filters, without leakage between any joints.

An adjustable serrated overflow V-notch weir shall be installed along the inside face of the backwash throughs and the inside face of the filter outlet boxes. The V-notches shall be at least 50 mm deep with a maximum of 5 mm spacing at the top of the V-notch. The plate shall be at least 250 mm high and be vertically adjustable for leveling purposes. The thickness of the weir plate shall be at least 3 mm. The weir plate and trough fasteners shall be 316 L stainless steel and shall be spaced at a maximum of 250 mm apart. The weir plates and troughs shall be sealed watertight with a sealant suitable for potable water. The weir plate and trough design must make allowance for shrinking and expansion. The V-notch weirs and troughs shall be leveled within a tolerance of ± 0.5 mm.

Tenderers shall allow in their prices for sealing against "off the shutter" concrete finish and between ends of weir sections with an approved durable material such as closed cell expanded neoprene.

2.5.8 Filter Outlet-box cover

Each filter outlet-box shall be provided with a white aluminium sliding frame and glass cover. The covers shall be fitted to each outlet box for the operator to easily open and inspect the filtrate.

2.5.9 Filter Outlet Orifice

A fixed orifice plate is required on the effluent line of each filter just before the filter outlet-box to limit the starting rate of a clean filter to 1.4 times the average design flow rate (average design flow rate is 30m^3/hr/filter).

2.5.10 Valves General

All valves shall be as per the Detailed Mechanical Specification: 2.11 VALVES.

2.5.11 Pipework General

All pipe sizes to be as per P&IDs and comply with Mechanical Specification: 0 Hydrostatic **Pressure Probe**

Equipment No.	Description	Specifications

104 PT 01	**Hydrostatic Pressure Probe**	Pressure Range	100 mbar to 2 bar
	To monitor the Rooidam water level. Probe to be placed on dam floor.	Liquid	Dam water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	Up to 100m
		Communication protocol	Modbus
		Probe Material	SS316L
		Units	kPa

PIPEWORK. If no pipe size is indicated, the following will apply to this section:

i) Maximum suction pipe velocity ≤ 0.7 m/s;

ii) Maximum delivery pipe velocity ≤ 1.5 m/s.

2.5.12 Materials of Construction

Weir Plates : 316L Stainless Steel
All submerged metal : 316 Stainless Steel
All under-water supports, ties, etc. : 316 Stainless Steel
All fasteners (Incl. Anchor Bolts) : 316L Stainless Steel
Filter outlet box cover frame : Aluminium

Pipework

All pipework : 304 Stainless Steel

2.5.13 Corrosion Protection

All Motors: IP 55 or painted to specification 2.18.7.1
Valves: Painted to specification 2.18.7.2
Belt Guards: Painted to specification 2.18.7.2
Aluminium Frames: Painted to specification 2.18.7.2
Gearboxes/Actuators: Painted to specification 2.18.7.3
Pump Casings: Painted to specification 2.18.7.3
Base Plates: Painted to specification 2.18.7.7
Acoustic Enclosures: Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:
Painted to specification 2.18.7.2

2.5.14 Specific Performance Testing

2.5.14.1 Filtered Water Performance Criteria

The filtered water needs to comply with the United States Environmental Protection Agency – Surface Water Treatment Rule. This requires that the filtered water turbidity, for a minimum period of 24 hours between backwash cycles, must be less than 0.3 NTU for 95% of the time and less than 1 NTU 100% of the time.

Turbidity meters shall be installed on all the filters so that the filtered water can be measured before it splits between the outlet box and the filter to waste line. The removal of turbidity and compliance to the above requirement must be integrated into the PLC of each filter such that if the required removal is not met, an alarm must sound for the operators to initiate a backwash.

2.6 DUAL PARALLEL FILTER UNDERDRAINS

2.6.1 Scope

This section covers the following new dual parallel lateral underdrains and associated equipment and should be read in conjunction with the P&IDs:

Lateral underdrains for the Media filters:

- Three (3) new dual parallel lateral underdrains for the media filters.

2.6.2 General Description and Performance Requirements

The underdrain system for the filters shall be a dual parallel lateral i.e. Leopold or equivalent. The system must be such that feeder and compensating chambers are provided within the cross-section of a single block. The cross-section of the underdrain shall be where the feeder (or primary) chamber is adjacent and connected to the compensating (or secondary) chambers through a series of orifices. The orifices shall be located at four different elevations and sized to provide a uniform distribution of air and water. All internal orifices shall be integrally moulded to provide a smooth bore orifice. Underdrains requiring secondary drilling procedures to install internal orifices will not be considered acceptable.

Underdrains shall be manufactured from corrosion-resistant, high-density polyethylene for installation in three (3) filter cells. Each filter cell measures 2,6 m width x 3,75 m length. The total filter area is 9.75 m² utilizing a Front Flume filter arrangement.
The blocks shall be arranged end-to-end and mechanically joined with an O-ring to form continuous underdrain laterals approximately equivalent to the length of the filter cell. The joints shall be gasketed, bell and spigot type with internal alignment tabs for proper alignment and be air and watertight. Joints shall be snap-lock type so that the blocks are joined with integral interlocking snap lugs and lug receptors for ease of assembly and installation of the laterals.
Each filter cell shall have an HDPE Insert with type 316 stainless steel hardware.

The underdrain system shall have an integral grout pocket designed to provide uplift resistance as a result of internal pressurization of 2.068 Bar without any external mechanical anchors. Underdrain blocks that do not have a grout pocket shall have external anchor rods embedded into the filter floor and shall extend above the underdrain and hold the underdrain down from the top. The external anchor system shall be designed for a minimum allowable load of 30 psi hold down across the filter. All anchors shall be tested prior to the placement of the underdrain block to 130% of the allowable load. All anchors shall be type 316 stainless steel.

2.6.2.1 Grout Retainer

A grout retainer bridge shall be utilized over the filter flume. The bridge shall be of high-impact polystyrene properly keyed to fit the underdrain blocks to allow adjustment of lateral center-to-center distance without difficulty. The bridge shall span the width of the flume and shall be laid side by side to cover the entire length of the flume and create a homogenous seal. The ends of the bridge shall have overlapping edges formed into the piece to create a contiguous seal perpendicular to the width of the flume. The elevation of the bridge can be adjusted vertically using flume sealing plates against the bottom side of the bridges. The bridge shall be supplied by the filter underdrain manufacturer.

2.6.2.2 Grout

Cement shall be standard brand Portland cement conforming to ASTM C150, Type II, for general use.
Cement that has become “lumpy” shall not be used. Water for mixing and curing shall be clean and clear potable water. The water shall be considered potable if it meets the requirements of SANS 241.

Sand shall be clean and washed masonry sand per ASTM C144. When tested in accordance with ASTM C144, 100% of sand particles shall pass No. 4 Sieve (4.75mm) and not more than 4% of sand particles shall pass No. 200 Sieve (0.075mm).

No chemical admixture is needed in most of the applications. The grout can be mixed in a small batch and used immediately.

The grout used in installing the blocks shall have a minimum compressive strength of 25 MPa after 30 days of curing. Normally, a grout with one-part Portland cement and two parts clean silica sand properly mixedand wetted with a maximum water-cement ratio by weight equal to 0.50 to 0.55 for the base grout and 0.61 to 0.67 for the fill grout are sufficient. A test batch and test cubes must be made for crushing and approval purposes, before the first laterals are installed.

The Mechanical Contractor will be responsible for complete installation of the underdrain system, including grout and grouting.

2.6.3 Equipment Data and Duties

The following duty flow rates shall be used for the OEM design of the underdrain system:

Max filtration rate per filter cell:	5.75 m/hr
Backwash Water Rate High (Rate 2):	40 m/hr
Backwash Water Rate Low (Rate 1):	20 m/hr
Backwash Air Rate:	55 m/hr

2.6.4 Performance Testing

2.6.4.1 Underdrain Lateral Flow Distribution Test

The filter underdrain system in each filter cell shall be given a series of visual, qualitative and flow distribution tests i.e. bubble test. This is to verify that orifices are not clogged with debris, to ensure uniform flow distribution of air and water, for any signs of quiescent zones and occurrence of excessive surface turbulence. The test must be conducted in the presence of the supplier’s installation technician. Once the supplier’s installation technician has approved and given written approval of the bubble test, the Engineer will witness the test. It is the Engineer’s sole discretion to approve or reject the underdrain installation. These tests shall be performed and approved before the support gravel and filter media are placed.

The mechanical contractor shall make provision for all water and pumping equipment necessary to conduct the tests.

2.6.5 Procurement Terms

The Tenderer shall include in his price any provisions to be made in order to comply with the necessary payment terms of the Supplier. The filter underdrain systems typically have long procurement lead time (up to 30 weeks). The Client will not conduct any advanced payments. Payment will be received by the Contractor once the items have been delivered to the Client as per the Client's payment terms.

2.7 BLOWERS

2.7.1 General

2.7.1.1 Positive Displacement Blowers

General

Each blower shall be provided with the following:

i) Isolating valve.
ii) Pressure relief valve sized for full flow.
iii) Check valve.
iv) Inlet filtration with paper element.
v) Inlet and outlet silencing.
vi) Discharge pressure gauge.
vii) Inlet pressure gauge (if not atmospheric).
viii) Anti-vibration mounts.

Roots-type rotary lobe blowers shall be installed and configured so that the suction and discharge pulsing is minimised and shall not cause undue noise or damage to equipment.

Pressure Relief Valve

A lockable pressure relief valve shall be fitted to **each** unit, regardless of whether any electronic protection system has been provided.

The pressure relief valve shall be sized for full flow at blow-off pressure. It shall be mounted immediately downstream of the blower but upstream of any valve. Unless provided as part of a proprietary package, the valve shall be mounted on a flanged nozzle on the discharge pipe. A padlock, or equivalent locking mechanism, shall be provided.

The valve shall be provided with a test certificate indicating the blow-off pressure setting.

2.7.2 Scope

This section covers the following new blowers and associated equipment and should be read in conjunction with the P&IDs:

Media Filters backwash blowers:

- Roots type rotary lobe blowers (one duty & one standby) for backwash air to the media filters.

2.7.3 General Description

Roots type rotary lobe blowers shall generally comply with clause 2.7.1.

All blowers shall be supplied with a flanged rubber tyre type coupling on the discharge end. Blowers shall be supplied with flanged spool pieces drilled to SANS 1123 on the suction and delivery side of the blower. The spool pieces

shall be fitted with nipples or flanged tee pieces for pressure indicators, air valves and other instrumentation required as per the P&ID's and specifications.

The Contractor shall submit the following characteristic curves as part of his Tender Document:

- H-Q curve
- Efficiency curve
- Motor Efficiency curve
- Power curve

Each blower shall have an acoustic enclosure to reduce noise levels. The acoustic enclosure shall be made up of easily removable panels. The silencers and acoustic enclosure shall reduce the noise level to a maximum of 80 dB(A) @ 1m away, during normal operation inside the building, with one unit running.
The heat build-up in the acoustic enclosure must be ventilated to the outside of the enclosure, by means of motorised fan. The ventilation system must be able to effectively remove heat build up in the acoustic enclosure.

An integrated cooling system for the bearings and oil must be provided with the blowers. The blowers must be provided with oil level viewing from outside the enclosure.

The acoustic enclosure must be fitted with two sets of removable suction dust filters. The one filter must supply air to the intake of the blower. No hot air from the enclosure may be sucked into the intake of the blower. The second filter must provide ventilation air into the enclosure and be abstracted with the hot air from the enclosure. Both dust filters must be easily accessible and easily removable. The Contractor must provide two filters cartridges per filter, one for use and one for storage. The pressure drop across the air intake shall be visible on a gauge outside of the enclosure.

The blower discharge pipe must be fitted with a pressure relief valve, an adequate oil trap, moisture filter, moisture trap, a non-return valve, discharge pressure gauge and isolating valve. The outlet position of the pressure relief valve vent shall not pose a safety risk to a bystander.

The delivery pipes shall be fitted with means of preventing the backflow of water into the blowers under all operational conditions. This could be achieved with the pipework at the filters. The Contractor shall supply and install all suction and delivery pipework and fittings inside the building.

The backwash air pipe at each filter shall be provided with an electrically actuated isolating valve which shall open and close as necessary during the backwash air scour cycle.

All blowers shall be equipped with an E-stop functionality next to each of the blowers.

2.7.4 Equipment Data and Duties

Equipment No.	Description	Specifications	
110BLO01 / 110BLO02	**Media Filters Backwash Blowers (1+1)**	Capacity	538 Nm3/hr
		Pressure	3 m Water Column (WC)
		Max inlet air temperature and ambient temperature	35 °C

		Max rpm	1500
		VSD required	Yes
		Silencers on in & outlet pipes	Yes
		Acoustic enclosure	Yes
		Acoustic enclosure heat ventilation	Yes

2.7.5 Electrical Motors

Electrical Motors shall comply with Mechanical Specification:2.13 Electric Motors.

Each pump motor shall be fitted with a temperature sensor integrated with the VSD or starter to protect the motor from overheating.

2.7.6 Baseplates

Base Plates shall comply with Mechanical Specification: 1.2.16 Baseplates.

The blower shall be supplied with a baseplate of adequate size and strength to support the blower, gearbox, motor and any other accessories. Each blower shall be fitted with sufficient anti-vibration mounts on top of the baseplate.

2.7.7 Pipework General

All pipe sizes are to be as per P&IDs and comply with Mechanical Specification: 0 Hydrostatic **Pressure Probe**

Equipment No.	Description	Specifications	
104 PT 01	**Hydrostatic Pressure Probe**	Pressure Range	100 mbar to 2 bar
	To monitor the Rooidam water level. Probe to be placed on dam floor.	Liquid	Dam water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	Up to 100m
		Communication protocol	Modbus
		Probe Material	SS316L
		Units	kPa

PIPEWORK.

2.7.8 Valves General

All valves shall be as per the Detailed Mechanical Specification: 2.11 VALVES.

2.7.9 Control Philosophy

Each blower set will feed into a dedicated common line that flows to the designated filter bank and then splits again into the flume of each filter.

The PLC shall be programmed with the functionality to achieve the backwash regimes as summarised in the tables below.

The operator shall be able to change the air backwash rate (within the limits of the blower) and duration of a backwash separately on the SCADA. When the blowers are in automatic mode and a backwash is started, at the control panel located at each filter, a backwash cycle will start. The blowers shall pump the selected flow for the selected duration by means of the VSD and air flow meter fitted on the common line of each blower set. The blowers shall be started automatically as part of a backwash cycle or manually with push buttons on the filter control panel when in manual mode.

The blowers shall operate as 1 duty and 1 standby units. If a blower is defective, the system shall automatically select the next blower. With each activation, the duty blowers shall cycle to ensure that all the equipment gets approximately equal run-hours.

MEDIA FILTERS	
Air Backwash Rates (Adjustable on SCADA)	35 m/h (minimum) - 55 m/h
Control Philosophy	1. Start Air only backwash (Duration Adjustable on SCADA) 2. Start Water only backwash at rate 1. Washout until water is sufficiently clean (Duration Adjustable on SCADA) 3. Start Water only backwash at rate 2. Slightly fluidize the bed >1% (Duration Adjustable on SCADA)

2.7.10 Materials of Construction

Backwash Blowers

Pump Impeller :	Ductile Iron,
Pump Casing :	Cast Iron
Acoustic Enclosure :	Hot dipped galvanized mild steel
In/Outlet Silencers :	316L Stainless Steel
Dust Filter Frames :	316L Stainless Steel
Base Plates: :	Hot dipped galvanized mild steel
All fasteners (Incl. Anchor Bolts) :	304 Stainless Steel

Pipework

All pipework :	304 Stainless Steel

2.7.11 Corrosion Protection

All Motors:	IP 55 or painted to specification 2.18.7.1
Valves:	Painted to specification 2.18.7.2
Belt Guards:	Painted to specification 2.18.7.2
Aluminium Frames:	Painted to specification 2.18.7.2
Gearboxes/Actuators:	Painted to specification 2.18.7.3
Pump Casings:	Painted to specification 2.18.7.3
Base Plates:	Painted to specification 2.18.7.7
Acoustic Enclosures:	Painted to specification 2.18.7.7

All other equipment either fitted or bought out and installed and not mentioned above:
Painted to specification 2.18.7.2

2.7.12 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

Stainless steel pipes to be banded with 3 x 250 mm bands (4 000 mm apart), as per the contents of the pipe.

2.7.13 Specific Performance Testing

The blower shall demonstrate that it can perform on its duty curve and stated power consumption. The functioning of the pressure relief valve shall be demonstrated by slowly closing a discharge valve until the PRV opens when the pressure reaches the defined pressure limit.

Workshop performance testing of the blowers will not be required if the pumps are of a reputable brand with more than 50 separate installations in South Africa and if certified performance curves can be supplied. If these conditions are not met, workshop performance testing will be required at the Contractor's expense, in the presence of the Engineer. It will be the Engineers sole discretion to decide whether witnessed workshop performance testing needs to be carried out.

2.8 CENTRIFUGAL PUMPING EQUIPMENT

2.8.1 General

2.8.1.1 Pump Duty

Details of pump duties are given in the Detailed Mechanical Specification and the type of pump and materials of construction shall at all times be selected to suit the fluid to be pumped and the performance requirements.

Pumps handling sewage and sludges shall be capable of running without choking, clogging, any liquid which may contain long fibrous material; vortex or open impellers are therefore preferred.

2.8.1.2 Pump Type

Centrifugal pumps shall, wherever possible, be of the single-stage, end-suction, back pull-out type, direct-coupled to the motor using spacer type couplings and complete with common baseplate and guard. Close-coupled pumps may be used on clear water applications for motor sizes up to 2,2 kW.

2.8.1.3 Pump Speed

Preference shall be given to pumps which operate at 1 500 rpm or lower. Pump speed and casing test pressures must be given in the Tender.

2.8.1.4 Performance Parameters

Performance characteristics shall be suitable for parallel operation with pump head increasing continuously to shut off. The pump shall be selected to operate as close as possible to best efficiency at duty point and shall be adequately sized to safely permit an increase in capacity of at least 25 % should the head be lower than estimated.

2.8.1.5 Margin of Power

A non-overloading absorbed power characteristic, preferably with maximum power absorbed at best efficiency, is preferred.

The motor's continuously rated power shall exceed the greater of the following:

i) 10 % above the maximum power demand under any condition of operation for the pump, including open discharge.

ii) 20 % above the pump's maximum power demand over the full range of flow and pressure conditions anticipated in the pump installation.

2.8.1.6 Life

Pumps and motors shall be designed for long life under continuous operation. Bearings shall be designed for an L10 life of not less than 100 000 hours.

2.8.1.7 Impeller

Preference shall be given to pumps whose impeller diameter does not exceed 95 % of the maximum impeller diameter for the volute/diffuser provided. The impeller surface finish shall be up to N7. The peripheral speed of impellers should be designed not exceeding 10.5 m/sec.

2.8.1.8 Lubrication

Unless otherwise specified in the Detailed Mechanical Specification, bearings shall be grease lubricated and adequately sealed against the ingress of moisture or dirt.

2.8.1.9 Vibration

Rotating elements shall be balanced.

The vibration severity of the unit during operation shall not exceed Vrms = 1 mm/s at the pump and motor bearings.

2.8.1.10 Pump Glands

Shaft sealing shall be arranged as follows:

i) **For clear, non-aggressive liquids up to 200 kPa** discharge pressure - shaft sleeve with packed gland or mechanical seal.

ii) For clear non-aggressive liquids at pressures above 200 kPa and for clear corrosive liquids at any pressure - 316 stainless steel shaft sleeve with mechanical seal.

iii) **For liquids with solids in suspension at any pressure** – mechanical seal or packed gland with hardened and/or protected stainless steel shaft sleeve and grease seal. If a mechanical seal is specified, the pump gland shall be arranged to suit a clean water flush. A throttle bushing made of a suitable non-corrosive, self-lubricating material shall restrict the flushing water flow into the pump. Mechanical seals for such applications shall have silicon or tungsten carbide sealing faces.

2.8.1.11 Venting

A vent cock shall be fitted to the highest part of the casing.

2.8.1.12 Connections

Suction and discharge connections shall be flanged for pump connections larger than 40 mm.

Pump connections of 40 mm and smaller may be screwed. Unions shall be incorporated in the pipework close to the suction and discharge connections.

A flexible coupling shall be fitted close to the pump’s suction connection.

2.8.1.13 Isolating and Check Valves

Isolating valves shall be provided on the discharge of all pumps. A check valve shall also be fitted between the discharge isolating valve and the pump except where reverse flow through the pump when stationary cannot occur. Any reducing necessary shall be done immediately next to pump connections.

2.8.1.14 Pressure Tapping Points and Gauges

Pressure tapping points shall be provided near the suction and discharge connections of each pump. These points shall be located, where feasible, on a straight length of pipework where readings will be steady and accurate. Pressure (or suction, as applicable) gauges shall be fitted at these tapping points. Gauges shall measure gauge pressure (i.e. not absolute pressure).

2.8.2 Scope

This section covers the new pumps and associated equipment and should be read in conjunction with the P&ID's. The following Pumps are required:

Filter Feed Pumps:

- Pumps settled water from a sump to the media filters - centrifugal pumps (one duty & one standby)

Backwash water pumps:

- Pumps filtrate from backwash suction sump for backwashing media filters - centrifugal pumps (one duty & one standby)

Service water pumps

- Pumps filtrate from backwash suction sump for chlorine disinfection and chemical make-up - centrifugal pumps (one duty & one standby)

Reservoir 3 Pumps:

- Pumps filtrate from final water sump to Reservoir 3 - centrifugal pumps (one duty & one standby)

Dam Transfer Pump:

- Pumps water from the Rooidam to the Nuwedam – centrifugal self-priming pump (one duty)

WTW Feed Pumps:

- Pumps water from the Nuwedam to the head of works - centrifugal pumps (one duty & one standby)

2.8.3 General Description

Centrifugal pumps shall generally comply with clause 2.8.1.

Pumps shall be supplied with double-flanged spool pieces drilled to SANS 1123 tables on the suction and delivery sides of the pump. The spool pieces shall be fitted with nipples or flanged tee pieces for pressure indicators, air valves and other instrumentation required as per the P&ID's or specification. All bends should, where practicable, have a radius of 3 x pipe diameter. Tees should be swept with and angle between 45° and 90° depending on pump station layout.

The Contractor shall submit the following characteristic curves as part of his Tender Document:

- H-Q curve
- Efficiency curve
- NPSH curve
- Motor Efficiency curve
- Power curve

The pumps shall be of the horizontal, centrifugal, end-suction type. Where possible single-stage pumps shall be preferred, however, multistage pumps will be acceptable for clear liquids and high pressure applications. The pump selection shall be done to achieve maximum efficiency, favouring the lowest lifecycle cost over a 20-year period.

Each pump shall be equipped with suitable no-flow protection, preferably by using proximity switches on the side lever of the non-return discharge valves.

The pump and motor casing shall be of high quality, close-grained cast iron able to withstand a minimum of 3 x maximum pump shutoff head. A suitable, heavy-duty epoxy or polyurethane coating system with a minimum thickness of 250 µm shall be provided on the pump and motor casings.

The design must make provision for a detailed surge analysis, but as a minimum air valves must be provided on the common discharge lines. Non-return valves shall be designed to be soft-closing and non-slamming. Suction and discharge connections shall be flanged. Flexible couplings shall be fitted close to the suction and delivery connection of all pumps. Restrained flanged adapters are preferred over rubber bellows.

Thrust forces shall be restrained either by pipe supports or restraints across couplings. The anchoring design must make provision for a surge pressure of 3 times the maximum working pressure.

Pumps shall be selected with their best efficiency as near the specified duty point as possible and shall achieve a minimum efficiency of 75% at the duty point. Performance characteristics shall be suitable for parallel operation with the pump head increasing continuously to shut off. The pump shall be selected to operate as close as possible to the best efficiency at the duty point and shall be adequately sized to safely permit an increase in capacity of at least 25% should the head be lower than estimated. The impeller diameter fitted to direct coupled pumps shall not exceed 95% of the maximum impeller diameter for the volute/diffuser provided.

A non-overloading absorbed power characteristic, preferably with maximum power absorbed at the best efficiency, is preferred. The motor's continuously rated power shall be 15% above the pump's input shaft power anticipated in the pump installation. Each pump motor shall be fitted with a temperature sensor integrated with the VSD to protect the motor from overheating.

The pumps shall have an automatic mode as described in the control philosophy of each pump set and a manual mode with push buttons to start individual pumps. When in manual mode protection against low suction water levels and temperature shall still apply. All pumps shall be equipped with an E-stop functionality next the pump.

The backwash water water pump station system requirements spans over a wide range of flows and heads (as shown in the equipment data). For all pump systems, a minimum of 25% standby capacity (rounded up to the nearest whole number) shall be provided.

For pump systems that require 1 to 5 duty pumps 1 standby pump shall be provided and for systems that require more than 5 duty pumps 2 standby pumps shall be provided.

2.8.4 Equipment Data and Control Philosophies

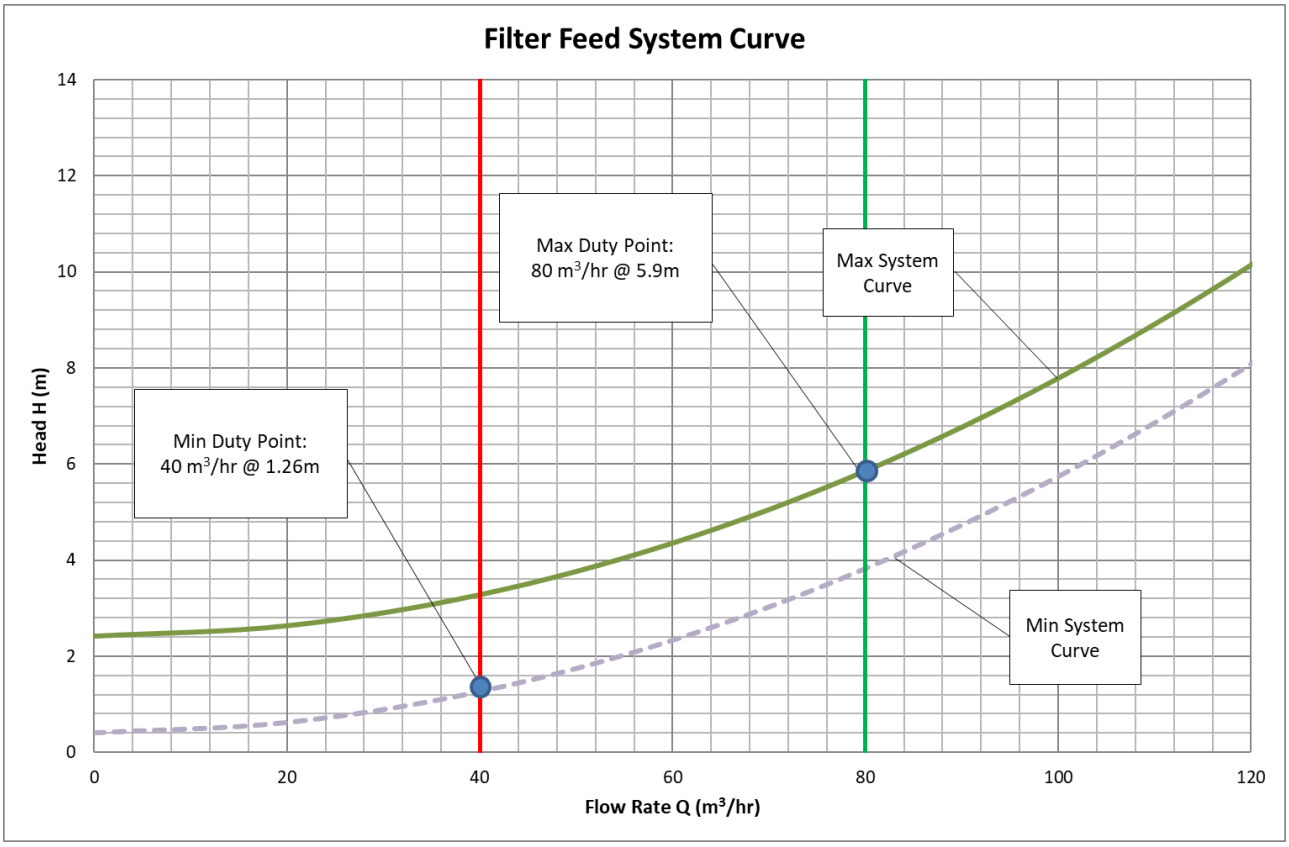
2.8.4.1 Filter Feed Pumps

Filter Feed Pumps

Equipment No.	Description	Specifications	
100PS01 **100PS02**	**Filter Feed Pumps (1+1) (Centrifugal)**	Maximum duty flow rate for 1 pump	80 m^3/hr
	Backwash water pumps pumping filtrate from the reservoirs to the media filters.	Minimum flow rate for 1 pump	40 m^3/hr
		Max Static head	2.42m
		Min Static head	0.4m
		Max Dynamic Pressure (including estimated local losses, friction losses)	5.9m
		Min Dynamic Pressure (including estimated local losses, friction losses)	1.26m
		System design range	As per System Curve below
		VSD	Yes
		Max rpm	1500

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



2.8.4.2 Backwash Pumps

Backwash Pumps

Equipment No.	Description	Specifications	
101PS01 **101PS02**	**Backwash Pumps (1+1) (Centrifugal)**	Maximum duty flow rate for 1 pump	391 m^3/hr
	Backwash water pumps pumping filtrate from the reservoirs to the media filters.	Minimum flow rate for 1 pump	195.5 m^3/hr
		Max Static head	3.74m
		Min Static head	0.44m
		Max Dynamic Pressure (including estimated local losses, friction losses)	7.2m
		Min Dynamic Pressure (including estimated local losses, friction losses)	3.9m
		System design range	As per System Curve below
		VSD	Yes
		Pump Control	Flow Control
		Max rpm	1500

Backwash Pumps Control Philosophy

The backwash water pumps must be able to backwash the media filters. The pumps shall be fitted with a flow meter. The backwash water pumps shall abstract water from the backwash suction sump. An ultrasonic level sensors in the suction sump relays the water level in the tank to the PLC and HMI of the pumps. This is also used to protect the pumps if the water level reduces below the minimum. It shall be programmed into the filter control philosophy that a backwash cannot be started if the suction sump is below the minimum submergence level.

The pumps are connected to the sump in a dry-well flooded suction configuration.

The pumps shall be able to backwash the filters at water rate 1 and water rate 2. The backwash regimes of the two types of filters are summarised in the tables below. The PLC of the pumps shall be programmed with the functionality to achieve the backwash regimes as described in the tables below as part of the backwash cycle.

MEDIA FILTERS	**Water Rate 1 (m/h)**	**Water Rate 2 (m/h)**
Backwash Rates (Adjustable on SCADA)	20 *	40 *
Duration (Adjustable on SCADA)	1-10 min	1-5 min
Control Philosophy	1.Start Air only backwash 2. Start Water backwash at rate 1 only without air to washout impurities 3. Start Water only backwash at rate 2 to fluidize the bed slightly and washout until water is sufficiently clean	
* Water rate in m/h must be converted to flow rate on the SCADA		

The operator shall be able to change the backwash rate and duration of a backwash separately on the SCADA. When the pumps are in automatic mode and a backwash is started at the control panel located at each filter a backwash cycle will start. The pumps shall pump the selected flow of wash rate 1 and then wash rate 2 consecutively for their selected durations through the VSD's and electromagnetic flow meter.

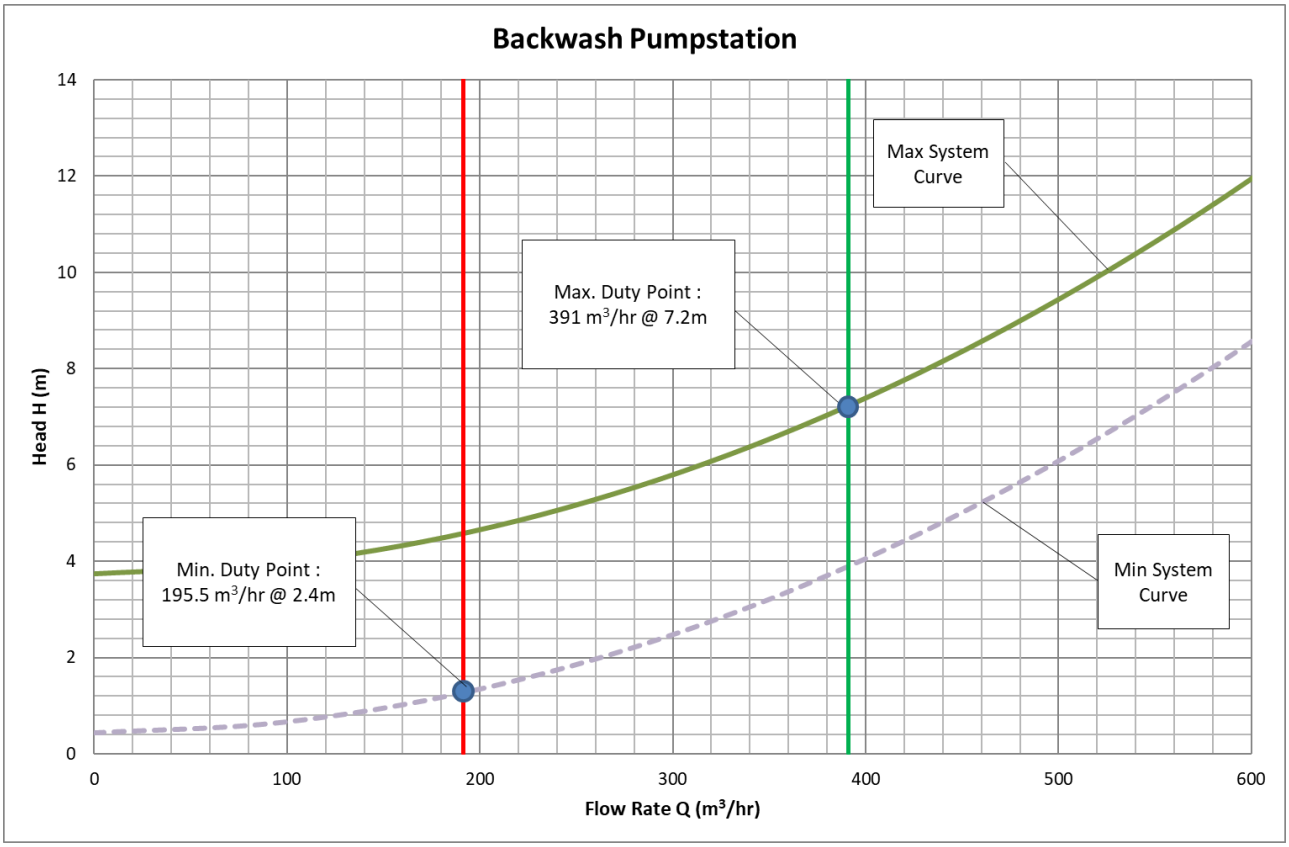
All bends in the pump station shall be medium or long radius. All tee-pieces shall be sweep tees. The Contractor shall supply and install all suction and delivery pipework and fittings up to the filter wall as indicated on the P&IDs. The backwash pipework to each filter shall be provided with electrically actuated isolating valves per filter which shall open and close as necessary during the backwash cycle.

No-flow protection for the pumps shall be provided by placing proximity switches at the lever arm of each non-return valve.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next in line. With each activation the duty lines (pumps) shall cycle to ensure that all the equipment get approximately equal run-hours.

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



2.8.4.3 Service Water Pumps

Service Pumps

Equipment No.	Description	Specifications	
102PS01 **102PS02**	**Service Water Pumps (1+1) (Centrifugal)**	Duty flow rate for pump set	3 -10 m^3/hr
	Service water pumps pumping filtrate from the reservoirs to on-site usage points	Duty Pressure	40 m
		Max rpm	1500
		Accumulator pressure tank with internal bladder	The pump system shall be fitted with an accumulator pressure tank to maintain the pressure in the system longer and reduce the pumps from stopping and starting more than 3 times per hour
		VSD required	Yes
		Pump control	Pressure Control

Service Water Pumps Control Philosophy

The pumps are connected to the backwash suction sump in a dry-well flooded-suction configuration. An ultrasonic level sensors in the suction sump relays the water level in the tank to the HMI. This is also used to protect the pumps if the water level reduces below the minimum.

When the pumps are in automatic mode the pumps shall also start and slowly ramp up when the pressure in the system is below 30% of the setpoint pressure. The pumps shall then pump until the setpoint pressure is reached again. The pressure sensor and transmitter on the common main shall monitor the pressure in the pipeline.

All bends in the pump station shall be medium or long radius. The Contractor shall supply and install all suction and delivery pipework and fittings up to the pump station wall as indicated on the P&IDs.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next line. With each activation, the duty lines (pumps) shall cycle to ensure that all the equipment gets approximately equal run-hours.

2.8.4.4 Reservoir 3 Pumps

Reservoir 3 Pumps

Equipment No.	Description	Specifications	
103PS01 **103PS02**	**Reservoir 3 Pumps (1+1) (Centrifugal)**	Maximum duty flow rate for 1 pump	40 m^3/hr
	Reservoir 3 pumps pumping filtrate from downstream of the	Minimum flow rate for 1 pump	20 m^3/hr
		Max Static head	1.0m
		Min Static head	0.0m

	chlorine contact channel to Reservoir 3	Max Dynamic Pressure (including estimated local losses, friction losses)	14.0m
		Min Dynamic Pressure (including estimated local losses, friction losses)	3.0m
		System design range	As per System Curve below
		VSD	Yes
		Pump Control	Level Control
		Max rpm	1500

Reservoir 3 Pumps Control Philosophy

The pumps are connected to the final water Reservoir 3 suction sump in a dry-well flooded-suction configuration. An ultrasonic level sensors in the suction tank relays the water level in the tank to the HMI. The pump will attempt to keep the suction sump at a constant level by means of the VSD.

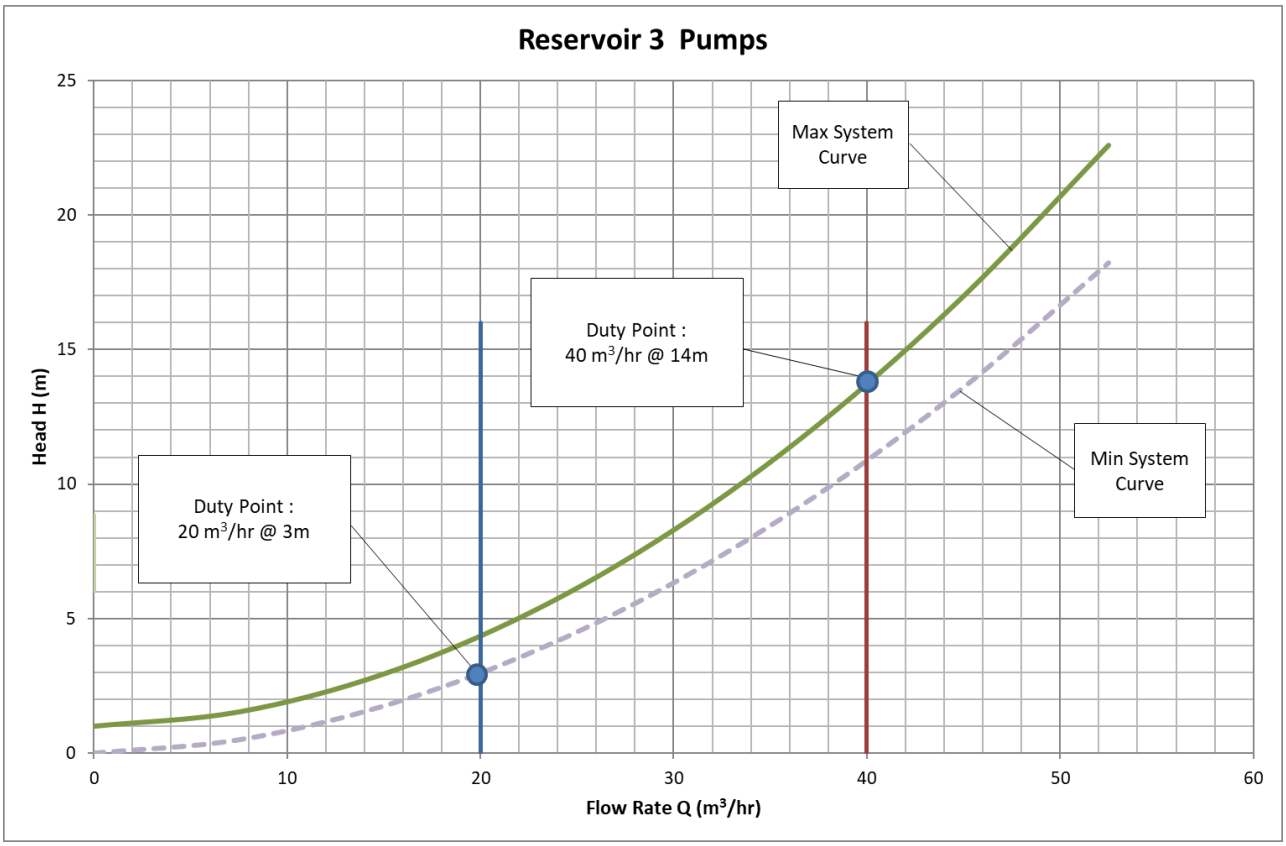
When the pumps are in automatic mode the pumps shall also start and slowly ramp up when the level increases above the setpoint height so as to bring it back down to the target level and vice-versa.

All bends in the pump station shall be medium or long radius. The Contractor shall supply and install all suction and delivery pipework and fittings up to the pump station wall as indicated on the P&IDs.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next line. With each activation, the duty lines (pumps) shall cycle to ensure that all the equipment gets approximately equal run-hours.

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



2.8.4.5 Dam Transfer Pump

Dam Transfer Pump

Equipment No.	Description	Specifications	
104PS01	**Dam Transfer Pump (1) (Centrifugal self priming)**	Maximum duty flow rate for 1 pump	40 m^3/hr
	Dam Transfer pump, pumps water from Rooidam to Nuwedam. The pump is a drywell self priming pump with suction higher than max water level of the suction dam.	Minimum flow rate for 1 pump	N/A
		Max Static head	15.5m
		Min Static head	9.5m
		Max Dynamic Pressure (including estimated local losses, friction losses)	16.6m
		Min Dynamic Pressure (including estimated local losses, friction losses)	10.6m
		System design range	As per System Curve below
		VSD	Yes
		Pump Control	None (only safety interlocks)
		Max rpm	1500

Dam Transfer Pumps Control Philosophy

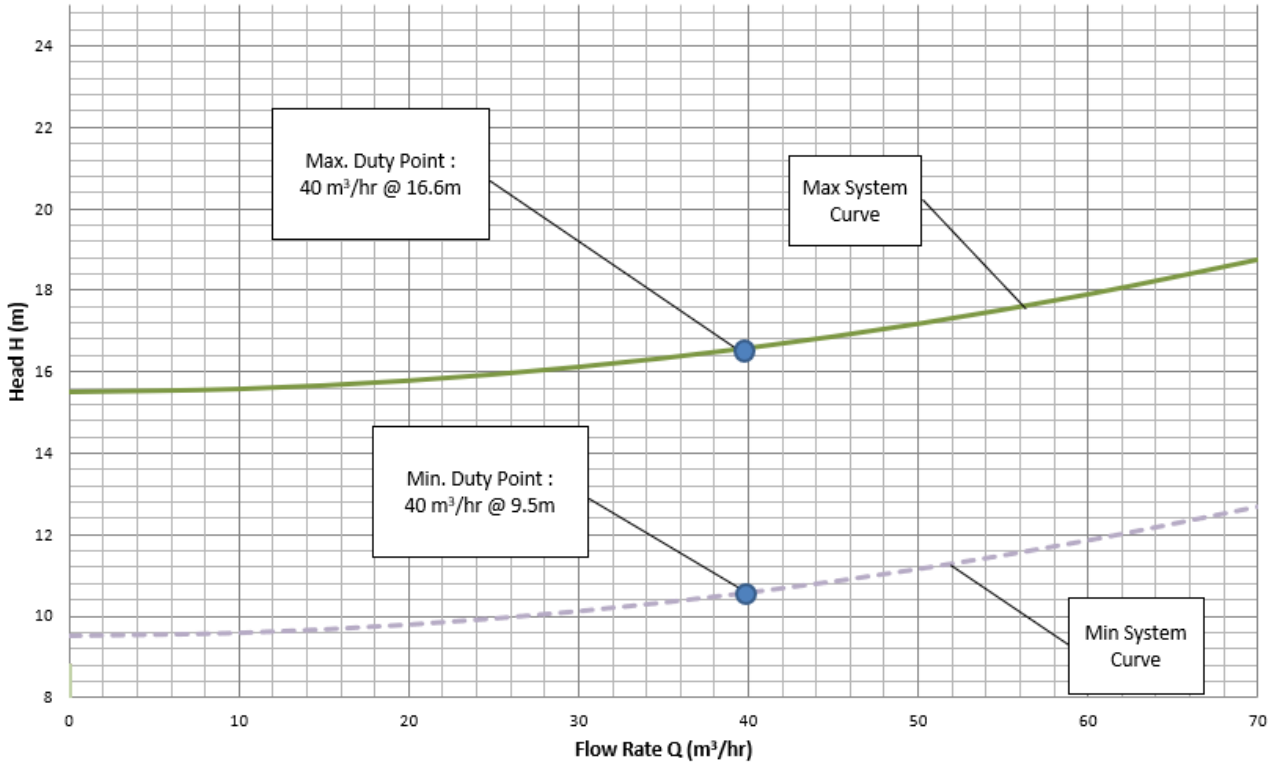
The pump is connected to the Nuwedam in a dry-well suction-lift configuration. An hydrostatic pressure probe relays the water level in the dam to the HMI. The pump will run at 50 Hz to achieve the stated duty point. If the level in the dam is too low, the pump will switch off.

All bends in the pump station shall be medium or long radius. The Contractor shall supply and install all suction and delivery pipework and fittings up to the pump station wall as indicated on the P&IDs.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next line. With each activation, the duty lines (pumps) shall cycle to ensure that all the equipment gets approximately equal run-hours.

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



2.8.4.6 WTW Feed Pumps

WTW Feed Pump

Equipment No.	Description	Specifications	
105PS01 **105PS02**	**WTW Feed Pumps (1+1) (Centrifugal)**	Maximum duty flow rate for 1 pump	80 m³/hr
	The WTW Feed pumps pump from the Nuwedam to the head of	Minimum flow rate for 1 pump	40 m³/hr
		Max Static head	3.3m

	works. The pumpstation is situated downstream of the dam wall and has a long suction pipe from the dam.	Min Static head	0m
		Max Dynamic Pressure (including estimated local losses, friction losses)	7.5m
		Min Dynamic Pressure (including estimated local losses, friction losses)	1.1m
		System design range	As per System Curve below
		VSD	Yes
		Pump Control	Flow Control
		Max rpm	1500

WTW Feed Pumps Control Philosophy

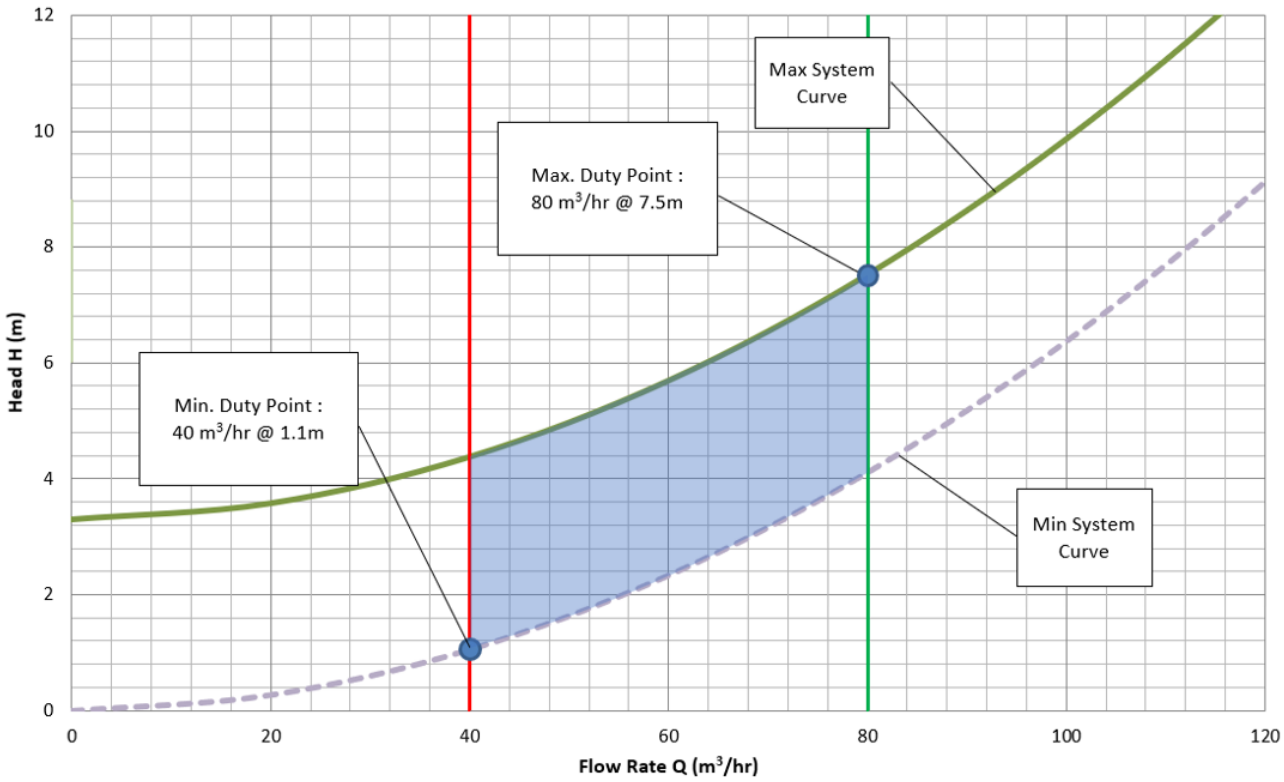
The pumps are connected to Nuwedam in a dry-well flooded-suction configuration. An pressure indicator transmitter on the common suction manifold suction tank relays ensures that sufficient water level is available in the dam. The pump will target a flow setpoint selected by the process controller on the HMI.

All bends in the pump station shall be medium or long radius. The Contractor shall supply and install all suction and delivery pipework and fittings up to the pump station wall as indicated on the P&IDs.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next line. With each activation, the duty lines (pumps) shall cycle to ensure that all the equipment gets approximately equal run-hours.

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



2.8.5 Electrical Motors

Electrical Motors shall comply with Mechanical Specification:2.13 Electric Motors.

2.8.6 Baseplates

Base Plates shall comply with Mechanical Specification: 1.2.16 Baseplates.

All baseplates must be fitted with a minimum of 8 anchor bolts. The diameter of the anchor bolts must be a minimum of 12 mm and for larger pumps (> 100 mm inlet diameter) the anchor bolt diameter must be 12 + (inlet diameter – 100)/25 rounded up the nearest standard size.

2.8.7 Pipework General

All pipe sizes are to be as per P&IDs and comply with Mechanical Specification: 0 Hydrostatic **Pressure Probe**

Equipment No.	Description	Specifications	
104 PT 01	**Hydrostatic Pressure Probe**	Pressure Range	100 mbar to 2 bar
	To monitor the Rooidam water level. Probe to be placed on dam floor.	Liquid	Dam water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	Up to 100m
		Communication protocol	Modbus
		Probe Material	SS316L
		Units	kPa

PIPEWORK. If no pipe size is indicated, the following will apply to this section:

iv) Maximum suction pipe velocity ≤ 0.7 m/s;

v) Maximum delivery pipe velocity ≤ 1.5 m/s.

2.8.8 Valves General

All valves shall be as per the Detailed Mechanical Specification: 2.11 VALVES.

2.8.9 Materials of Construction

Centrifugal pumps

Base Plates:	Hot-dipped galvanized mild steel.
All fasteners (Incl. Anchor Bolts):	304 Stainless Steel
Pump Shaft material:	AISI 4140 Alloy steel

Pipework

All pipework:	304 Stainless Steel

2.8.10 Corrosion Protection

All Motors:	IP 55 or painted to specification 2.18.7.1
Valves:	Painted to specification 2.18.7.2
Belt Guards:	Painted to specification 2.18.7.2
Aluminium Frames:	Painted to specification 2.18.7.2
Gearboxes/Actuators:	Painted to specification 2.18.7.3
Pump Casings:	Painted to specification 2.18.7.3
Base Plates:	Painted to specification 2.18.7.7
Acoustic Enclosures:	Painted to specification 2.18.7.7
All other equipment either fitted or bought out and installed and not mentioned above:	Painted to specification 2.18.7.2

2.8.11 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.8.12 Specific Performance Testing

Performance testing shall comply with Mechanical Specification: 1.2.26 Pump Performance Testing.

Workshop hydraulic pressure testing, and performance testing of the pumps will not be required if the pumps are of a reputable brand with more than 50 separate installations in South Africa and if certified pump curves can be supplied. If these conditions are not met, workshop performance testing will be required at the Contractor's expense, in the presence of the Engineer.

Pumps will be tested on-site to determine whether the installed pump is running on the provided characteristic curve and at the stated efficiency. Pump and motor sets shall be tested for vibration.

2.9 CHLORINE DOSING SYSTEM

2.9.1 Legislation, Regulations and Standards

The complete installation shall comply with the relevant safety standards and manufacturer's recommendations. The recommendations regarding chlorine handling, storage and general safety appearing in SANS 10298:2009 (Ed. 1.02) shall be adhered to wherever applicable.

2.9.2 Corrosion Protection

The environment in the chlorine rooms shall be considered corrosive and potentially hazardous. All equipment shall be suitably protected against corrosion due to chlorine (whether liquid or gas) and water and shall be designed to operate in a corrosive environment.

2.9.3 General

2.9.3.1 System Components

The system shall consist, as a minimum, of the following components:

- 30 days' worth of duty and standby chlorine gas cylinders at the design flow rate and dosing concentration as specified in equipment data and duties.
- Vacuum regulators
- Automatic change-over device.
- Chlorine gas feed controller (chlorinator)
- Chlorine injectors
- Injector booster pumps
- High and low-pressure gas and water pipeworks, valves, fittings and specials
- Strainers and flow switches on booster pump discharge pipework
- Pressure gauges (on gas and water pipework)
- Liquid traps
- All electrical switchgear and control panels
- A complete heating system to maintain the chlorine in the gaseous state
- One trolley and scale for each duty and standby cylinder connected to the system
- A chlorine gas leak detection and alarm system
- Safety equipment

2.9.3.2 General Arrangement

The chlorination system shall be connected to a duty and standby chlorine cylinder or cylinders and space shall be provided to store replacement cylinders.

Chlorine shall be drawn off in the form of gas, metered by gas feeders (chlorinators), drawn into solution in a chlorine injector and discharged into the water that is to be disinfected.

A safety excess pressure blow-off valve with a neutralizing pot to absorb the blow-off from the excess pressure blow-off shall be situated between the chlorine cylinders and the gas feeder. The neutralizing pot shall be able to neutralize the contents of at least one full chlorine gas cylinder.

An appropriate number of suitably rated wall-mounted chlorine gas feeders (chlorinators) shall be installed to monitor and adjust the chlorine gas flow. Each gas feeder shall be associated with an injector.

2.9.3.3 Gas Cylinder Stations

Unless otherwise specified in the equipment data and duties, the chlorination system will utilize 68kg chlorine gas cylinders.

The maximum withdrawal rate of gaseous chlorine from 68kg cylinders shall be limited to 18kg/d, and to 180kg/d for 1 tonne tanks.

Duty and standby cylinders shall be securely restrained in a vertical position by means of chains. Restraining chains, fasteners, hooks and brackets shall be manufactured of stainless steel.

Cylinders shall be connected to a manifold in such a manner that they are depleted at the same rate. A scale for one cylinder shall be provided for the bank of duty cylinders, as well as for the bank of standby cylinders. Scales shall comply with the requirements as set out elsewhere in this standard specification.

2.9.3.4 Automatic Change-Over Device

A change-over device shall automatically switch from an empty cylinder (or bank of cylinders) to a full cylinder (or bank of full cylinders). In the case of a bank of cylinders, each cylinder shall have its own pressure regulator before being attached to a common manifold.

The automatic change-over device shall be of the vacuum type (with automatic and manual change-over) to change the chlorine feed from one cylinder to the other. It shall be installed in the chlorine cylinder room.

The automatic change-over device shall be located in the high-pressure chlorine gas pipework where the lines from the two cylinders or bank of cylinders join. The device shall clearly indicate which cylinders are being used for chlorination and which cylinders are on standby, and shall also indicate when chlorine cylinders are ready for replacement.

The change-over device shall incorporate a pressure gauge to monitor the pressure in the active cylinder or cylinders (upstream of the change-over device). It shall be possible to manually set and adjust the pressure at which change-over takes place. The set point shall be indicated on the face of the pressure gauge in red.

2.9.3.5 Vacuum Regulators

If the automatic change-over device does not incorporate a vacuum regulator to maintain less than atmospheric pressure in the pipe system, a separate vacuum regulator shall be provided immediately downstream of the automatic change-over device. The vacuum regulator shall be installed in the chlorine cylinder room and shall be compatible with the chlorinator provided.

2.9.3.6 Chlorine Gas Feed Controller/Chlorinator

A chlorine gas feed controller or chlorinator shall be installed in the chlorination control room. The chlorinator shall be capable of dosing at a dosing rate that will satisfy the performance requirements specified. Taking into account the peculiarities of the reticulation system and the chlorination system offered.

The chlorinator shall have a calibrated and clear visual flow rate indicator and shall include a strainer on the inlet side to prevent the ingress of dirt and to protect the working mechanism.

The chlorination equipment and piping shall operate only under a vacuum. Should the vacuum fail then the chlorinator shall shut off immediately.

The chlorinator shall be rated to provide the amount of chlorine as stated in the equipment data and duties. The dosing rate shall be adjustable between zero and the maximum as stated in the equipment data and duties.

2.9.3.7 Chlorine Injector

A chlorine injector shall be installed in the location indicated on the drawings, at the point where chlorine is to be injected into the water.

Injectors shall be suited to the capacities and pressures applicable to the installation concerned. Injectors shall be provided with threaded or flanged connections, manual throat adjustment and a double-check arrangement to prevent water from leaking into the chlorine gas supply when the injector is not in operation.

Each injector shall be fitted with an appropriate vacuum gauge protected by a diaphragm seal.

2.9.3.8 Booster Pumps

A booster pump, if required, shall be used if the differential pressure across the injector is low and it is needed to boost pressure. The booster pump shall be adequately sized to provide adequate flow and pressure to operate the injectors at the maximum chlorine dosing rate.

Booster pumps shall be centrifugal type and shall comply with the requirements of the standard specification on water pumps contained elsewhere in this document.

The pump shall have a no-flow cut-off switch.

There shall be suitably rated pressure gauges on the suction and the delivery sides of the pumps and suitably rated strainers located directly before the pumps on the suction pipework to protect the injectors.

If there is a pressure differential between the intake and discharge points of the water system then the pipework shall incorporate a reflux valve to prevent back-flow of water.

2.9.4 Pipework

The supply and installation of all pipework for the conveyance of chlorine gas, water and aqueous chlorine solutions shall be in accordance with the manufacturer’s recommendations and in accordance with the relevant safety standards.

Pipework shall be kept as simple as possible and shall have a minimum number of joints.

All pipework shall be well supported and shall be protected from temperature extremes.

All pipework shall be colour-coded in accordance with the specifications related to colour coding.

2.9.4.1 High-Pressure Chlorine Gas Pipework

Cylinders shall be connected to common manifolds by means of coiled tubing to allow flexibility during cylinder replacement, and to reduce loading on the manifold pipework. Isolating valves shall be provided to make it possible to isolate each cylinder individually.

Liquid traps shall be provided on each manifold, upstream of the automatic change-over device.

Where appropriate, heating tape shall be provided on the pipework and appurtenances to prevent re-liquefaction of the chlorine gas in the pipework.

Pipework for the conveyance of liquid or gaseous chlorine shall be schedule 80 steel pipes with forged steel fittings.

All valves installed on chlorine gas pipes shall be of the quarter-turn ball type.

2.9.4.2 Low-Pressure Chlorine gas pipework

Unless otherwise stated in the equipment data and duties, gas pipework downstream of the vacuum regulator shall be uPVC class 16.

All valves installed on the chlorine gas pipes shall be of the quarter-turn ball type.

uPVC pipework exposed to direct sunlight shall be painted with UV-resistant paint.

2.9.4.3 Pipework for Water and Aqueous Chlorine Solutions

Unless otherwise stated in the equipment data and duties, pipework conveying aqueous solutions of chlorine shall be uPVC Class 16.

uPVC pipework exposed to direct sunlight shall be painted with UV-resistant paint.

A pressure gauge shall be installed directly upstream of each chlorine injector.

A manual shut-off valve shall be provided to enable the complete chlorine delivery line to be isolated from the water reticulation system.

An in-line strainer suitably sized and rated to protect the injectors and with easily removable filter elements, shall be installed between the booster pumps and the injectors.

All valves on the chlorine solution lines shall be PVC ball valves.

Before any testing is done, the Contractor shall clean the completed pipework system and remove all foreign materials, oil, and dirt by flushing and cleaning with a cloth saturated with a suitable chlorinated solvent. Cleaning agents shall be used, and all cleaning materials and waste shall be disposed of, in strict accordance with the manufacturer's instructions.

2.9.5 Chlorination Plant Rooms

Chlorine gas cylinders and dosing equipment shall be located inside a suitable fire-resistant building. Where it is not possible to store spare and/or empty cylinders indoors, these shall be protected from direct sunlight and rain.

Doors to the chlorination plant room shall open only to the outside. Both the cylinder room and the chlorinator room shall have a clear gas-tight non-opening window to allow the equipment to be viewed without entering the rooms. The minimum dimensions of these windows shall be 300mm x 300mm.

The chlorine room shall provide space for the duty and standby chlorine cylinders (or banks of cylinders), the manifolds, liquid traps, the automatic change-over device/s, the vacuum regulator/s and the chlorine leak detector/s.

Storage areas (e.g. below the chlorine cylinders), working areas (e.g. below the gas feeders and automatic change-over device/s), and machine areas (e.g. around pump/motor sets) shall be painted red.

Separate areas shall be allocated to full and empty cylinders, and these areas shall be clearly marked “EMPTY” and “FULL” in large painted yellow lettering.

Walking and safe areas shall be painted green.

Division lines between the different zones shall be marked by a 100mm wide yellow line.

The chlorine room shall house the chlorination equipment, including the electrical control panel, gas feeders and the chlorine injector/s. The emergency breathing apparatus and the chlorine safety suit shall be stored in a cabinet inside this room, and the chlorine alarm and a chlorine leak detector shall also be installed in this room. If required, the chlorine residual analyser and gas feeder control shall also be located here.

The water supply for chlorination shall be from the service water pumps. The water flow rate for each of the two dosing lines shall be regulated by adjusting a globe valve in each line. Each line shall be equipped with a flow indicating rotameter.

The contractor shall create the required holes through the dividing brick wall from the pump station and shall seal around the pipes with an approved flexible material to prevent any gas passage between the rooms outside of the pipes. Electrical conduits shall also be sealed to prevent gas passage between the separate rooms.

One 4.5kg (net) dry powder stored pressure type extinguisher (ABC ammonium phosphate based) shall be provided and stored on a suitable mounting next to the door inside the chlorinator room.

The Contractor shall provide a 15-liter plastic household dirt bin in the chlorinator room.

2.9.6 Chlorine Cylinder Trolley

Chlorine trolleys shall be supplied and shall be to the following specifications:

- One trolley, suitable for transporting single full chlorine gas cylinders in the upright position, shall be provided.

- Trolleys shall have two wheels and shall be able to pass through a standard door opening. The trolley shall be tall enough to safely carry a 68kg gas cylinder resting on a foot plate cantilevered at the approximate position of the axle of the trolley. The cylinder shall rest against a vertical backing plate, which shall have a restraining chain to keep the cylinder securely in place during transport. It shall be possible for the trolley to remain in the vertical position when not loaded, and when vertical the foot plate shall be in a horizontal position.
- Trolleys shall be adequately protected against corrosion.
- The Contractor shall submit drawings of his proposed trolley to the Engineer for approval before the ordering or manufacturing of the trolley.

2.9.7 Scales

A scale shall be supplied and shall have the following specifications:

- One cylinder in each of the duty and standby banks of cylinders shall be placed on a scale that shall be provided as part of the chlorination system. Cylinders shall be securely fastened to the base of the scale, and the cylinders on the scales shall not be restrained by means of wall-mounted chains.
- Scales shall be calibrated in increments of 1kg and shall have analogue displays with a minimum diameter of 100mm. Full-scale deflection shall be 125% of the maximum mass of the cylinder to be weighed.
- Scales shall be able to withstand accidental overloading by 200% without damage.

2.9.8 Chlorine Gas Leak Detection and Alarm

A chlorine gas leak detection is required and shall have the following specifications:

- The chlorine cylinder room shall be monitored by a chlorine warning system that shall be triggered when the chlorine level in the room reaches a level that is hazardous to human health.
- A chlorine leak detector shall be installed at a suitable level in the chlorine cylinder room. The detector shall be fully protected against damage by the movement of cylinders or personnel. In the vent of a leak, the leak detector shall initiate an indication of an easily visible alarm condition in the control room and shall activate a red flashing warning light, which shall be situated in a conspicuous position outside the chlorine cylinder room and chlorination rooms, and an audible alarm.
- A ventilation system to discharge air to the atmosphere during a chlorine leak shall be installed in the gas storage room. This system shall consist of a ventilation fan and pipework to discharge the air inside the chlorine room at a sufficiently high level above the building such that it gets dispersed into the atmosphere. Ventilation fans shall comply with the requirements of the standard specification on ventilation systems.
- The ventilation system shall be controlled by means of the chlorine leak detector in the following manner:
    - At a pre-set contamination level 1, the alarm is sounded. When a chlorine leak alarm is activated, all valves shall fail in a close position and the works' staff will be expected to address the source of the leak to minimize the amount of gas escaping.
    - At a pre-set (higher) contamination level 2, the alarm continues to sound, and the ventilation fan is automatically switched on.
    - The ventilation fan shall recirculate the contaminated air into the atmosphere.

- When the leak detector indicates a safe environment, the ventilation system shall automatically be turned off.
- The ventilation system shall be provided with a manual turn-on override, but it shall not be possible to turn the system off unless the leak detector indicates a safe condition. However, an emergency stop button shall be provided next to the fan inside the cylinder room.
- If specified in the equipment data and duties, the telemetry arrangements shall include for the alarm signal to be transmitted as a digital signal, together with digital signals to advise the use of the neutralization system (healthy, run, trip) as well as an analogue signal from the detector.

2.9.9 Safety and Emergency Equipment

The following safety equipment and emergency equipment shall be supplied:

- The contractor shall supply, install, test (where applicable) and commission the following safety equipment:
    - A complete Emergency Kit “A”, which shall contain devices to stop leaks at the valve, fusible plug, and in the sidewalls of a 68kg chlorine gas cylinder. Instruction booklets explaining the application of each device and all required accessory equipment and tools shall be included.
    - Two pairs of size 10 chlorobutyl-proof rubber boots.
    - Two pairs of chlorobutyl-proof rubber gloves.
    - Two pairs of gas-tight chemical safety goggles.
    - Tow chemical cartridge respirators, each with two cartridges. Cartridges shall be of the disposable type and shall be supplied sealed in their packaging.
    - Two chlorobutyl-proof body protection suits. Suits shall be tight-fitting at wrists and ankles and the front opening/collar shall be suitably sealed. The Contractor shall obtain the Engineer’s approval for his proposed body protection suits prior to ordering.
    - One sefl-contained breathing apparatus, in accordance with SABS compulsory specification, VC 8038: Breathing Apparatus, Part II – 1989, Open Circuit Breathing Apparatus.
    - The following apparatus, or similar approved will be acceptable:
        - Drager Face mask – Panorama Nova P breathing protection mask and demand valve: P.A. 90A (push-in type)
        - Drager chlorine safety suit – Bluemax, Size: Large, model A.
        - Drager self-contained breathing apparatus – P.A. 90 Series, model SH-BA-69.
        - The self-contained breathing apparatus shall be stored in a separate weatherproof cabinet of suitable size, which shall be positioned on-site in a position to be determined by the Engineer.
        - One emergency First Aid Kit containing at least the following:
            - Ventolin Spray.
            - Propan gel.
            - Vitamin E cream.
            - Resuscitubes with non-return valve.

- Instructions and inventory list.

2.9.10 Emergency Equipment Cabinet

An Emergency equipment cabinet system shall be supplied as follows:

- One emergency equipment cabinet, which shall be sufficiently large to allow all the above equipment other than the self-contained breathing apparatus to be stored inside it, shall be provided and installed.
- The cabinet shall be built into the outside wall of the cylinder room, so that it is accessible from both inside and outside the room, and shall have lockable doors on each side. The doors shall have chlorobutyl-proof rubber seals to prevent ingress of chlorine gas in the event of a leak.
- Keys shall be stored in weatherproof key boxes with breakable (but replaceable) glass panes. Key boxes shall be installed adjacent to the cabinet on the inside and outside of the building. One extra key shall be provided for safekeeping by the works supervisor.

2.9.11 Emergency Shower and Eye Bath

The Contractor shall supply an emergency shower and eye bath system as follows:

- The Contractor shall provide for an outside emergency shower that is readily accessible. The shower shall be well marked and shall be of the rapid action, deluge type. For the gaseous chlorine disinfection system the shower shall be platform-operated, i.e. the weight of a person standing on a platform at the shower shall activate the water supply. The water supply shall be shut off when the platform is released. For a sodium hypochlorite disinfection system, the shower shall be foot or arm-operated and not of the chain-operated type.
- An eye bath shall also be provided for a gaseous chlorine disinfection system. Unless the shower incorporates an eye bath, an eye bath shall be provided adjacent to the shower. The eye bath shall be wall-mounted or free-standing and shall be manufactured from stainless steel. The eye bath shall be platform-operated, in a similar manner as the shower.
- The installation of the emergency shower and eye bath shall include for all connections to a suitable water supply, which shall be available within 10m of the chlorine rooms unless indicated otherwise on the drawings or equipment data and duties.

2.9.12 Safety Notices and Instructions

The following safety notices and instructions are required and shall be mounted in an approved location as follows:

- An outside wall chart, EXE 1017: CHLORINE CYLINDERS, HANDLING AND STORAGE, shall be attached to the door of the chlorine room and shall be suitably protected to the approval of the Engineer against the outside elements.

2.9.13 Monitoring Equipment

The following monitoring equipment is required:

- A residual chlorine analyser/dosage control unit shall be connected to the system and installed in the chlorinator room. Each residual analyser shall be furnished to amperometrically analyse a continuous sample of water for total chlorine residual.
- Each unit shall display the residual in a field-selectable LED readout range of 0 – 5mg/l and shall provide a proportional 4-50mA analog output. The measuring cell shall provide continuous online analysis of chlorine residual, sensitive to one microgram per liter (0.001mg/l).

- Each analyser shall be furnished for wall mounting with a calibration accuracy of 2 percent of residual reading and an operating range of 10:1, in an appropriate enclosure.
- The remote probe/recorder shall be as specified elsewhere in this document.
- Each analyser shall include all of the following features:
    - A 3-electrode amperometric cell to give stability and sensitivity, regardless of changes in sample characteristics.
    - Continuous online analysis of chlorine residuals down to one part per billion (1 µg/l)
    - Allow continuous feedback control of chlorine residual down to ten parts per billion (10 µg/l or 0.01mg/l)
    - Operator controls via the use of touch keypad.
    - Three different display menus available for proper operation, ease of set-up, and servicing as follows:
        - A scrollable, informative operator menu with an easy change of operating parameters, including alarm messages and a 4-digit operator-defined access code to limit unauthorized changes.
        - A supervisor's set-up menu with step-by-step displayed instructions and error messages to ensure proper start-up.
        - An online self-diagnostic menu for calibration, servicing and troubleshooting.
    - Pinpoint control of reagent feed rate via valveless, peristaltic pumps using brushless stepping motors for accuracy and reliability.
    - Automatic back-flushing of cell orifice and flow path, preset for zero 48 times per day.
    - A magnetically coupled impeller in the cell to maintain constant sample velocity at the measuring cell to provide grit bombardment to keep electrode surfaces clean.
    - An appropriate enclosure for electronics with plug-in connectors for cell and pumps.
    - Battery backup in case of loss of power for up to 24 hours to ensure set point and calibration will not be lost.
    - In addition to transmitting a signal to a remote recorder, the analyser shall be equipped with compound loop control, motorised valve, and signal to the chlorinator for residual control.
    - The analysers shall be designed to utilise inexpensive reagents such as battery acid for pH control of the sample. They shall not lose sensitivity due to extended periods of samples containing no chlorine.

2.9.14 Spares and Tools

The contractor shall supply the following spares and tools:

- The Contractor shall provide a torque wrench, gauged and set to the correct torque setting, for the tightening of the threaded fittings on the chlorine gas cylinders.
- Where other special tools are required to service and maintain equipment, such tools shall be provided as part of the equipment provided. Payment for such tools will be deemed included in the rates tendered for the supply, delivery, and installation of the relevant items.
- At the request of the Employer, the Contractor shall provide a detailed description and value of all spares he considers necessary for the operation and maintenance of the chlorination

equipment for a period of two years. These spares shall not be supplied without a specific instruction to do so from the Employer, who may decide, at their discretion, to order any, all, or none of the spares listed.

- All tools and spares supplied by the Contractor shall comply with the standards set by the manufacturer of the equipment for which such tools or spares are intended.

2.9.15 Scope

This section covers the following new chlorine gas disinfection system and associated equipment and should be read in conjunction with the P&IDs:

Chlorine Dosing Package Supply:

- A chlorine disinfection system that is able to sufficiently dose chlorine into the filtrate from the media filters before the treated water reservoirs to achieve 4 log virus inactivation.

Chlorine motive water shall be sourced from the service water pumps. Chlorination will be by gas chlorine in 68kg cylinders. Chlorine will be dosed at the following two locations:

- Into the filtered water pipeline just before the treated water water reservoir. This dose shall be controlled by a pre-set chlorine residual measured by a chlorine residual analysers at the outlet of the chlorine contact channel.

One dedicated chlorine room is constructed. This room will be used for the storage of full standby cylinders, duty cylinders connected to the chlorination equipment, empty cylinders, chlorination equipment and booster pumps (should it be required). All electrical installations shall be included for the system and shall be suitable for a corrosive gas.

2.9.16 General Description

The chlorination system shall be installed as described in this specification. Over and above what has been described, the following shall apply this application:

- At least two chlorine cylinders shall be connected to a manifold for each of the duty and standby sides.
- It is envisaged that gas cylinders shall be connected to the manifold by means of pigtails from each cylinder to the manifold. The pigtail shall be a flexible pipe of seamless copper tubing coating inside and outside with monel (or similar approved chlorine rate material). Monen (monel metal) is an acid-resisting alloy of nickel (60-70%), copper (25-35%), iron, manganese, carbon, and silicon, used in chemical handling.
- A manifold will be connected to a vacuum regulator. Dedicated cylinder-mounted vacuum regulators will also be considered as an alternative to a manifold system.
- Manifolds shall be interchangeable from duty and standby. The status of the manifold being duty or standby shall be clearly indicated on the equipment installed.
- An automatic changeover device shall be installed to change from the duty to the standby manifold once the gas to the duty manifold is empty.
- A chlorinators will control the dose to the dosing point.
- One chlorine residual analysers are required which will measure the chlorine residual leaving the chlorine contact channel.
- The chlorination system (disinfection) will have an automatically adjusted chlorinator to dose to a pre-set chlorine residual. The adjustment shall be automatically adjusted to seek a pre-set value using the information from the chlorine residual analyser.

2.9.17 Equipment Data and Duties

Equipment No.	Description	Specifications	
90CH01	**Chlorine dosing system**	Type Cylinders	68kg
	Gaseous chlorine dosing system for final treated water disinfection.	High and low-pressure pipework	See 2.9.4
		Minimum no. of Cl_2 cylinder to be stored on site	10
		Disinfection (4-log Viruss inactivation)	
		Maximum Cl_2 dosing concentration	10mg/l
		Maximum Cl_2 dosing rate	0.8kg/hr

2.9.18 Chlorine Residual Analyser Probes

Chlorine residual analysers shall be capable of measuring the chlorine residual in the pipes being probed. Three probes are required in total. Two probes are required to measure the residual chlorine in the treated water pipes from each of the treated water reservoirs. The third probe is required in the filter feed pipe before the borehole water filters.

Each chlorine residual analyser measure cell shall incorporate a self-cleaning mechanism whereby the cell is continuously cleaned in a non-aggressive manner. It shall incorporate a powder activated carbon calibration system for pre-setting and calibration of the analyser.

The tube from the sampling point to the analyser shall be greater than a 20mm Ø HDPE pipe with a PE 100 – PN16 working pressure rating.

The chlorine residual analysers shall be housed in the chlorine room.

The water from each sampling point shall be returned to the reservoir in a 32mm Ø HDPE pipe with a PE 100 – PN16 working pressure rating.

The chlorine residual analysers shall interpret the chlorine residual and convert it to a 4 – 20mA signal back to the chlorinators where the signal shall be used to adjust the rate at which the water is chlorinated.

2.9.19 Automatic Control System

There shall be two independent automatic control systems. One for the iron and manganese oxidation and another for filtered water disinfection.

The signal from the chlorine gas residual analysers shall be used to operate (linearly or otherwise), the automatic control system whereby the gas dosing rate is adjusted automatically via a controller being controlled by the 4-20mA signal.

The controller shall adjust the chlorine supply to maintain the chlorine residual at a predefined level, ranging between 0-10mg/l, based on the reading from the chlorine residual analyser cell. The controller shall incorporate an adjustable time delay to ensure that the controller does not hunt.

The automatic control system shall have a manual override.

2.9.20 Booster Pumps

Chlorine motive water is supplied to the injectors from the service water pump station. If deemed to be required the Contractor shall supply and install a set of duty and standby booster bumps dedicated to each chlorinator.

2.9.21 Electrical Motors

Refer to Detailed Mechanical Specification:2.13 Electric Motors.

2.9.22 Baseplates

Refer to Detailed Mechanical Specification: 1.2.16 Baseplates.

2.9.23 Corrosion Protection

All Motors:	IP 55 or painted to specification 2.18.7.1
Valves:	Painted to specification 2.18.7.2
Belt Guards:	Painted to specification 2.18.7.2
Aluminium Frames:	Painted to specification 2.18.7.2
Gearboxes/Actuators:	Painted to specification 2.18.7.3
Pump Casings:	Painted to specification 2.18.7.3
Base Plates:	Painted to specification 2.18.7.7
Acoustic Enclosures:	Painted to specification 2.18.7.7

2.9.24 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.9.25 Specific Performance Testing

Over and above the testing and commissioning called for elsewhere in the Contract, the Contractor shall also undertake the following testing and commissioning as follows:

- After flushing, cleaning and drying the pipe system shall be filled with dry air at a pressure of 1Mpa, and tested for leaks by application of soapy water at all joins and junctions. Any leaks that are found shall be repaired and the pipeworks shall again be cleaned and dried, whereafter the leak-testing process shall be repeated.
- The Contractor shall arrange for the services of an authorised representative from the manufacturer or distributor of the equipment to advise on the installation and start-up of all chlorination equipment, to calibrate and adjust the system where necessary, and to instruct the Employer’s staff in its operation and maintenance procedures, where required.

2.9.26 Training

Over and above training stated elsewhere in this Contract, the Contractor shall give dedicated training by a registered and recognized chlorine gas safety officer to five officials selected by the Employer. Training shall be specific to handling 68kg gas chlorine cylinders.

2.10 Backwash Recovery Equipment

2.10.1 Scope

This section covers the following backwash recovery system and associated equipment and should be read in conjunction with the P&IDs:

Backwash Recovery Equipment for two (2) new backwash recovery tanks:

- Floating upernatant draw-off device
- Stilling baffle

2.10.2 General Description

Two new concrete backwash recovery tanks will be constructed with associated equipment. The tanks work on a duty/standby cycle with one backwash recovery tank being able to take the total daily backwash volume. The spent backwash water will flow from the filter backwash outlet point to the respective duty backwash recovery tank.The entrance of the backwash recovery tank shall contain a stilling baffle no less than 6mm thick, 600mm deep and the width of the backwash recovery tank to force the water in a downward direction so as to promote settling.

A floating supernatant draw-off device, designed by the Contractor shall ensure that the supernatant slow overflows the draw-off device so as to empty the tank in 16 hours. The draw-off device shall be guided by rails fixed to the floor of the tank. The draw-off device shall be connected with a flexible pipe to ensure free movement up and down and shall be connected to a flanged puddle pipe (DN200) in the backwash recovery tank wall.

Guide rails:

- The guide rails shall have a stop position at a level to ensure a minimum water level within the tank.
- Minimum DN50mm SS316L with thickness of at least 3mm.
- Rails to be supported with SS316L brackets to the side of the tank for lateral support.

2.10.3 Equipment Data

The following duty flow rates shall be used for the OEM design of the floating supernatant draw-off device:

Design flow rate for draw-off weir:	8.5 m^3/hr
Minimum Water Level:	0.3m

2.10.4 Materials of Construction

Draw off device guide rails :	SS316L
Draw off device weir:	SS316L
Inlet baffle plate:	SS304
All fasterners:	SS316L

2.11 VALVES

2.11.1 General

The valves to be used on the more common applications are specified below.

Where special valves are necessary for special applications, these will be specified in the Detailed Mechanical Specification but, if not, tenderers must select suitable valves and provide details in the tender.

The handwheel, lever, etc. on valves, valve actuators and valve gearboxes to be supplied and installed shall be clockwise closing.

2.11.1.1 Requirements for All Valves

All valves shall comply with the following (unless inapplicable):

i) Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation.

ii) Valves shall be double-flanged unless unavailable or otherwise specified.

iii) Valves and their method of actuation shall be designed to operate under the full pressure rating of the valve.

iv) If not obvious from the configuration, all valves, including valves with gearboxes and valves with actuators, shall be provided with an indication of the current position as well as an indication of the closing and/or the opening direction.

v) Spindle covers shall be provided for valves with rising spindles.

vi) The specific application shall be taken into account in the corrosion protection of valves.

vii) Cast iron valve components, including valve bodies, shall be protected with System – “Fusion Bonded Epoxy” or System – “Hot-Applied Thermoplastic”.

viii) Metal plating of ferrous materials is not an adequate corrosion protection system.

ix) Lever handles on small bore valves and position indicator plates shall be of stainless steel.

x) Fasteners shall be of grade 316 SS, or better. This applies to all fasteners on the body of the valve and its gearbox. Pipework flange bolts are specified elsewhere.

2.11.1.2 Cast Iron Gate Valves with Resilient Seals

Resilient seal gate valves may be used on raw sewage, raw water, effluent and general duties where some solids may be present but must not be used on high solid applications such as sludge and grit duties. The valves shall comply with the following:

i) The valves shall comply with SANS 664 or SANS 665, Class 10 or higher as required.

ii) The valves shall be double-flanged.

iii) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the valve opening position.

iv) Handwheels shall be of cast-iron.

v) The spindle shall be of grade 316 SS, or better.

vi) Fixing lugs for end of travel limit switches shall be provided

vii) Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.

viii) Valves larger than DN 150 shall be provided with bypass arrangements.

2.11.1.3 Cast Iron Gate Valves (Wedge Gate)

Wedge gate valves shall be used on raw water and treated water duties but shall not be used on raw sewage, raw water, effluent, sludge and general duties where some solids may be present. The valves shall comply with the following:

i) The valves shall comply with SANS 664 or SANS 665, Class 10 or higher as required.

ii) The valves shall be double flanged.

iii) The material of the body seat and the material of the gate trim shall be of copper alloy or stainless steel.

iv) The body shall be provided with channel guides for gate travel. The gate shall be provided with shoes which slide within the channel guides. Guides and shoes shall be of a copper based alloy or of stainless steel and shall guide the gate along the complete travel distance.

v) Fixing lugs for end of travel limit switches shall be provided.

vi) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the gate position.

vii) The spindle shall be of grade 316 SS, or better.

viii) Handwheels shall be of cast-iron. Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.

ix) Valves larger than DN 150 shall be provided with bypass arrangements, normally isolated by brass ball valves.

x) Valves larger than DN 250 shall be provided with doors for inspection and cleaning.

xi) The valves shall comply with the additional requirements of W&S-BW015:1993 where applicable.

2.11.1.4 Knife-Gate Valves

Knife-gate valves shall be used on water sludges as well as on primary, waste activated and digested sludge duties. They shall also be used on raw sewage and other liquid/solids application and may be used for duties specified under Clause "Cast Iron Gate Valves with Resilient Seals".

The valves shall comply with the following:

i) Valves shall have cast iron bodies, stainless steel blades, cast handwheels, and shall have no carbon steel parts.

ii) Valves shall be clockwise closing (with the exception of valves for the Bulk Water Branch which shall be anti-clockwise closing).

iii) Valves shall have chamfered blade edges and resilient body seals.

iv) Blade faces shall be surface ground or otherwise provided with two flat, parallel surfaces.

v) The blade seal shall be protected by a non-metallic scraper or similar device.

vi) Suitable sealing shall be provided to prevent leakage from the valve and it shall be possible to adjust these seals while the valve is in line under pressure.

vii) Valves shall be droptight but need not be designed for bi-directional flow unless called for in the Detailed Mechanical Specification.

viii) Internal and external surfaces of the valve body shall be protected with a water resistant, non-toxic and non-tainting, FBE pipe coating in accordance with System – "Fusion Bonded Epoxy".

ix) Valves shall be double-flanged and shall suit the standard flange rating but may incorporate drilled and tapped fastener holes (wafer type valves will be considered for acceptance only where it is unlikely that the pipe or flanged item on either side will have to be removed or if isolation will not be necessary if it is removed). Fasteners may be studs or setscrews manufactured to suit the tapping depth.

2.11.1.5 Waterworks Type Butterfly Valve

These are the type which utilise a replaceable rubber seal with retaining ring and shall be used on raw and potable water duties. Valves shall comply with W&S-BW001:1995.

2.11.1.6 Resilient Seal Butterfly Valves

These are the type which either utilise a resilient body liner with a stainless steel disc or utilise a resilient-lined disc for sealing. They may be used on air, gas and clean liquid duties where approved by the Engineer and shall comply with the following:

i) Shafts and fittings shall be of stainless steel and bearing bushes shall be of Teflon or similar. Seals shall be selected to suit the application. No carbon steel components shall be permitted internally and externally such components shall be properly protected.

ii) Valves shall be air, gas and water-tight when closed, as applicable.

iii) Hand lever valve actuation with a locking system for incremental valve setting from fully shut to fully open shall be provided for valves up to and including DN 200. Valves larger than DN 200 shall be equipped with robust, weatherproof grease-filled gearboxes with an indicator to show the degree of valve opening.

iv) For normal usage, the valves may be of the type which is clamped between two flanges. Where it is necessary to remove equipment on either side for maintenance purposes, suitable spacer pipes must be provided or the valves shall be flanged and provided with drilled and tapped holes.

v) The valves shall be installed with their disc shafts in horizontal orientation.

2.11.1.7 Bronze Isolating Valves

These may be used for isolating duties on clean air and liquid duties up to DN 50.

Bronze gate valves shall be to SANS 776.

Ball or plug valves of appropriate construction may also be used where preferred.

2.11.1.8 Diaphragm Valves

Diaphragm valves may be used on air, sewage, sludge and other dirty or corrosive liquid duties as well as clean liquid duties. The diaphragm material shall be suitable for the fluid to be carried.

Valves shall be double-flanged and shall preferably be of the straight-through type. The weir type may be used for control valve duties. The design shall allow for replacement of the diaphragm without removal of the flanges from the line.

This type of valve shall not be used on the suction side of pumps or on any line subject to vacuum unless designed specifically to cope with design conditions.

2.11.1.9 Needle Valves (above DN 150)

Needle valves, VAG Plunger Valve or equivalent, shall be used for the regulation of flow and/or pressure in pipelines containing water where the size is DN 150 or greater unless this is overridden by the requirements of the Detailed Mechanical Specification. The configuration shall be double-flanged with co-axial flanges unless otherwise specified.

The seal seat and associated downstream parts shall be selected to prevent any cavitation for the application. Such parts shall be of stainless steel or copper based alloy.

2.11.1.10 Telescopic Overflow Valves

Telescopic overflow valves, (Fulton, or equivalent), shall be vertically mounted and shall be specifically designed for the purpose intended.

Operation shall be by handwheel mounted on an independently mounted headstock. Rising spindles are preferred. The outer tube shall be flanged and bolted to a similarly flanged vertical pipe. The inner tube shall incorporate a conical bellmouth. The bridge connnecting the inner tube to the valve's spindle shall be attached to the outside of the bellmouth in order to limit the effect of fouling rags, etc.

The spindle shall be of grade 316 SS, or better. The outer tube and inner tube shall be of 3CR12.

The headstock and handwheel shall be of painted cast iron or painted 3CR12.

2.11.1.11 Level Control Valves

Level control valves which do not incorporate pilot control are preferred, VOSA Series 7354 or equivalent.

Level control valves which incorporate pilot control shall be simple to check and to maintain. A suitably sized strainer shall be provided to prevent blockage of the pilot. The strainer shall be self-cleaning or shall be easily cleaned.

Level control valves which are not proprietary items and which incorporate linkages shall be designed with overall strength and rigidity in mind. The design shall incorporate an allowance for fatigue effects.

2.11.1.12 CHECK VALVES

General

Where special valves are necessary for special applications, these will be specified in the Detailed Mechanical Specification but, if not, tenderers must select suitable valves and provide details in the tender. Check valves to be used on the more common applications are specified below.

Single-door and double-door check valves shall comply with SANS 1551-1 unless overridden by the requirements of this Clause.

Bronze swing type check valves may be used for pipework up to DN 50.

Requirements for All Check Valves

Check valve installations shall comply with the following:

i) Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation.

ii) Valves shall be double-flanged unless unavailable or otherwise specified.

iii) Valves shall be designed to function correctly under the full pressure rating of the valve.

iv) The specific application shall be taken into account in the corrosion protection of valves. Steel and cast iron valve components, including valve bodies, shall be protected with System –

v) “Fusion Bonded Epoxy” or System – “Hot-Applied Thermoplastic”.

vi) Fasteners shall be of grade 316 SS, or better. Flange fasteners are specified elsewhere.

vii) Check valves shall be sized to open fully at the system’s design flow rate.

viii) The check valve installation shall ensure that the valve is able to operate without interference from a physical obstruction such as a shut-off valve, bend, mortar lining, etc. Where a check valve is located close to another valve, a straight pipe shall be provided and this shall have a flange-to-flange length of not less than 1,5 times the valve diameter.

ix) Indelible body markings, as per SANS 1551-1, shall include the manufacturer’s name, pressure rating (PN), nominal size (DN) and the direction of flow.

x) A shut-off valve shall be installed downstream of each check valve.

Axially-Sprung Check Valves for Water

Axially-sprung check valves (nozzle check valves) for treated water and raw water duty shall be double-flanged; RGR Concentric, Vent-O-Mat Maxiflo or equivalent.

The valve design shall prevent shock closing and shall incorporate a hydrodynamically efficient flow path to minimise head loss.

The spring shall be of stainless steel and the guide rod shall be supported within a non-corroding, non-galling bearing material.

Double-Flap Check Valves for Water

Double-flap check valves for treated water and raw water duty shall be of the positive-closing type; Crane Duo-Chek II or equivalent.

Bodies shall be of cast-iron or cast-steel. Flaps shall be of the light, leaf type, shall be of bronze or stainless steel with machined sealing faces, shall be specifically designed to be non-sticking, and shall have teflon bearing washers. Seals shall be of resilient material. The axis of rotation of the flaps shall be vertical, pins shall be of 316 SS, or better, and closure shall be initiated by stainless steel springs, suitably rated for the duty so that closing is initiated prior to the onset of reverse flow.

Positive, external indication of the position of both plates shall be provided.

Rubber Diaphragm Check Valves

Rubber diaphragm check valves shall be of the double-flanged configuration and shall incorporate a hydrodynamically efficient flow path to minimise head loss; VAG Top-Stop or equivalent. Valves featuring multiple small orifices will only be acceptable for nominal flow speeds below 0,5 metres/second.

The flexible rubber diaphragm shall be replaceable.

Ball Check Valves

Ball check valves, AVK Series 53 or equivalent, may be used on sewage, sludge or similar applications.

The ball shall be rubber coated and it shall be possible to inspect and/or replace it without removing the valve from the pipework.

Swing Check Valves

Suitably designed swing check valves may be used on sewage, sludge or similar applications. Orientation of the valve shall comply with the manufacturer's recommendation.

Swing check valves shall:

i) be of double-flanged configuration.

ii) have ductile iron bodies.

iii) be suitable for a working pressure of at least 1 000 KPa.

iv) be fitted with a side lever and adjustable weight.

v) be provided with a bolted cover which provides access, without dismantling or removing the valve, to the swing flap.

vi) have stainless steel hinge pins.

vii) have engineered plastic or non-ferrous bearings.

2.11.1.13 AIR RELEASE VALVES

General

Air release valves for water pipework shall be of the non-slamming type, A.R.I. or Vent-O-Mat or equivalent.

Valves for sewage and similar duties shall be specifically designed for the application.

Arrangement and Installation

Air valves shall be installed above pockets designed to collect the air entrained with the water flow. The pockets shall be designed in accordance with the requirements for nozzles in the Clause "Pipework". The diameter of the nozzle shall be at least half the diameter of the parent pipework.

Valves shall have flanged connections and shall be provided with upstream isolating cocks.

2.11.2 Scope

This section covers the following new valves and associated equipment and should be read in conjunction with the P&IDs.

2.11.3 Equipment Data and Duties

RSV Gate Valves (Manual)

Equipment No.	Description	Specifications	
120 GV 01 **120 GV 02** **121 GV 01** **121 GV 02** **121 GV 03** **30 GV 01** **30 GV 02** **30 GV 03**	**RSV Gate Valves**	Diameter (Nominal Bore)	200mm
		Liquid	Water (clarifier sludge and clear water)
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Butterfly Valves (Actuated)

All actuators to be electrical as per specification 2.12.2.

Equipment No.	Description	Specifications	
50 BFV 01 **50 BFV 02** **50 BFV 03** **50 BFV 11** **50 BFV 12** **50 BFV 13** **50 BFV 41** **50 BFV 42** **50 BFV 43**	**Actuated Butterfly Valves**	Diameter (Nominal Bore)	150mm
		Liquid	Raw and treated water
		Actuation/Control	Open/close feedback to PLC/HMI
		Actuator Turn Ratio	Quarter Turn Actuator
		Communication protocol	Modbus
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
110 BFV 01 **110 BFV 02**	**Actuated Butterfly Valves**	Diameter (Nominal Bore)	150mm
		Liquid	Air
		Actuation/Control	Open/close feedback to PLC/HMI
		Actuator Turn Ratio	Quarter Turn Actuator

		Communication protocol	Modbus
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
50 BFV 21 **50 BFV 22** **50 BFV 23**	**Actuated Butterfly Valves**	Diameter (Nominal Bore)	300mm
		Liquid	Raw and treated water
		Actuation/Control	Open/close feedback to PLC/HMI
		Actuator Turn Ratio	Quarter Turn Actuator
		Communication protocol	Modbus
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
50 BFV 31 **50 BFV 32** **50 BFV 33**	**Actuated Butterfly Valves**	Diameter (Nominal Bore)	350mm
		Liquid	Raw and treated water
		Actuation/Control	Open/close feedback to PLC/HMI
		Actuator Turn Ratio	Quarter Turn Actuator
		Communication protocol	Modbus
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Butterfly Valves (Manual)

Equipment No.	Description	Specifications	
50 BFV 51 **50 BFV 52** **50 BFV 53** **102 BFV 01** **102 BFV 02** **102 BFV 11** **102 BFV 12** **102 BFV 21** **102 BFV 22**	**Butterfly Valves**	Diameter (Nominal Bore)	80mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
104 BFV 11	**Butterfly Valves**	Diameter (Nominal Bore)	100mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
100 BFV 11 **100 BFV 12** **100 BFV 21** **100 BFV 22** **103 BFV 11** **103 BFV 12** **103 BFV 21** **103 BFV 22** **104 BFV 01** **105 BFV 11** **105 BFV 12** **105 BFV 21** **105 BFV 22** **105 BFV 23** **110 BFV 03** **110 BFV 04**	**Butterfly Valves**	Diameter (Nominal Bore)	150mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
100 BFV 01 **100 BFV 02** **103 BFV 01** **103 BFV 02** **103 BFV 51** **103 BFV 52** **104 BFV 21** **105 BFV 01** **105 BFV 02** **120 BFV 11** **120 BFV 12**	**Butterfly Valves**	Diameter (Nominal Bore)	200mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
101 BFV 11 **101 BFV 12** **101 BFV 21** **101 BFV 22**	**Butterfly Valves**	Diameter (Nominal Bore)	300mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
101 BFV 01 **101 BFV 02**	**Butterfly Valves**	Diameter (Nominal Bore)	400mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10
Equipment No.	Description	Specifications	
120 BFV 01 **120 BFV 02**	**Butterfly Valves**	Diameter (Nominal Bore)	450mm
		Liquid	Raw and treated water

120 BFV 21		Actuation/Control	Handwheel, clockwise close
		Communication protocol	None
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Check Valves

Equipment No.	Description	Specifications	
102 NRV 01 **102 NRV 02**	**Check Valve**	Diameter (Nominal Bore)	80mm
	Backwash pump non-return valves	Liquid	Raw and treated water
		Type	Swing check valve with lever arm and limit switch for no-flow protection of pump
		Grit content	Low
		Fibrous material	Low
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
104 NRV 01	**Check Valve**	Diameter (Nominal Bore)	100mm
	Backwash pump non-return valves	Liquid	Raw and treated water
		Type	Swing check valve with lever arm and limit switch for no-flow protection of pump
		Grit content	Low
		Fibrous material	Low
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
100 NRV 01 **100 NRV 02** **103 NRV 01** **103 NRV 02** **105 NRV 01** **105 NRV 02** **110 NRV 01** **110 NRV 02**	**Check Valve**	Diameter (Nominal Bore)	150mm
	Backwash pump non-return valves	Liquid	Raw and treated water
		Type	Swing check valve with lever arm and limit switch for no-flow protection of pump
		Grit content	Low
		Fibrous material	Low
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Equipment No.	Description	Specifications	
101 NRV 01 **101 NRV 02**	**Check Valve**	Diameter (Nominal Bore)	300mm
	Backwash pump non-return valves	Liquid	Raw and treated water
		Type	Swing check valve with lever arm and limit switch for no-flow protection of pump
		Grit content	Low
		Fibrous material	Low
		Connection	Flanged
		Spindle length	standard
		Material	Cast Iron, FBE coating and lining
		Pressure class	PN10

Ball Valves

Equipment No.	Description	Specifications	
20 BV 01 **20 BV 02** **20 BV 03** **20 BV 04** **20 BV 05** **20 BV 06** **20 BV 12**	**PVC Ball Valve**	Diameter (Nominal Bore)	63mm
		Liquid	Water, Polyaluminium chlroride and soda-ash
		Connection	Coupling
		Material	PVC
		Pressure class	PN6

Telescopic Valves

Equipment No.	Description	Specifications	
121 TV 01 **121 TV 02** **121 TV 03**	**Telescopic Bowl Mouth Valves**	Diameter (Nominal Bore)	250mm
		Liquid	Raw and treated water
		Actuation/Control	Handwheel, clockwise to lower bowl mouth
		Vertically mounted and shall be specifically designed for the purpose intended	
		Operation shall be by handwheel mounted on an independently mounted headstock with a rising spindle.	

		The outer tube shall be flanged and bolted to a similarly flanged vertical pipe. The inner tube shall incorporate a conical bellmouth.
		The bridge connnecting the inner tube to the valve's spindle shall be attached to the outside of the bellmouth in order to limit the effect of fouling rags, etc.
		The outer tube and inner tube shall be SS304
		The headstock and handwheel shall SS304
		The spindle shall be of grade SS304

2.11.4 Corrosion Protection

Valves: Painted to specification 2.18.7.2

2.11.5 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.12 Actuators

2.12.1 General

Manual operation, by lever, handwheel, etc., shall be provided on all actuators unless otherwise specified.

The direction of operation of handwheels shall comply with Clause "Valves for Liquids or Gases".

Metal plating of ferrous materials, (e.g. zinc or cadmium plating) is not an adequate corrosion protection system for items such as actuator shafts and such items shall be provided with an additional coating of a semi-setting, thick protective layer, such as a suitable Tectyl product, or equivalent.

2.12.2 Electric Actuators

Electric actuators shall be specifically matched to the design duty. Actuators providing modulating duties shall be specifically designed for continuous modulation.

The actuator motor and gearbox shall form one integrated unit. Motors shall be for three phase, 400 Volt, 50 Hz supply, shall be Class F insulated (or better) and shall have an embedded thermostat for overload protection. The complete unit, including installation work, glands and controls shall be ingress protected to IP 68 unless otherwise specified.

If the opening or closing period is specified in the Detailed Mechanical Specification (e.g. to avoid water hammer) this period shall be achieved, without pulsing, by incorporating a suitable gear ratio to allow the motor to operate from fully open to fully closed without stop/starts.

For open/shut duties, the continuous actuator torque rating shall be at least 200 % of the start-opening or shut-off torque, whichever is higher, specified by the valve manufacturer for this application (after the gearbox mechanical advantage has been taken into account). For modulation duties, the continuous actuator torque rating shall be at least 400 %.

All components of the drive shall be designed to prevent backlash.

Electric actuators shall incorporate the following features:

i) hand operated gearwheel override operation incorporating open/close direction indication.

ii) visual valve position indication at the unit.

iii) the terminal compartment shall be separately sealed from the internal electronics and mechanisms.

iv) the actuator shall initiate a trip if:-

- it does not succeed in moving the valve within a suitable period.
- the motor windings overheat.

Where specified in the Detailed Mechanical Specification, the following shall be provided:

i) the actuator shall provide an impact effect to overcome:-

- tightly seated valves.
- an unintended loss of movement.

ii) the following information shall be fed back to the control panel or, if applicable, the SCADA system:-

- valve position.
- torque on output shaft.

iii) it shall be possible to configure the control instructions and interrogate the actuator status without removing covers.

2.12.3 Pneumatic Actuators

Pneumatic actuators shall be selected to match their valves' operating requirements.

Actuators shall be fabricated of non-corrosive materials and shall be mounted using stainless steel mounts and couplings. Fasteners shall be of stainless steel.

Unless the system configuration clearly does not require it, automatic spring-closing shall be provided to ensure that the valve closes (if open) or remains closed (if closed) upon power failure or failure of the air supply. The spring shall be of stainless steel.

Linear actuators shall be provided with stainless steel cylinder piston, cylinder rod and attachments. For open/shut duties, continuous actuator force rating shall be at least 200 % of the start-opening or shut-off force, whichever is higher, specified by the valve manufacturer for this application (after any mechanical advantage has been taken into account). For modulation duties, continuous actuator force rating shall be at least 400%.

2.13 Electric Motors

2.13.1 Rating

All electric motors shall be rated for operation on a 3-phase, 4-wire, 400/230 volt, 50 Hz, AC supply at sea level, with an ambient temperature of up to 40 ºC.

The rated power of the motor shall be selected to be not less than 20 % in excess of the designed power requirement of the associated plant unless the motor forms part of a packaged unit and/or where the size of the motor is specified and/or as otherwise approved by the Engineer.

A motor shall be selected so that it shall reach full operating speed within 10 seconds for the method of starting and drive arrangement used.

2.13.2 Specifications

Except as otherwise specified, motors shall be standard squirrel cage or slip-ring motors complying with SANS 1804 as amended, with IP55 enclosure and IC 0141 cooling, and suitable for a damp environment. Motors shall be suitable for both "continuous running duty", Duty Class S1, and "intermittent periodic duty", Duty Class S3. Windings shall be copper conductors insulated with Class F material (100 ºC rise capability) with Class B temperature rise (80 ºC). The motors shall be suitable for 6 starts per hour, two of which shall be consecutive.

2.13.3 Type

The type of motor (and starter if applicable) to be supplied is determined by the requirements of the application specified in the Detailed Mechanical Specification and by the starting limitations specified in the Electrical Specification. In the absence of such specifications, a standard squirrel cage motor complying with this Clause shall be offered.

2.13.4 Construction

Motor frames shall be of the totally enclosed fan cooled type with cast iron yoke frames and cast iron end covers. Sheet steel is not acceptable for fan cowls and these shall be of cast iron, tough plastic or stainless steel. The end covers and yoke shall be properly machined and each cover shall locate on a spigoted register to ensure concentricity and parallelism. Bearings shall be of grease lubricated roller and/or ball type, provided with grease nipples (with extension tubes where access is restricted) and sealed to suit external use. Motors required for external use shall be fully weatherproofed.

2.13.5 Terminal Boxes

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from either side. The two ends of each stator winding shall be "brought out" to the terminal box. Squirrel cage motors shall be wired to permit both direct-on-line and star-delta starting.

2.13.6 Thermistors

Motors of 55 kW and up to (but not including) 150 kW, as well as motors for variable speed drives shall be provided with thermistors embedded in the windings of each phase. The thermistor tails shall be "brought out" to separate terminals mounted near the motor winding terminal block.

2.13.7 RTDs

Motors rated at 150 kW and above, both fixed and variable speed, shall be provided with PT 100 type RTDs. Two RTDs shall be provided per phase winding. All six shall be incorporated into the control system; three to provide monitoring and three to provide high temperature trip functions.

2.13.8 Heaters

Motors of size 75 kW and above shall be fitted with "pocket" heaters. The heater shall be mounted at the bottom of the motor frame and shall be replaceable without dismantling the motor. These shall be arranged to switch on when the motor stops operating and switch off when it starts operating.

2.13.9 Slip-Ring Motors

Slip-ring (wound rotor) motors shall be of the totally enclosed fan cooled type with stainless steel slip-rings. The slip-rings shall be mounted inboard of the non-drive end bearing and shall be fitted and keyed to the shaft as a single unit. The terminal box shall be common to both stator and rotor connections.

The brush holders shall be manufactured from fibreglass and shall be removable from the terminal box as a complete unit. Where the current density in a single brush at the full operating load approaches or is above 80 % of the capability of the brush, then an additional brush shall be provided in a separate brush box.

2.13.10 Motor Speed

Motor speeds shall be selected as follows:

i) motors with ratings below 30 kW can have nominal speeds up to 3 000 rpm.

ii) preference shall be given to motors with nominal speeds up to 1 500 rpm for ratings between 30 kW and 132 kW, both inclusive.

iii) motors with ratings above 132 kW shall have a nominal speed of 1 500 rpm or below.

2.13.11 Variable Speed Applications

In applications where the motor speed is controlled by variable frequency drive, the motors shall be cooled by a separate, 50 Hz motor driven "piggy-back" fan. This requirement will be waived if the Contractor can provide documentation to confirm that the drive and motor design can operate in the application, with shaft-mounted fan, without overheating. This requirement does not apply to submerged motor applications.

2.13.12 Hazardous Locations

When required to suit a hazardous location in terms of SANS 10108 or in terms of this Specification, suitable motors complying with SANS 60034-5 or SANS 61241, as appropriate, shall be supplied. The relevant SANS certificates, clearly indicating the location classification in which the machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

2.13.13 Special Motors

Should the Tenderer wish to offer a different type of motor to those specified so as to obtain special starting characteristics and/or variable speed, a full technical specification of the motor must be supplied and such specification shall be for equipment to a standard at least equal to that of the motors specified above. In particular, no item of electrical protection shall be omitted.

2.13.14 Warning

Motor manufacturers must be warned that the motors are to be installed in an extremely corrosive and often damp environment. All motors shall therefore be adequately protected against corrosion.

2.14 INSTRUMENTATION

2.14.1 General

Environmental protection of electronic instrumentation shall be as follows:

i) Instrumentation and associated displays and transmitters which are either located inside or located outside and above ground level shall have IP 55, or higher, rating.

ii) Instrumentation and associated displays and transmitters which are located in underground chambers shall have IP 68 environmental protection. The instrument shall be mounted in an enclosure which shall provide physical protection and shall be self-draining.

iii) Instruments and associated displays and transmitters which are located outside buildings shall be mounted in enclosures. Enclosures shall be of polycarbonate construction with transparent front, Fibox EK or equivalent. The complete enclosure installation shall have an IP 55 rating or higher. The enclosure size shall be chosen to provide a clearance of at least 100 mm all-round the instrument.

Instruments and their cabling shall be protected so that electromagnetic interference does not affect their operation and signal transmission.

Calibration certificates shall be included in the Manual.

2.14.2 Scope

This section covers the following new valves and associated equipment and should be read in conjunction with the P&IDs.

2.14.3 Equipment Data and Duties

Electromagnetic Flow Meters

Equipment No.	Description	Specifications	
102 FM 01	**Electromagnetic Flow Meter**	Diameter	50mm
		Liquid	Raw or treated water
		Grit content	low
		Fibrous material	low
		pH	4.5 to 9
		Transmitter position	Remote
		Local Display	yes
		Transmitter cable length	Determined by Contractor
		Communication protocol	Modbus
		Instantaneous flow rate units	m^3/hr
		Instantaneous flow rate range	0 to 100 m^3/hr
		Totalizer units	m^3

Equipment No.	Description	Specifications	
100 FM 01 **103 FM 01** **103 FM 02**	**Electromagnetic Flow Meter**	Diameter	100mm
		Liquid	Raw or treated water

104 FM 01 **105 FM 01**		Grit content	low
		Fibrous material	low
		pH	4.5 to 9
		Transmitter position	Remote
		Local Display	yes
		Transmitter cable length	Determined by Contractor
		Communication protocol	Modbus
		Instantaneous flow rate units	m^3/hr
		Instantaneous flow rate range	0 to 100 m^3/hr
		Totalizer units	m^3

Equipment No.	Description	Specifications	
101 FM 01	**Electromagnetic Flow Meter**	Diameter	250mm
		Liquid	Raw or treated water
		Grit content	low
		Fibrous material	low
		pH	4.5 to 9
		Transmitter position	Remote
		Local Display	yes
		Transmitter cable length	Determined by Contractor
		Communication protocol	Modbus
		Instantaneous flow rate units	m^3/hr
		Instantaneous flow rate range	0 to 500 m^3/hr
		Totalizer units	m^3

Thermal Mass Flow Measurement

The instrument shall be a compact thermal mass flowmeter for air for continuous measurement of flow in kg/hr or Nm3/hr. The sensor shall not cause pressure loss and no pressure or temperature compensation shall be required. High accuracy of 1.5% is required. Other general requirements are shown in the table below:

Description	**Requirements**
Process connection:	Plug-in sensor with scaling and sliding sleeve
Insertion tube material:	Stainless steel 316L
Transducer body material:	Stainless steel 316L
Protection class:	IP 67
Connectivity:	Modbus

The contractor will install the instrument in strict accordance with the manufacturer's instructions and recommendations.

Equipment no.	Description	Medium	Flow range (m^3/hr)
110 FM 01	Measuring backwash air going to the media filters	Air	0 - 650

Ultrasonic Level Sensors

Equipment No.	Description	Specifications	
50 LT 01 **50 LT 02** **50 LT 03** **100 LT 01** **101 LT 01** **103 LT 01**	**Level Transmitter**	Level Range	0 – 4000mm
		Liquid	Raw and treated water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Level units	mm

Equipment No.	Description	Specifications	
20 LT 01 **20 LT 02** **20 LT 11**	**Level Transmitter**	Level Range	0 – 1500mm
		Liquid	Chemicals
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Level units	mm

pH Sensors

Equipment No.	Description	Specifications	
20 AIT (PH) 01 **20 AIT (PH) 02**	**pH Sensor and Transmitter**	pH Range	3 - 12
		Liquid	Raw and treated water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Units	pH

Turbidity Meters

Equipment No.	Description	Specifications	
50 AIT (NTU) 01	**Turbidity Meters**	NTU Range	0 - 30
		Liquid	Potable water

		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Units	NTU

Chlorine Residual Analyser

Equipment No.	Description	Specifications	
90 AIT(CA) 01	**Chlorine Residual Analyser**	Range	0 – 10 mg/l free chlorine
	Final potable water	Liquid	Potable water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Units	mg/l

Pressure Transducers

Equipment No.	Description	Specifications	
100 PIT 01 **101 PIT 01** **102 PIT 01** **103 PIT 01** **105 PIT 01** **105 PIT 01**	**Pressure transducer**	Pressure Range	-100kPa to 100kPa
		Liquid	Raw and treated water
		Transmitter position	Integral / Remote
		Local Display	Yes
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus
		Environmental Protection	IP68
		Units	kPa

Hydrostatic Pressure Probe

Equipment No.	Description	Specifications	
104 PT 01	**Hydrostatic Pressure Probe**	Pressure Range	100 mbar to 2 bar
	To monitor the Rooidam water level. Probe to be placed on dam floor.	Liquid	Dam water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	Up to 100m
		Communication protocol	Modbus
		Probe Material	SS316L
		Units	kPa

2.15 PIPEWORK

2.15.1 General

2.15.1.1 Pipes and Fittings

Steel Pipe – General Duties

Steel pipes for general non-corrosive, non-abrasive duties for liquid, air and gas shall be as follows:

Up to DN 150 - SANS 62 medium class.
Over DN 150 - SANS 719.

Unless otherwise specified, steel pipework and fittings shall be hot-dip galvanised and painted.

Steel Pipework – Design

Pipework up to DN 600 shall be in accordance with SANS 1476. Pipework for the conveyance of water shall, in addition, comply with CCT-WS 11 Standard Specification for Steel Pipe, Fittings and Specials.

Stainless Steel Pipework

Stainless steel pipework shall be to ASTM 312. Schedule 10 pipes and fittings shall be used except where otherwise specified.

Steam Pipework

Steam pipework smaller than DN 50 shall be of 316 stainless steel to ASTM A-312 Schedule 40 or approved equal. Steam pipework DN 50 and larger shall be manufactured to SANS 62 heavy class, ANSI B36.10 STD/Schedule 40 or to BS 1600 Schedule 40. Steel pipework shall be supplied with a suitable temporary corrosion protection both internally and externally in order to prevent corrosion during the storage, installation and pre-commissioning period. A primer similar to Plascon SNK 2, phenolic modified polyvinyl butyral self-etch primer, would be suitable.

Hydraulic and Oil Pipework

Hydraulic pipework shall be to BS 778 or equal. All hydraulic and oil pipes and fittings shall be thoroughly degreased, descaled and cleaned internally and externally after fabrication by abrasive blasting or pickling, thoroughly cleaned and rinsed, dipped in a hot iron phosphate solution and coated internally with a corrosion inhibiting, oil soluble preservative. After treatment and drying all openings shall be sealed until the pipes are installed.

Butt Weld Fittings

Steel butt welding pipe fittings shall be to ANSI B 16.9, BS 1965 or BS 1640 of the same schedule as the pipework or heavier. Butt weld fittings in stainless steel shall be to ASA B 36.19 for schedule 5S and 10S and ASA B 16.9 for schedule 40S and 80S. Alternatively, fittings may be to BS 1640.

Malleable Cast Iron

Malleable cast iron fittings shall be to SANS 14.

Cast Iron

Cast iron pipes and fittings shall comply with BS 2035 (Class D) and shall be pressure tested in accordance with Clause 12 of that Standard. The requirements of the Standard's Clause 6 regarding freedom from defects and casting appearance and Clauses 8, 9 and 10 regarding casting accuracy will be strictly applied. The requirements of the Standard with regard to protection and flanges shall be modified to comply with this Specification. Also refer to Clause "Castings" of this Specification.

Copper

Copper pipes shall be to BS 2871 or approved equal.

Plastic Pipework

Polyethylene or Polypropylene pipes shall comply with SANS 533 and SANS 1315 respectively and shall carry the SABS mark. The contractor manufacturing and installing the pipework shall satisfy the requirements of SANS 9001. PVC pipework is not acceptable except where specified. An operating life of 50 years shall be designed for and appropriate derating factors shall be applied to suit the application. The rated maximum working pressure at operating conditions of the class of pipe selected shall be not less than 1,5 times the actual maximum operating pressure. If the material used has insufficient resistance to solar radiation (U.V. light) for the application, suitable protection must be provided to achieve the required life. **Note that nominal bores and pipe diameters specified must be regarded as the minimum inside diameter.**

2.15.1.2 Pipework Design

Pipe Type and Material

The type and material of pipe to be used will be given in the Detailed Mechanical Specification.

Pipe Diameters

Unless otherwise specified in the Detailed Mechanical Specification, pipe diameters shall be based on the following velocities. The velocities shall be based on the compressed volume at the operating pressure in the case of steam, air and other gases. Valves and other ancillaries shall generally be of the same nominal diameter as the pipe. Non-standard sizes shall not be used.

Fluid	**Fluid Flow (l/s)**			
	0-2.5	2.5-15	15-100	100-500
	Allowable flow velocity (m/s)			
Liquid				
Grit Free	0.75max	1.25max	1.5max	2max
High Solids or grit		0.8min	1min	1min
		1.5max	1.75max	2max
Steam	10max	15max	20max	25max
Air and Gas				
Above 10kPa	5max	8max	10max	12max
Below 10kPa	2.5max	3max	4max	5max

Coupling Arrangement

Screwed fittings may be used on DN 50 and smaller provided that sufficient unions or flanges are provided for disassembly and removal of equipment. Reducing sockets and reducing bushes shall be used where required.

All steel pipes larger than DN 50 shall be flanged or fitted with mechanical pipe couplings as applicable.

Suitable pipe couplings shall be incorporated wherever necessary to facilitate maintenance or isolate vibration. A coupling shall be provided on each pump suction. Couplings shall be adequately restrained by harnesses as specified in the Clause "Pipe Couplings".

Draining, Venting and Purging

On liquid lines provision shall be made for draining and venting where necessary. Vents shall be provided at all vertical down bends on gravity lines. On gas lines provision shall be made for purging.

Condensate Drains for Air Lines

Automatic condensate traps with isolating valves and valved by-passes shall be provided at all necessary points including ahead of any globe type valve, orifice plate or concentric reducer in a horizontal line, at each change of level and immediately ahead of the user equipment.

A suitable well of a diameter equal to the pipe diameter with a bottom drain shall be provided at each condensate removal point. Condensate traps and valves shall be accessible and condensate shall be piped to the nearest drain. Pipework shall be sloped in the direction of flow towards a drain point with a slope of 1 in 150 and care shall be taken to avoid sagging at any point.

By-Passes

Isolating valves and valved by-passes shall be provided around condensate traps, pressure reducing valves and valves with solenoid or other actuation which do not have provision for manual operation.

Encased Pipes

Pipework to be permanently encased in concrete, cement or similar shall be of cast iron or 316 SS, or better, for steel and stainless steel pipework respectively. The encased portion shall be a short, straight length of pipe, flanged both ends with adequate clearance between the wall surface and the flanges for inserting flange bolts. Victaulic type couplings may in some instances be permitted instead of flanges.

Pipe sections through walls below ground or water level shall be provided with a puddle flange the same diameter as a standard flange. The encased area shall in such cases be uncoated up to 30 mm inside the wall surface and coated to Specification from there on.

Isolation

The layout design shall make provision for isolation and easy removal of mechanical equipment.

Nozzles for Fittings, Gauges, etc.

Nozzles on pipework (for installation of gauges, transmitters, drain pipes, cooling water take-offs, air release valves, etc.) shall be designed so that the pipework corrosion prevention system is not affected.

Nozzles shall consist of a flanged, welded tee-off of at least 100 mm diameter, painted or cement-lined internally and provided with a non-corrosive blank flange, e.g. grade 316 stainless steel. The blank flange shall be provided with tapped holes suitable for the equipment installation.

Internally painted, small diameter carbon steel nozzles and screwed carbon steel tee-offs are not acceptable. Carbon steel pipework may be provided with small diameter, grade 316 stainless steel

nozzles which are welded into the pipework if the Engineer considers this acceptable in the application.

Flow Straighteners

If a flow straightener is specified in the Detailed Mechanical Specification, this shall be provided in accordance with drawing number ME-A4/1520: Pump Suction Flow Straightener – Plain Ended Pipe. This design is for plain ended pipes on the suction side of pumps but the blade configuration shall apply where applicable to other applications.

2.15.1.3 Pipework Installation

Appearance

Pipes and fittings shall be conservatively selected to suit the application, neatly installed, straight to line and level, adequately supported and shall operate without vibration.

Valve Orientation

On sludge or raw sewage pipelines, check valves shall, wherever possible, be mounted horizontally and isolating valves with spindles vertical. Valve handwheels shall be arranged so that they are accessible to the operators.

Supports

Proposed designs of pipe supports shall be submitted to the Engineer for acceptance prior to manufacture. Specific requirements are:

i) Steel supports shall be fabricated from heavy duty hot-rolled steel sections. The complete assembly shall be hot-dip galvanised after all fabrication is completed.

ii) Welds shall be “all-round”.

iii) Each foot shall feature at least four anchor fasteners.

iv) For cantilevered pipe supports, the spacing between anchor fasteners shall be not less than one third of the cantilevered length

The spacing between pipe supports shall be as follows:

APPROXIMATE DISTANCE BETWEEN SUPPORTS FOR STEEL PIPE	
Pipe Diameter (DN)	**Distance Between Supports (mm)**
0 – 15	800
20 -50	1500
65 – 100	2500
125 – 100	3500
250 - 500	5000
>500	6000
Distance between supports must be halved for pipe materials other than carbon steels and stainless steels.	

Pipe supports shall be so located that when an item of mechanical equipment is removed, the associated valves and pipework are still adequately supported. Supports shall be provided close to heavy items such as valves. No external loads shall be placed on items of mechanical equipment such as pumps, compressors, etc. Adequate provision shall be made for expansion and contraction due to variations in temperature or pressure.

3 mm thick neoprene strips shall be placed between pipes and supports or clamps to protect the paintwork and limit corrosion. Where roller or sliding supports are used to accommodate movement, suitable wear blocks shall be fixed to the pipe to prevent damage.

Floor pipe supports shall be aligned using a nut above and below the foot. A space of at least 20 mm shall be left between the foot and the floor and this space shall be filled using non-shrink grout in accordance with the manufacturer's recommendations once alignment has been completed. Alternative designs and installations may be submitted by the Contractor. Wall pipe supports shall be similar.

Where the Engineer approves the use of concrete pipe supports to be built by a civil contractor under a separate contract, these will be constructed after installation of the pipework and temporary supports shall be provided by the Contractor in positions which will not interfere with the construction of the concrete supports.

Pressure Testing

All pipelines shall be pressure tested to 1,5 times maximum working pressure. This shall be done before covering up the pipeline in any way where applicable and shall be witnessed by the Engineer.

2.15.1.4 Pipework for Pump Suction

General

Pump suction pipework shall be designed in accordance with good engineering practice. The following, in particular, shall be complied with:

i) Suction pipework shall be sized, where practical, to ensure that the flow speed is no higher than 1,5 m/s.

ii) High points shall be avoided and it is preferred that the pipework slopes up toward the pump.

iii) Air leaks shall be avoided / prevented.

iv) Reducers shall be of the unequal type.

v) Reducers shall have a diametral reduction of no more than 50 mm per 300 mm length and shall have a parallel-sided length between the tapered portion and each flange.

vi) “Lobster-back bends” shall have a minimum of five segments. The segments welded to the pipe flanges shall be perpendicular those flanges.

vii) Flow straighteners shall be provided where specified in the Detailed Mechanical Specification.

viii) Strainers shall be provided where specified in the Detailed Mechanical Specification.

Bell-Mouths

All pump suction piping which draws the pumped liquid from open sumps shall be provided with bell-mouth inlets. The bell-mouth shall have an integral flange and shall be bolted to a flange on the suction pipework.

The bell-mouth design shall be in accordance with drawing EAM_ME_2015_001.

The preferred material for the bell-mouth is glass-fibre or stainless steel 316 however cast iron suitably coated, may be acceptable.

2.15.1.5 Flanges

Standards

All standard flanges shall comply with SANS 1123. For flange sizes not included in the SANS, BS 4504 shall be used. Cast iron flanges and their mating flanges shall have flat faces. The flange table shall be as specified or, if not specified, selected to suit the maximum possible operating pressure but not less than Table 1000. Drilling and installation of flanges shall be "off-centre".

Flange Fixing

Flanges DN 50 and smaller may be of the screwed on type. Metal flanges above DN 50 shall be welded on in accordance with BS 806 Type 6 unless otherwise agreed or specified.

Machining of Flanges

All flanges shall be machined on the sealing face. Flanges cut from plate shall also be machined on the bore and outside diameter. Cast iron flanges shall also be machined or spot faced on the back of the flange to ensure a flat bearing surface for the fastener's head or nut and washer. All edges, including bolt-holes, shall be chamfered or rounded to a 2 mm radius.

Butt Flanges

If the use of a loose hot-dip galvanized butt flange arrangement with stainless steel pipework is specified or approved by the Engineer, such arrangement and design shall comply with BS 4504 Table 6/6 or 10/6 as appropriate. The butt welded shouldered end for the pipe may be rolled from hot rolled stainless steel angle section. The hot-dip galvanized butt flange must be electrically insulated from the stainless steel pipework.

Gaskets

The jointing material used on flange joints shall be of rubber or compressed asbestos fibre at least 3 mm thick complying respectively with BS 2494 or BS 1832, as applicable. Full face gaskets shall be used for full face flanges. Inner bolt circle gaskets shall be used on raised face flanges and when clamping items such as wafer type valves between flanges inside the bolt circle. Properly designed O-ring seals are also acceptable.

2.15.1.6 Pipe Couplings

General

Where pipework movement, misalignment or dismantling must be allowed for, or if necessary for any other reason, pipe couplings may be used if approved by the Engineer. Pipe couplings shall be of the mechanical type, stainless steel bellows type or rubber bellows type.

Supports and Anchors

Pipework using couplings shall be supported and anchored strictly in accordance with the coupling manufacturer's recommendations.

If the pipework configuration does not provide axial restraint, harnesses against separating forces shall be provided. Systems incorporating additional flanges or lugs and connected by tie bars or positively fixed to anchors will be acceptable. Systems relying purely on friction will not be acceptable. Tie bar harnesses shall incorporate three tie bars or more.

Mechanical Pipe Couplings

Mechanical pipe couplings shall:

i) be of rolled steel, forgings or of high grade castings;

ii) be coated;

iii) have rubber seals of a suitable grade;

iv) shall have stainless steel fasteners, and,

v) be supplied without centre register unless otherwise specified.

Pipe ends shall be in accordance with the coupling manufacturer's recommendations. Where machining is required, as in the case of cast iron pipes, the length of machining on each pipe shall be approximately equal to the total length of the coupling to ensure that the coupling can be separated for pipe removal.

Couplings for air applications below 60 ºC shall be hot-dip galvanized for air applications above 60 ºC shall be of stainless steel. Couplings for liquid applications shall be coated in accordance with System – “Hot-Applied Thermoplastic” or System – “Fusion Bonded Epoxy”. Couplings for stainless steel pipework shall be stainless steel.

Fasteners, including coupling studs, **stub studs** (i.e. studs welded to the flanges of flange adaptors), washers and nuts shall be of grade 316 SS, or better.

When couplings are part of a buried pipeline, the metallic surfaces shall be coated as specified above and then covered and wrapped. Couplings shall be covered with mastic to a smooth finish, wrapped with tape and then wrapped with a polythene sheet which is strapped in place. "Denso mastic" and "Denso tape", or equivalent products, are suitable. If the operating temperature is likely to exceed 70 ºC, the mastic and tape shall be replaced with suitable grease or a suitable sealer.

Stainless Steel Bellows Pipe Couplings

Stainless steel bellows shall incorporate stainless steel flanges and fasteners.

Rubber Bellows Pipe Couplings

Rubber bellows couplings are acceptable for machinery which is flexibly mounted and also in applications which require isolation of driven machinery from the surrounding pipework and/or structures.

The flexible material used for rubber expansion joints shall be chosen specifically for maximum resistance to bursting.

Metal backing flanges for rubber expansion joints shall be of stainless steel or hot-dip galvanized steel.

2.15.2 Final Colour

Refer to Detailed Mechanical Specification: 2.18 CORROSION PROTECTION AND PAINT.

2.16 LIFTING EQUIPMENT

2.16.1 General

2.16.1.1 General Requirements

Lifting equipment shall comply with the following general requirements:

i) The design, fabrication and installation of lifting equipment shall be fully in accordance with the relevant aspects of the Occupational Health and Safety Act and Regulations.

ii) Lifting equipment shall be designed, constructed and installed in accordance with an internationally accepted technical design standard.

The guidelines given in the Southern African Steel Construction Handbook may be used where applicable and where these do not conflict with the internationally accepted technical design standard.

iii) Test certificates shall be provided for all items of lifting equipment.

iv) The safe working load (SWL) shall be permanently marked on all items of lifting equipment.

v) Lifting equipment and installations shall be inspected and shall be tested over the complete lifting range using a test load.

Unless otherwise specified in the internationally accepted technical design standard, the test load shall be:

- at least 125 % of the SWL for equipment with a SWL of up to 10 tonne SWL;
- at least 110 % of the SWL for equipment with a SWL of 10 tonne and above.

vi) High-tensile and alloy steel chains shall have a factor of safety of at least four. Other chains shall have a factor of safety of at least five.

vii) Steel-wire ropes shall have a factor of safety of at least six. Man-made fibre ropes or woven webbing shall have a factor of safety of at least six. Natural fibre ropes shall have a factor of safety of at least ten.

viii) Anchor fasteners for securing steel structures to concrete shall have a diameter of not less than M16 and shall be of grade 316 SS, or better.

ix) Foot-plates for columns which form part of lifting gantries shall be secured with a minimum of four anchor bolts.

x) Hollow steel sections such as pipes and tubing are not acceptable as structural members unless the section is fully closed by welding.

xi) Tenderers shall note that many aspects, such as fabrication, welding, corrosion protection and fasteners, shall be in accordance with the requirements of other clauses in this Standard Specification for Mechanical Works (including General Works).

2.16.1.2 Steel Gantries

In addition to the general requirements for lifting equipment, steel gantries shall comply with the following:

i) The same internationally accepted technical design standard used for the design of the crawl beam or crane shall be used for designing the gantry which supports the crane or crawl beam.

ii) Columns shall be cross-braced and/or “triangulated” in more than one plane. In other words, columns shall not be cantilevered in any vertical plane.

iii) Gantry steelwork shall be hot-dip galvanised. If this is not feasible, steelwork shall be hot-metal zinc-sprayed, sealed and coated in accordance with the clause 2.18.7.1.

2.16.1.3 Overhead Travelling Cranes

In addition to the general requirements for lifting equipment, overhead travelling cranes shall comply with the requirements below.

General

Construction of the crane shall be in accordance with BS 466 and BS 2573 (or BS EN 13 001), as applicable. All welding of steelwork shall be carried out in accordance with BS EN 1011 by competent artisans meeting the requirements of BS 4872. (Suitable equivalent standards are acceptable).

Design requirements for the fixing and installation of the crane rails shall be provided by the Contractor to the Engineer for acceptance.

The Tenderer shall determine a suitable method of installation for the crane and the crane rails and shall manage all work accordingly.

The Contractor may use the crane during the installation of other parts of the Works on condition that all testing and certification for the complete lifting installation, including the supporting structure, has been successfully completed.

Certificate

The Contractor shall supply to the Engineer a certificate from the crane manufacturer which:

i) certifies that the crane has been manufactured in accordance with the requirements of the Driven Machinery Regulations of the Occupational Health and Safety Act;

ii) specifies the internationally accepted technical design standard used, and;

iii) states the SWL and the test load.

This certificate shall be provided to the Engineer prior to delivery of the crane to Site.

Configuration

The overall configuration shall be as follows:

i) the crane hoist shall be supported on and travel along a steel crane beam structure.

ii) the crane beam shall be supported on end carriages which travel along crane rails.

iii) the crane rails shall be supported along their full length, either on a concrete beam or on a hot-dip galvanised steel beam structure.

The crane long travel, cross travel and hoist shall be electrically-powered or manually operated as stated in the Detailed Mechanical Specification.

Unless otherwise stated:

i) the lowest hook level shall be floor level.

ii) electrical control pendants shall be arranged to move independently along the length of the crane beam and shall be situated at one metre above floor level.

iii) the operating chains of manually operated cranes shall fall to one metre above floor level.

Construction

All materials shall be new and unused and suited to the application. Structural steelwork shall comply with the requirements of SANS 1431 and the grade used for structural members shall be 300 WC.

Fabrication shall comply with the following:

i) Site welding will not be acceptable.

ii) Welding shall be continuous.

iii) Crevices will not be permitted.

iv) Weld slag and spatter shall be removed and welds shall be ground smooth prior to coating.

v) Welds shall be free of blowholes and undercut.

vi) Edges shall be rounded to a radius of at least 3 mm.

vii) Open pockets which are inaccessible for preparation and coating will not be permitted.

The crane rails shall be standard rail sections. Rails manufactured from square section steel bar will not be acceptable. Rail lengths shall be joined using fish-plates, with at least four fasteners, to provide a continuous path for the travel of the crane wheels.

The crane beam and end carriages shall be designed with suitable dimensions, wheel spacings and gusset plates or diagonal bracing to prevent cross-whipping.

End stops with rubber buffers shall be fitted to prevent the hoist from moving off the travelling beam.

Stops and buffers are also required to limit the long travel on the rails.

Lubrication systems shall be designed to exclude dirt and moisture and all gear wheels shall be fully enclosed.

Bearings shall be mounted in sealed, cast iron bearing housings or in totally enclosed and sealed housings, grease-lubricated and provided with grease nipples in both cases. The open type bearing units with exposed "lubricated for life" bearings will not be acceptable.

Installation

The crane and rails, when erected and installed, shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper working order. The crane rails shall be straight to within the permissible deviations given in BS 466 over their entire length.

The distance between rail supports shall not exceed 1 000 mm. Every rail length shall be supported at both its ends.

Crane rail anchor fasteners shall be M16 or larger and shall be of grade 316 SS or better.

The full length of the rails shall be grouted in cases in which the rails rest on a concrete beam. A suitable gap between the rails and the beam shall be provided for application of the grout. The grout shall be applied strictly in accordance with the manufacturer's instructions. The grout shall be neatly finished with a 45º chamfer. The Engineer shall be notified prior to application of the grout.

In the alignment of equipment or structures, the use of multiple shims will not be permitted. Shimmed feet shall be fully grouted to provide corrosion protection of the shims.

Grouting shall be done using a non-shrink cementitious grout, ABE Duragrout 1000 or equivalent, to the approval of the Engineer and in accordance with the manufacturer’s instructions.

Corrosion Protection

The Contractor shall arrange for the fabrication of the crane to be inspected by the Engineer at the fabricator's premises prior to preparation for corrosion protection.

The crane beam and end carriages shall be hot-metal zinc-sprayed, sealed and coated in accordance with the clause “Corrosion Protection: Metal Coatings”. Smaller items, such as cable brackets and protective covers, shall be hot-dip galvanized.

The crane rails shall be hot-dip galvanized after all fabrication work is complete.

Maintenance Platform and Ladder

Where specified in the Detailed Mechanical Specification, a maintenance platform for two people shall be provided along the length of the crane beam.

The crane beam structure shall incorporate welded lugs onto which the platform shall be bolted; i.e. the platform shall be removable and shall not be welded to the crane beam. The complete platform and all guard-railing shall be hot-dip galvanised after fabrication. The platform floor shall have a minimum width of 500 mm.

Guard rails shall be provided on the maintenance platform and shall comply with the clause “Guard Railing”.

Where specified in the Detailed Mechanical Specification, a hot-dip galvanised fixed steel ladder shall be provided at a suitable position within the building for accessing the platform on the crane. This shall comply with Clause “Permanent Ladders and Stairs”.

2.16.1.4 Hoists

In addition to the general requirements for lifting equipment, hoists shall comply with the following:

i) Hoists shall be provided with an overload prevention device; e.g. a clutch which slips upon overloading. Powered hoists shall comply in all applicable respects with Driven Machinery Regulation 18 of the Occupational Health and Safety Act.

ii) Powered hoists shall hold the load stationary upon power failure.

iii) The bottom hook shall swivel on a ball or roller bearing through 360º and the bearing shall have a protective skirt. The hook shall be fitted with a safety latch.

iv) Lifting chain is preferred, but corrosion-protected steel wire rope is acceptable.

v) Chain boxes shall be provided for holding unloaded lengths of lifting chain.

vi) Wire rope hoists shall comply with the following:

- Drum diameter shall be at least 25 times the wire rope diameter.
- Drums shall have no more than three layers of wire rope when fully wound up.
- Drums shall have no fewer than three full turns of wire rope remaining when the hook is at the lowest design level.

2.16.1.5 Hoist Trolleys

In addition to the general requirements for lifting equipment, hoist trolleys shall comply with the following:

vii) Hoist trolleys shall be designed so that the trolley will remain on the support beam if a wheel falls off or a wheel axle fails.

2.16.1.6 Crawl Beams

In addition to the general requirements for lifting equipment, crawl beams shall comply with the following:

viii) Crawl beams shall be fabricated from standard I-Sections or standard H-Sections.

ix) Crawl beams shall be hot-dip galvanised after all fabrication is complete. If the zinc coating is removed or damaged by drilling or welding or any other activity, the complete beam shall have the zinc removed by abrasive blasting and it shall be returned to the galvanisers for hot-dip galvanising.

x) Crawl beams anchored to concrete shall be secured using grade 316 SS, or better, anchor bolts. The anchor bolts shall, preferably, be through-bolted. If through bolting is not feasible and chemical anchor is used, every anchor shall be tested to the design load for the anchor prior to installation of the beam.

xi) Mechanical expanding anchors are not acceptable for anchoring crawl beams.

xii) Crawl beams fastened to steel support structures shall be secured using hot-dip galvanised fasteners.

2.16.1.7 Davits

In addition to the general requirements for lifting equipment, davits shall comply with the following:

i) Davits shall be column mounted with swivelling booms and shall be designed to suit the application. Where specified in the Detailed Mechanical Specification, each davit shall be provided with a winch rigidly fixed to the davit at a convenient height and position.

ii) The davit shall be designed for a SWL at least 50 % above the load requirements of the equipment installation.

iii) Guide pulleys shall be provided to suit the arrangement. These pulleys shall be machined with a groove having a radius 5 % to 7,5 % greater than the rope radius and with a flare angle of 52º. The pulley effective diameter shall be not less than 25 times the wire rope diameter. The groove depth shall be twice the rope diameter or greater.

iv) The davit shall either be manufactured of grade 316L SS, or better, or of carbon steel, hot-dip galvanized and painted. All fasteners, pins, shafts, shackles, hooks, etc., shall be of 316 SS, or better. Guide pulleys and shafts shall be made of 316 SS, or better, or other approved corrosion resistant material, and shall use suitable non-metallic bearings which do not require lubrication.

v) The swivelling arrangement shall be properly designed for easy operation, shall be accurately fitted and shall not be subject to corrosion problems. Bushes made of nylon, "Vesconite" or other suitable non-metallic material shall be used and any metallic rubbing mating face shall be of 316 stainless steel.

vi) Operating cross bars, locking arrangements, fixing arrangements, etc., shall not represent a hazard to passers-by. If necessary, operating levers shall be hinged so that they can be swung out of the way when not in use.

2.16.1.8 Hand Cranked Winches

In addition to the general requirements for lifting equipment, hand cranked winches shall comply with the following:

i) Hand cranked winches shall be rated for a SWL of at least 50 % in excess of the expected working load. All gears, clutches, etc., shall be enclosed in a robust cast iron, cast steel or fabricated stainless steel casing which shall be grease filled and sealed against ingress of dirt and moisture. The winch shall be designed to hold the load stationary when the hand crank is released during raising and lowering. In addition, a locking arrangement to lock the position of the load at any point shall be provided.

ii) The force required to operate the winch at its maximum rated load shall not exceed 130 Newtons.

iii) The wire rope shall be of stainless steel. The wire rope shall be long enough to reach the lowest required position and still have at least 3 turns remaining on the drum. The drum size shall easily store the full rope length. The drum shall have a diameter of at least 25 times the diameter of the wire rope.

iv) The support brackets, all exposed fasteners, shafts, handles, pins, etc., shall be of 316 SS, or better, and the casing shall be hot-dip galvanized or hot-metal zinc-sprayed (to a thickness of 150 µm) and then painted.

2.16.2 Scope

This section covers the crawl beam and associated block and tackle to be supplied and installed for the pump room.

2.16.3 General Description

The lifting equipment shall be designed to suit the building dimensions, lifting duty and functional requirements as appropriate for the equipment supplied.

2.16.4 Equipment Data and Duties

The tendered rate shall include the complete design, provision of drawings for approval by the Engineer, supply, installation, testing, commissioning and certificate for the following Lifting Equipment:

- The crawl beam and manual block and tackle in the pump room. The safe working load (SWL) shall be the weight of heaviest piece of equipment in the room + 50%;
- The length of the crawl beam shall be 5300mm. The lift height shall be 3300mm.

2.17 HEATING VENTILATION AND AIR CONDITIONING

2.17.1 General

2.17.1.1 Ventilation Systems

Design

Performance requirements to be achieved by the Contractor's design are specified in the Detailed Mechanical Specification.

Resistance to flow for all ductwork, pipework and associated equipment shall be calculated by the Contractor prior to equipment selection. At least 250 Pa shall be allowed for resistance losses in filters unless the Contractor can confirm a lower figure. Reasonable modification to ductwork and pipework during installation shall be provided for in the design; i.e. a suitable safety factor shall be incorporated in the design.

Fans

Direct-drive, axial-flow fans shall incorporate manually adjustable pitch, cast aluminium, aerofoil section blades, clamped in split, metallic hubs. Terminal boxes shall be mounted on the fan unit. Fan casings shall cover the overall length of the fan and motor assembly or shall feature a plate mount which incorporates a bell mouth inlet. Suspended fans shall be restrained to prevent excessive torsional and axial movement during start-up.

Axial flow fans installed in corrosive flows shall be either belt-driven or shall have their motors protected by bifurcated airstreams.

Centrifugal fans shall be constructed of galvanized sheet steel with spun steel inlet cones and machined shafting supported on rolling bearings mounted in sealed bearing housings provided with grease nipples. The open type bearing units with exposed "lubricated for life" bearings will not be acceptable. Fans shall be mounted on steel channel base frames sized to accommodate drive motors.

Fan motors shall be protected to IP 55 or higher. Fans and motors shall preferably have a nominal speed of 1 500 rpm or lower and motors shall have a nominal voltage of 400 Volts.

Fans shall be dynamically balanced to ISO 1940, grade G6,3. Fans shall be flexibly connected to ducting.

Fan/motor housings shall, as a minimum, be provided with rubber mountings. Where flexible mounting is specified, fans shall be flexibly supported off the structure using spring or rubber-in-shear mountings having a minimum static deflection of 20 mm. Suction and discharge areas shall be effectively guarded with hot-dip galvanized (or better) wire screens of 12 mm maximum mesh and 1,6 mm minimum gauge. Belt drives shall be accurately aligned axially and angularly and shall be to the Engineer's approval. Guarding shall totally enclose drives, shall be rigidly mounted off base plates and shall be to the Engineer's approval.

Drive motors shall comply generally with the clause 2.13.

Ducting and Sheet Metalwork

All ducting for air conditioning and ventilation purposes shall be manufactured in accordance with SANS 1238.

Volume control dampers shall be installed where required or where called for in the Detailed Mechanical Specification and shall be of the opposed blade type.

Unless otherwise specified, materials used in the fabrication of air conditioning and ventilation ductwork shall be of hot-dip galvanized, low carbon steel and sheet steel material thicknesses shall be in accordance with SANS 1238.

Flexible connections between ducting and moving equipment shall be by means of approved coated fabric collars with sewn and cemented seams. Flexible collars shall have sufficient free movement to take up the deflection of the connected moving equipment and shall not be used as a means of accommodating misalignment. When installed, collars shall not restrict the free area of the ducting and particular care shall be taken to avoid mounting flexible collars at fan intakes and discharges.

Take off sockets shall be provided where grilles or louvres are mounted in distribution ducting. Sockets shall be long enough to ensure that no part of the grille or its associated control mechanism projects into the duct cross-section. All such duct-mounted grilles shall be provided with opposed-blade, volume control dampers or flap-type volume controls with straightening blades.

Rectangular ducting shall be supported on trapeze type hangers constructed from hot-dip galvanized, low carbon steel angle with Ø10 stainless steel hanger rods. Rod diameter shall be not less than 10 mm and support spacing shall be less than 2 000 mm.

Circular ducting shall be supported in hoops constructed from 40 mm X 5 mm hot-dip galvanized low carbon steel flat bar suspended from Ø 10 mm stainless steel rod at 3 000 mm maximum centres.

Where ductwork penetrates brickwork, a wrot timber frame shall be built in to locate and mount the ductwork or air terminal as the case may be.

Where ductwork penetrates concrete slabs or walls, flanges shall be provided on one side to stabilize the duct and weak grout or fire stopping shall be applied to the spaces between the ducting and the structure to effectively seal the clearance. Where ducting penetrates between areas having differing fire risk or mandatory fire separation, fire dampers to the latest amendment of SANS 193 shall be installed to the Engineer’s approval.

Filters

Filter cells shall be mounted in proprietary frames and clip-fixed to achieve zero discernible by-pass. Slide frame mounted filters shall have wing nut fixed airtight cover plates.

Filter banks shall have a differential manometer connected across them. Manometers shall be correctly set up and levelled and shall be provided with red gauge oil of the correct specific gravity.

The filter frame shall be fabricated from hot-dip galvanised steel (minimum thickness of 0,5 mm) unless otherwise specified in the Detailed Mechanical Specification.

Flow speed through the filter opening shall be not greater than 2 m/s.

Sound Attenuators

Circular attenuators shall be directly connected to axial flow fan flanges. Where diameters differ by more than 20 mm, hot-dip galvanized low carbon steel connecting cones shall be bolted between the fan and the attenuator to adapt the respective diameters. Attenuators containing an acoustic pod shall have leading and trailing fairings in moulded grp or spun hot-dip galvanized steel. Pods shall be securely and concentrically fitted in the casings to the Engineer's approval.

Splitter attenuators shall be fabricated of galvanized sheet steel with mating flanges. Splitters shall comprise acoustic lining material mounted on galvanized sheet steel and shall be securely supported within the attenuator casing. Leading and trailing ends of splitters shall have fairings in moulded grp or hot-dip galvanized steel sheet.

Attenuators shall be constructed to achieve the overall acoustic performance specified. Acoustic infill material shall be "Eurolon" by Donkin or equivalent. Where air passageway velocities exceed 20 m/s, the infill material shall be supported by pre-galvanised perforated sheet steel having a thickness of at least 0,8 mm.

Where attenuators are to be used in grease or oil-laden atmospheres or where called for in the Detailed Mechanical Specification, a polyester membrane shall be interposed between the infill material and the perforated sheet.

Attenuators shall not impose a resistance of more than 50 Pa at rated air-flow.

External surfaces of the attenuators shall be painted as for the general ductwork.

Equipment Bases for Equipment in Acoustically Sensitive Areas

The Detailed Mechanical Specification specifies whether the ventilation equipment system design must comply with the requirements of this Clause.

Inertia bases for centrifugal fans, chillers, refrigerant compressors, air cooled condensers, air compressors, pumpsets, motors and the like shall consist of reinforced concrete cast into sheet metal formers and shall be at least 150 mm deep.

Bases shall be reinforced with, at least, □13 mm reinforcing bars located at 150 mm centres each way.

The mass ratio between bases and equipment shall be at least 1:1 for fans and 1,5:1 for pumps. Concrete bases for pumpsets shall be large enough to support pipes and fittings between the pumps and flexible connections and shall also be generally large enough to accommodate the motors and driven equipment. Equipment shall be bolted onto concrete inertia bases.

Structural steel bases shall be provided for cooling towers and evaporative condensers.

Spring isolators shall be installed between concrete inertia bases and floor plinths and between cooling towers or evaporative condensers and floor plinths. Either free standing stable spring units or caged spring units with snubbers may be used. Spring isolators shall be installed with levelling bolts and shall incorporate 6 mm thick ribbed neoprene acoustic pads bonded to the base. Spring diameters shall be large enough to prevent excessive rocking of equipment during start-up as well as normal operation.

Isolators shall be chosen to give a static deflection corresponding to a ratio of 3:1 of the lowest disturbing frequency to the natural frequency of the mounting.

Bases and spring isolators shall be arranged to give a clearance of approximately 25 mm between the underside of the bases and floor plinths.

Floor plinths shall be provided for all equipment bases. Plinths shall be large enough to accommodate the concrete inertia bases and spring isolators. Floor plinths shall also be provided under items of equipment, such as cooling towers, air plena etc., which do not require concrete inertia bases. Plinths under the air plena shall be at least 100 mm higher than the finished floor level.

Equipment Noise Control

Refer to clause 1.2.20.

Machine Vibration

Refer to clause 1.2.19.

2.17.2 Scope

This section covers the HVAC equipment for the pump room, MCC room and office.

2.17.3 General Description

Filtered inlet air shall be supplied to the bottom of the equipment rooms via new forced ventilation fans and ducting arrangements. The forced air introduced shall allow for adequate cross-flow throughout the entire room. The introduced air in the building shall escape through outlet louvres at a high level on the opposite side of the room.

The ventilation systems for the buildings listed above shall be designed to adequately ventilate the rooms. The ventilation systems shall include the following:

i) New outlet louvers discharging air at a high level on the outside wall;

ii) New inlet forced ventilation fans, on the opposite wall of the new outlet louvers;

iii) The inlet forced ventilation fan arrangements shall include coarse air filters, which must be easily accessible and removable. A spare set of filters for each system must be provided;

iv) All necessary ducting arrangements for each fan to supply air to the bottom of the building on the opposite side to the outlet louvers;

v) All necessary sound attenuation on all the forced ventilation fans; The sound attenuation shall reduce the noise level to a maximum of 80 dB(A) @ 1m away, during normal operation, with one unit running;

vi) Each building shall be provided with its own duty/standby inlet ventilation fan arrangement;

vii) Scope to cover the necessary switchgear and electrical considerations required to successfully install, commission and operate the system.

2.17.4 Equipment Data and Duties

New forced ventilation fans will be required for the buildings listed in the table below, to supply air to the bottom of the equipment rooms and force the heat generated to outside and maintain the required air changes. On the suction side of each fan air shall be filtered by a coarse air filter. Air shall be taken into the building with common ducting routed to a low level in the building such that air is introduced at various points and in such a way that the entire room is ventilated. The Tenderer shall size the louvres, fans and ducting such that the above described ventilation requirements are met and submit calculations to this effect.
The face velocity at the outlet louvers located at a high level in the outside wall should equate to a maximum of 2.0 m/s. The louvres shall be weather resistant, sand trap, vermin and bird proof louvres.

Ventilation				
Room	**No. of air changes (/hr)**	**Size of Room (m^3)**	**Forced ventilation requirement (m^3/hr)**	**Outlet Louvres requirement (m^3/hr)**
Equipment Room (main pumpstaion building)	5	700	3500	3500

2.17.5 Electrical Motors

Refer to Detailed Mechanical Specification:2.13 Electric Motors. The fan motor speed shall not exceed 1 500 rpm.

2.17.6 Control Philosophy

The ventilation system shall operate continuously and be interlocked with the equipment it is serving inside the particular room. If the particular equipment switches on, the associated ventilation system must switch on. This shall apply to the backwash pumps only in the pump room.

The design of the ventilation system, including drawings, functional specification, control panel layout, circuit diagrams and protection systems, shall be submitted to the Engineer for approval.

2.18 CORROSION PROTECTION AND PAINT

2.18.1 Corrosion Protection: Application and Control

2.18.1.1 Painting Contractor

Surface preparation and coating application shall be carried out by suitably trained and experienced industrial painting contractors who are fully equipped and staffed to do such work in their own covered premises strictly in accordance with the paint manufacturer's recommendations. Before proceeding with the corrosion protection coatings, the Contractor shall submit the name of the painting sub-contractor and the proposed works supervisor for approval by the Engineer.

2.18.1.2 Site Work

Surface preparation and coating application shall not be done on Site except for minor repairs, for application of the final aesthetic coat, where specifically called for in the Detailed Mechanical Specification or where permitted by the Engineer in writing.

2.18.1.3 Systems to be Used

Systems

The corrosion protection systems to be used on the plant and equipment will usually be specified in the Detailed Mechanical Specification, but if not, the Contractor shall recommend a suitable system for approval by the Engineer. If doubt exists as to the system or colour to be used, the Engineer's requirements must be ascertained.

Alternative Systems

Alternative systems superior to those specified may be used if approved in writing by the Engineer.

All Items to be Painted

Except where otherwise specified, all metal surfaces shall be painted. This includes hot-dip galvanized items and metal-sprayed coatings. In the latter case the paint shall be in the form of a sealer. Details of approved painting systems to be used are given below.

Grade 316 Stainless Steel

It is not usually necessary to paint 316 stainless steel. If corrosion of 316 stainless steel does occur, and depending on the appearance or extent of the problem, the Engineer may call for pickling, electro-cleaning, painting or replacement of the item at no additional cost. Painting may however be required if contaminated or stained surfaces cannot be properly cleaned or where stitch welding has been approved.

2.18.1.4 Quality Control of Coating Application

Quality Plan and Records

The Contractor shall provide a Quality Plan which shall include all steps in the surface preparation and corrosion protection process plus technical data sheets for all products proposed. Records of compliance with the Quality Plan shall be maintained.

Responsibility and Rectification

The Contractor is responsible for the quality of the work and materials used, irrespective of any quality surveillance that may be carried out by the Engineer.

If unacceptable work is found on Site, the full area associated by the engineer with that unacceptable area shall be redone after the Contractor has submitted a method proposal.

Inspections

The Contractor shall arrange for the coating application on fabricated steelwork to be inspected throughout by the Engineer. The Engineer may approve inspections by an independent competent person (hereinafter called the Inspector) appointed by and at the cost of the Contractor. Inspections shall be adequate to ensure compliance with the Specification and shall be done at the following stages as a minimum:

Coating (Hot-Metal Spray, Paint, etc.)

After fabrication but before surface preparation.
After surface preparation but before application of the first coat.
After application of the final hot-metal sprayed coating or after application of the paint primer or first coat (as applicable).
After the final factory applied paint or sealing coat.

Hot-dip Galvanizing

After fabrication but before hot-dip galvanizing.
After hot-dip galvanizing.

Duplex Protection (Hot-dip Galvanizing and Coating)

After fabrication but before hot-dip galvanizing.
After hot-dip galvanizing but before application of the first coat.
After application of the primer.
After the final Site-applied paint coat.

Witnessing of Inspection

If the coating is to be done in the Cape Peninsula by in inspector other than the Engineer, the Contractor shall, nevertheless, arrange for the Engineer to witness the inspections at the latter's discretion.

Dry Film Thickness

The dry film thickness of any coat or coating system shall be determined in accordance with SANS 2808. The test method defines that the instrument is to be calibrated on a substrate that
represents the surface to be coated.

Inspection Report

A written report of the inspections, prepared by the Inspector and signed by both the Inspector and the Contractor, shall be submitted for appraisal by the Engineer before delivery of the equipment to Site.

Inspector Qualifications

Inspectors appointed by the Contractor shall hold an appropriate qualification from one of the following:

i) Corrosion Institute of Southern Africa.

ii) South African Institute of Welding.

iii) South African Institute for Non-Destructive Testing.

iv) South African Qualification and Certification Committee.

Identification of Items

Every item to be coated shall be identified by a welded or hard-stamped code. Records shall be maintained for each item.

2.18.2 Corrosion Protection: Surface Preparation

2.18.2.1 Imperfections

Welding shall be free of blowholes and all welding flux removed. All weld spatter, sharp edges and other imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. (Weld grinding must not, however, be performed on stainless steel). Areas to be painted shall be free of crevices.

2.18.2.2 Edges

Edges shall be rounded to a radius of at least 2 mm.

2.18.2.3 Cleanliness

The provision of acceptable cleanliness entails not only the removal of existing mill scale, coatings and/or corrosion product, but also the removal of surface contaminants such as oil, grease and soluble salts.

Water soluble salts present on the steel before application of the primer shall not exceed 10 µg/cm^2.

2.18.2.4 Abrasive Blasting

Before coating, all new steel surfaces shall be abrasive blast cleaned in accordance with Section 4.3 of SANS 10064 to a preparation grade of ISO-Sa3 in accordance with ISO 8501. The blast profile, measured in accordance with SANS 5772 (dial gauge), shall be in the range of 50 to 75 µm. The abrasive shall comply with SANS 10064 and shall be free from all traces of oil, grease, foreign matter and corrosive contaminants such as chlorides, etc. The blasted surface shall be cleaned and degreased as required. The prepared surface shall be given the first coat of the painting system within 4 hours after blasting.

In instances where stainless steel and 3CR12 are to be painted, the surface shall be suitably abrasive blasted prior to primer application.

2.18.2.5 Between Coats

Between coats or with previously painted surfaces in good condition, all traces of oils, greases, soluble salts and corrosive air borne contaminants shall be thoroughly washed from the surface to be painted using a detergent type cleaning agent, rinsed and dried. The previous coat shall then immediately be lightly sanded or otherwise prepared as recommended by the paint manufacturer, wiped clean, dried and painted. Solvents are not acceptable as a surface cleaning agent.

2.18.2.6 Hot-Dip Galvanized Surfaces

Hot-dip galvanized surfaces to be painted shall not be passivated and shall be free from white rust and shall be leaned with an approved water based galvanizing cleaner using non-metallic abrasive pads until a "water break free" surface is obtained. The surface shall then be thoroughly rinsed with clean potable water to remove all residues and dried immediately prior to painting. Where necessary to obtain adhesion a sweep blast of the surface shall be done after cleaning.

2.18.3 Corrosion Protection: Metal Coatings And Duplex Coatings

2.18.3.1 General

Fabrication of items to be protected by metal coatings shall be in accordance with SANS 14713.

2.18.3.2 Hot-Dip Galvanizing

General

Hot-dip galvanizing shall be done in accordance with SANS 121 and the following shall apply:

i) Coatings shall be to the thicknesses detailed in the Standard.

ii) Hot-dip galvanized material which is to remain unpainted shall be passivated as specified in SANS 121. Items to be painted after hot-dip galvanizing shall be air dried and not passivated.

iii) Hot-dip galvanized material shall be substantially free from white rust when it is erected on site. Stacking and storing shall at all times be done in a manner to prevent white rust forming.

iv) Damage to hot-dip galvanizing caused by welding, grinding, etc. is not acceptable. Repair to hot-dip galvanizing damaged by handling or transport shall be done by cleaning the area and applying 3 coats of a zinc rich primer giving a dry film thickness of at least 100 µm and containing at least 94 % zinc in the dried film. If the Engineer considers that damage is excessive, such items shall be replaced by the Contractor without cost to the Employer.

v) Welding after hot-dip galvanizing is not acceptable.

vi) The Contractor shall supply a galvanizer's guarantee or test certificate prior to installation.

Duplex Systems

Preparation and application of organic coatings on hot-dip galvanizing shall be done in accordance with the Hot Dip Galvanizers Association Southern Africa's Code of Practice for Surface Preparation and Application of Organic Coatings.

The duplex system shall be as follows:

i) Hot-dip galvanizing; without passivation of the zinc coating.

ii) Application of one coat of an epoxy primer (two part; for hot-dip galvanised surfaces) with a dft of 75 µm.

iii) Polyurethane enamel top coat (two part) with a dft of 50 µm; done on Site after suitable repair to the primer.

Acceptable coating products are specified elsewhere.

2.18.3.3 Hot-Metal Sprayed Coatings

General

Fabrication and surface preparation of items to be protected by hot-metal spray shall comply with the requirements specified in this Standard Specification for Mechanical Works (including General Works).

Hot-metal sprayed coatings shall be in accordance with SANS 2063 and shall comply with the following:

i) The minimum coating thickness for both aluminium and zinc shall be 150 µm. Greater thicknesses may be specified in the Detailed Mechanical Specification.

ii) The thickness shall be checked on every surface plane at points not more than 300 mm apart for small articles and 500 mm for large articles. Angles shall be checked along all 4 surfaces, channels along all 6 surfaces, pipes in 4 planes. The minus tolerance on thickness in isolated areas shall also not exceed –10 % and such low areas shall not be larger than 50 mm in diameter.

iii) The time between surface preparation and coating shall be shortened from 4 hours to 2 hours at any application area closer than 10 km from the coast.

iv) Unless otherwise specified, all hot-metal coatings shall be sealed and coated immediately after hot-metal spraying. The system shall consist of a low viscosity sealant, which is applied until absorption is complete, followed by a suitable coating system.

The sealant systems outlined below are acceptable (where appropriate for the particular application).

System 1 (for immersion applications)

Application of an epoxy zinc sealer to a dft of 60 µm (Sigmacover 522, or equivalent).

Application of two coats of epoxy pipe coating to a dft (per coat) of 125 µm; (Sigmaguard 720, or equivalent).

System 2 (for non-immersion applications)

Application of a two part epoxy primer to a dry film thickness of 40 µm; (Intergard 269, Carboline Rustbond Penetrating Sealer, or equivalent).

Application of one intermediate coat chemical resistant vinyl copolymer to a minimum dry film thickness of 70 µm (Carboline Polyclad 938 HB, or equivalent).

Application of one coat of vinyl copolymer chemical resistant enamel to a minimum dry film thickness of 40 µm (Carboline Polyclad 938-2, or equivalent).

System 3 (suitable for crane beams, gantries, etc.)

Application of one coat of a two-part epoxy primer to a dry film thickness of 40 µm; (Carboline Rustbond Penetrating Sealer, Intergard 269, or equivalent).

Application of two coats of a two-part polyurethane enamel (two part) to a minimum combined dry film thickness of 70 µm.

System 4

Application of micaceous oxide pigmented polyamide cured epoxy to achieve a dry film thickness of 60-80 µm; (Sigmacover 522, or equivalent).
One coat of solvent borne modified acrylic coating to achieve a dry film thickness of 70 µm; (Sigma Topacryl coating, or equivalent).

One coat of solvent borne modified acrylic finish to a dry film thickness of 30-45 µm; (Sigma Topacryl finish, or equivalent).

2.18.4 Paint

2.18.4.1 Paint Quality

Paint shall be of best quality, of approved manufacture and brand and comply with the requirements of the relevant SANS (South African National Standards) or BS specifications.

Compatibility

All materials in a paint system shall be purchased from one paint manufacturer.

Packaging

All coating materials shall be delivered in the manufacturer's original, sealed containers of maximum 25 litre capacity, clearly marked with the following:

i) Manufacturer's name.

ii) Product Brand and Reference Number.

iii) Batch Number, which may incorporate the date of manufacture.

iv) Date of manufacture, unless already incorporated in the batch number.

v) Abbreviated instructions for storage and use of the material, which shall include mixing ratios of components for multi-component materials, minimum temperature of application, method of application, and minimum and maximum overcoating times where applicable.

Confirmation of Suitability

Contractors shall obtain confirmation from their paint suppliers that, when using their paints, the systems specified are technically correct and suitable for the application and the material being coated.

2.18.4.2 Paint Application

Surface Preparation

All surfaces shall be properly prepared as specified in Clause "Corrosion Protection: Surface Preparation".

Coats shall be clean and free from dust, oil and moisture before overcoating. The primary method for determination of oil and grease contamination of surfaces shall be visual inspection. Any surface that exhibits obvious signs of oil and grease, as well as variations in surface rusting and flash rusting, shall be regarded as having oil or grease contamination. All surfaces which have been machined or have had holes drilled shall be regarded as having oil and grease contamination.

Environmental Conditions

Paint shall not be applied if:

i) the conditions are windy or dusty.

ii) the surface temperature is less than 10 ºC.

iii) the surface temperature is less than 3 ºC above dewpoint.

iv) the surface temperature is above 35 ºC.

v) the conditions are contrary to the manufacturer's recommendations.

vi) the relative humidity is 85% or above (the determination of humidity may be made using moisture sensitive hair-type gauges, electronic gauges or sling psychrometers (whirling hygrometers) having a resolution of at least 1% humidity. Electronic gauges shall have calibration certification not more than 6 months old. Moisture sensitive hair-type and analogue gauges shall have a calibration certificate not more than 1 month old. The accuracy of thermometer used in sling psychrometers shall be tested by placing at least 4 thermometers displaying temperatures within half a degree Centigrade of a mean shall be used).

Mixing

Coating materials shall be mixed thoroughly by a power stirrer.

In the case of two-pack materials, each component shall be thoroughly stirred separately. The two components shall then be mixed together in the proportions supplied by the manufacturer until the mixture is completely homogeneous. The use of part of the contents is not acceptable. In the case of solvent based epoxy materials, the mixed material shall be allowed to stand for the induction period recommended by the material manufacturer.

Painting

Paints shall be applied strictly in accordance with the manufacturer's instructions by tradesmen skilled in this class of work. Thinning of paint shall only be allowed for spray application and the manufacturer's recommended thinners shall be used.

Stripe Coats

All edges and welds shall be provided with at least one stripe coat. This coat shall, preferably, be the same as the primer but can be the same as the intermediate coat.

Coating of Hidden Areas

Areas which will be inaccessible after erection and surfaces resting on floors shall receive the full paint system prior to erection.

Surfaces in Contact

Mating or contact surfaces shall be treated with one of the following systems, the system being chosen to suit the application:

i) Surfaces shall be prepared and primed and brought together while the paint is still wet; or,

ii) Each surface shall be provided with one coat of inorganic zinc silicate; or,

iii) Surfaces shall be provided with a mastic or sealant; or,

iv) Surfaces shall be provided with insertion rubber or other gasket material.

Crevices

Crevices will not be permitted. Where unavoidable crevices are accepted by the Engineer, such crevices shall be sealed with either a coal tar product which can be applied at thicknesses of up to 1 000 µm such as Carboline Bitumastic 50 or equivalent; or a two part solvent free epoxy which can be applied at thicknesses of up to 600 µm such as Sigmaline 523 or equivalent.

Items encased in Concrete

Metal to be encased in concrete shall be painted externally up to 30 mm inside the concrete section, leaving the remainder bare so as to facilitate bonding with the concrete.

Protection of Machined Surfaces

Where painting of machined surfaces is not possible or advisable, these surfaces shall be coated with an approved proprietary anti-corrosion compound giving 12 months protection under operating conditions. Shaft ends and machined mating or mounting surfaces or pads shall be so coated and shall not be painted.

Coating Thickness

The dry film thickness shall be measured using a non-destructive thickness testing machine and shall comply with the Specification. 90 % of all thicknesses measured shall comply with the minimum requirements of the Specification. Up to 10 % of all readings may be below the specified minimum thickness, but may not be less than 80 % of the specified minimum thickness.

Repair

Painted areas damaged during transportation, erection or any means whatever shall be repaired as follows - Rusted spots shall be removed and cleaned by means of a wire brush or emery paper to a bright metal finish and the surrounding paint which is still intact shall be feathered for a distance of 50 mm beyond the damaged area. Spot priming and repair shall consist of all the coats previously applied and shall overlap the undamaged area.

Protection on Site

Proper and adequate use of cover sheets and other means shall be made to protect the existing paintwork from damage and from metal dust and sparks when welding, grinding, and wire brushing on site. Similarly, effective steps shall be taken to prevent spillage or splashing or other damage to floors, walls and equipment when painting on site and any damage or mess caused shall be corrected at the Contractor's cost.

Final Coat

A continuous, smooth finish with a uniform colour is required. The final external coat/s shall, where applicable, be applied on Site after installation.

2.18.5 Final Colour

Colours shall comply with the National Colour Standard, SANS 1091.

The final colour marking shall be in accordance with SANS 10140.

Where SANS 10140 does not specify a requirement, the colour marking shall comply with the following:

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Air				
Compressed, Power	Arctic Blue (F28)			
Aeration	Arctic Blue (F28)	Canary Yellow (C61)		
Instrument	Arctic Blue (F28)	Salmon Pink (A40)		
Vacuum	Arctic Blue (F28)	Primrose (C67)		
Lime Transfer	Arctic Blue (F28)	Crimson (A03)		
Backwash	Arctic Blue (F28)	Verdigris Green (E22)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Chemicals				
Aluminium Sulphate	Jacaranda (F18)	Verdigris Green (E22)		
Sodium Aluminate	Jacaranda (F18)	Crimson (A03)		
Ferric Sulphate	Jacaranda (F18)	Canary Yellow (C61)		
Lime (dry powder)	Jacaranda (F18)	Salmon Pink (A40)		
Activated Carbon	Jacaranda (F18)	Light Stone (C37)		
Polyelectrolyte	Jacaranda (F18)	Cloud White (G80)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
GASSES (other than air); liquefied or gaseous				
Butane, Propane	Light Stone (C37)			
Ammonia Light	Stone (C37)	Ultramarine (F09)		
Blast furnace	Light Stone (C37)	Crimson (A03)		
Carbon Dioxide	Light Stone (C37)	Light Brunswick Green (H07)		
Coke Oven	Light Stone (C37)	Light Grey (G29)		
Polyelectrolyte	Light Stone (C37)	Cloud White (G80)		
Producer	Light Stone (C37)	Verdigris Green (E22)		
Chlorine, Hypochlorite	Light Stone (C37)	Canary Yellow (C61)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Water				
Cold Drinkable	Brilliant Green (H10)	Cornflower (F29)		
Hot Drinkable	Brilliant Green (H10)	Crimson (A03)	Cornflower (F29)	
Boiler Feed (Distilled)	Brilliant Green (H10)	Crimson (A03)	Cloud White (G80)	Crimson (A03)
Boiler Feed (De-mineralised)	Brilliant Green (H10)	Cloud White (G80)		
Industrial, Raw	Brilliant Green (H10)	Golden Yellow (B49)		
Reclaimed	Brilliant Green (H10)	Jacaranda (F18)		
Backwash	Brilliant Green (H10)	Light Stone (C37)		
De-sludge	Brilliant Green (H10)	Canary Yellow (C61)		
Stove Circulating	Brilliant Green (H10)	Salmon Pink (A40)		
Hydraulic Power	Brilliant Green (H10)	Terra Cotta (A10)		
Final Treated Effluent	Aquamarine (E67)			
Interchange, Stage	Drakensberg Green (H36)			
Raw Sewage	Olive Green (H05)			
Sea Water	Light Brunswick Green (H07)			
Primary Sludge	Dark Brown (B03)			
Waste Activated Sludge	Light Brown (B15)			
Digested Sludge	Light Brown (B15)	Light Olive Green (H21)		
Pasteurised Sludge	Light Brown (B15)	Cloud White (G80)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Oil				
Diesel Fuel	Golden Brown (B13)	Cloud White (G80)		
Hydraulic Power	Golden Brown (B13)	Salmon Pink (A40)		
Lubricating	Golden Brown	Verdigris Green		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Oil				
	(B13)	(E22)		
Transformer	Golden Brown (B13)	Crimson (A03)		
Paraffin	Golden Brown (B13)	Arctic Blue (F28)		

Plant and Equipment	
Equipment	Colour Code
Fire Fighting	
Equipment and Pipework	Signal Red (A11)
Electrical	
Distribution Boards, Switch-Gear, Terminal Boxes and Conduits	Light Orange (B26)
Emergency Stop	Signal Red (A11)
Machine Guards	
Inside	Light Orange (B26)
Outside	Colour of Machine
Protruding Shafts, Exposed Gear Wheels and Rotating Parts	Light Orange (B26)
Handrails	
Horizontal Rails and Chains	Golden Yellow (B49)
Stanchions	Black
Protrusion, Sides of Ramps	Black and Yellow Diagonal Stripes
General	
Scour Pipes	Deep Buff (B24)
Valves	Basic colour of pipeline
Workshop Floor Demarcation	
Demarcation Lines	Golden Yellow (B49)
Working Areas	Pastel Grey (G54)
No Parking, No Storage	Golden Yellow (B49)
Aisles and Walkways	Brilliant Green (H10)
Storage Area Terracotta (A10)	Terracotta (A10)
Urethane based paint is to be used for concrete surfaces *Traffic paint is to be used for tarred surfaces*	

2.18.6 Acceptable Materials and Suppliers

The table below lists acceptable materials and suppliers. In all cases, other equivalent materials and suppliers are acceptable.

GENERIC	MATERIAL/SUPPLIER
Hot-Dip Galvanizing	Hot-dip galvanisers shall hold the certification mark for SANS 121.
Powder Coating	Plascon epoxy/polyester powder : CEP series, Sigmalining FBE 27.
Universal Undercoat	Sigmarine 40, Carboline GP-64 Undercoat, Plascon Plasconamel 189 Undercoat.
High-Gloss Alkyd Enamel	Carboline AD-51 Finish, Plasconamel 1000 Finish, Sigmarine 49.
HB Epoxy Primer : Two Part	Plascon Plascotuff HB Epoxy MLE series, Sigmazinc 109HS, Carboline 193 Primer.
Epoxy Primer : Two Part (for hot-dip galvanized surfaces)	International Interguard 269, Sigmacover 280.
Polyamine/Amide Cured Epoxy Sealer/Coating: Two Part	Carboline Rustbond Penetrating Sealer, Plascon Plascoguard Copon EA3 Primer, Sigmacover 522.
Epoxy Intermediate Coat	Sigmacover 456, Carboline 190 HB, Plascon Plascosafe 18 Primer, Sigmacover 435.
Low Solvent, High Solids, Polyamine/Amide Cured Epoxy: Two Part	Plascon Plascoguard Copon KSIR88, Sigmaguard 720 Ameron Amercoat 385, Carboline 891.
Polyamine/amide Cured Coal Tar Epoxy : Two Part	Sigmacover 300, Carbomastic 200, Ameron Amercoat 78HBB.
Solvent Free Epoxy repair coating	Plascon Plascoguard Copon Hycote 151, Sigmaguard 575.
Aluminium Filled Epoxy: Two Part	Ameron Amerlock 400 AL, Carbomastic 15, Sigmacover 630.
Two Part Solvent Free Epoxy For Submerged Applications	Sigmarite Submarine Coating, Carboline 1208, InterZone 954, Jotamastic 87.
Zinc Phosphate Primer	Carboline GP-18 Primer, Plascon Plascoprime 183 HB, Bildphos M10 Primer.
Inorganic Zinc Silicate	Plascon Plascozinc 233, Sigmazinc 160, Carboline Carbozinc 11, Ameron Dimetcote 11.
Modified Silicon	Carboline 4631, Plascon Plascotherm Silicone 540 – Aluminium, Sigmatherm 520.
Silicone Acrylic	Plascon Plascotherm Silicon – Acrylic 200 T, Carboline 1248.
Polyurethane Enamel: Two Part	Sigmadur 550, Carboline 134 over polyamine/mide coatings, Carboline 133 HB over zinc coatings, International Interthane 990, Plascon Plascothane Recoatable Enamel CPC Series, for two-coat systems, Plascon Plascothane Recoatable Enamel CPQ Series, for single coat systems.

Glass Flake Resin	Power Blast Vitaglass or equivalent.
Hot-applied Thermoplastic Thick Coating for Complex Surfaces	Rilsan or equivalent. Sigmaline 523 or Carboline Bitumastic 50.

2.18.7 Painting Systems

The abbreviation "dft." used in this Specification shall mean dry film thickness given in microns and, except where otherwise specified, is the minimum (not average) thickness permissible.

2.18.7.1 System for Steel in Dry Applications up to 200 ºC

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501.	
2.	Coat of inorganic zinc silicate.	75
3.	Coat of modified silicon heat resisting coating for 200ºC.	75
		Total = 150µm
Particular care shall be taken to obtain the recommended anchor pattern during abrasive blasting and to achieve the required primer thickness on all surfaces in one coat. The primer must be factory applied. The primer shall be tested for full cure before applying the subsequent coat. An intermediate coat suitable for 200 ºC shall be included between the primer and topcoat if so recommended by the paint manufacturer. The top coat must cure at ambient temperatures.		

2.18.7.2 System for non-immersed Steel in Coastal Atmosphere

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501.	
2.	Coat of two component zinc epoxy primer.	100
3.	Coat of two component epoxy intermediate.	150
4.	Coat of polyurethane enamel (two part).	50
		Total = 300µm

2.18.7.3 System for Cast Iron Components

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa2$_{1/2}$ in accordance with ISO 8501	
2.	Coat high build epoxy primer	100
3.	Coat polyurethane enamel (two part)	60
		Total = 160µm

2.18.7.4 System for Large Immersed Steel Fabrications

This system is suitable for steel items subject to immersion, semi-immersion and non-immersion such as tanks, pipes, etc.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501	
2.	Apply three coats of a low solvent, high solids, polyamine/amide cured, epoxy (two part).	350
		Total = 350µm

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
The coating shall undergo EID detection over the full surface in accordance with SANS 1217. This test shall be done by an inspector holding an appropriate qualification from either the CISA, the SAIW or the SAQCC. When applied to hot-dip galvanized surfaces, a suitable epoxy primer shall be used after careful surface preparation before applying this system. This system shall be applied by a specialist applicator prior to delivery to site with particular attention to the required interval between coats. The first and third coats shall be a different colour to the second coat.		

2.18.7.5 System for Large Immersed Steel Fabrications (non-chalking surface)

This system has similar applications to the system above, but which also require a non-chalking
surface.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	System for Large Immersed Steel Fabrications	350
2.	One coat of polyurethane enamel (two part)	40
		Total = 390µm

2.18.7.6 System for Large Immersed Steel Fabrications (not requiring decorative finish)

This system is suitable for steel items subject to immersion, semi-immersion and non-immersion such as archimedes screw pumps, large tanks, etc.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501	
2.	Coat of polyamine/amide cured coal tar epoxy.	140
3.	Coat of polyamine/amide cured coal tar epoxy.	140
4.	Coat of polyamine/amide cured coal tar epoxy.	140
		Total = 420µm
Each coat shall preferably be of a different colour. Two coats will be acceptable if recommended by the paint manufacturer.		

2.18.7.7 System for Hot-Dip Galvanized Steel (Duplex)

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	After hot-dip galvanizing, do not passivate.	
2.	Coat epoxy primer (two part for HDG surfaces)	75
3.	Coat polyurethane enamel (two part)	50
		Total = 125µm

3.4.5. ELECTRICAL SPECIFICATIONS

PSE – Electrical Specifications

INTRODUCTION

1. SCOPE SUMMARY

This section of the project relates to the medium and low voltage electrical, control, network, telemetry, SCADA and generator components for the new section of plant at the existing McGregor WTW.

The project offer pertains to the design, manufacturing and procurement, quality control, transport and rigging, installation, testing, commissioning, system optimisation, trial-period, taking-over and closing-out of a holistic, complete and compliant project of works by the Contractor and associated Sub-Contractors.

This contract will be executed as a Main Contract, with Sub-Contractors where required. The Contractor must liaise closely with their respective work forces/teams associated to the project, for example civil construction and mechanical installation to ensure smooth parallel running and or/interlinking coordination between structural, casting tasks as well as layout requirements and programming of integrations and installations. The Contractor must allow for all costs involved in liaising with the related or Sub-Contracting parties, to convey the requirements or coordination and attend meetings as required during the project, as no additional costs will be allowed for during the contract for such work.

The Electrical components are broken down into the following relevant project specification categories:

- PART 1 : MEDIUM VOLTAGE ELECTRICAL
- PART 2 : LOW VOLTAGE ELECTRICAL
- PART 3 :CONTROL SYSTEM INTEGRATION
- PART 4 : SCADA AND TELEMETRY
- PART 5 : BACKUP GENERATOR

Each project specification part must be read in conjunction with the others, as the electrical components must function as a whole and fully functional system.

2. REFERENCED STANDARD SPECIFICATIONS

The Electrical, Control and Instrumentation (E,C&I) Project Specifications must be read in conjunction with the following Electrical Standard Specifications:

SSE01	Medium Voltage	Rev 1
SSE02	LV and Control	Rev 1
SSE03	Instrumentation and Control Devices	Rev 1
SSE04	Telemetry and SCADA	Rev 2
SSE04	Generators	Rev 1

The Electrical, Control and Instrumentation (EC&I) Project Specifications take precedence over the Electrical Standard Specifications, should there be contradictions. The E,C&I Specifications must also be read in conjunction with the Mechanical Project Specification and Mechanical Standard Specification(s), including all issued drawings, to ensure integration and allowance made for interfaces that may be required for pump, motors and other mechanical equipment.

3. APPLICABLE STANDARDS

All work carried out, including design of plants and equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

In addition, the latest revisions of the following statutory regulations, laws and obligations as pertaining specifically to any and all electrical work applicable to this specific project are applicable:

- The regulations of the local Supply Authority
- The regulations of the Client, being either Governmental, Municipal, Parastatal or Private
- Local fire regulations
- SANS 10400-A: 2010 – The application of the national building regulations, Part A: General principles and requirements

All references to “SABS” specifications shall be read as “SANS” in light of the recent changes by the South African Bureau of Standards. Any reference made to a standards, shall refer to the latest available revision, or sub sequent standard that replaces the referred standard. Where a SANS Standard does not exist or if not applicable, the relevant IEC or BS Standard shall be applicable.

In the event of discrepancy between any of the specifications, regulations and codes of practice, the SANS 10142-1 Code of Practice for Wiring of Premises shall take precedence.

Additionally, the following specifications, whether specifically mentioned, or not, within this document, shall also apply:

SANS 1091	National colour standards
SANS 10140	Identification colour marking
SANS 156	Moulded case circuit breakers
SANS 60269-1	Low-voltage fuses, Part 1: General
SANS 60269-4	Low-voltage fuses, Part 4: Supplementary requirements for fuse-link for the protection of semiconductor devices
SANS 1507-1	Electrical cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V), Part 1: General
SANS 1973-1	Low voltage switchgear and controlgear assemblies, Part 1: Type-tested assemblies with stated deviation and a short-circuit withstand strength above 10kA
SANS 1973-3	Low voltage switchgear and controlgear assemblies, Part 1: Safety of assemblies with a rated protective short-circuits up to and including 10kA
SANS 475	Luminaires for interior lighting, streetlighting and floodlighting – Performance requirements
SANS 10114-1	Interior lighting, Part 1: Artificial lighting of interiors

SANS 10222-5-1-3	Electrical security installations, Part 5-1-3: CCTV installations - CCTV surveillance systems for use in security applications - Installation, planning and implementation requirements
SANS 60793-1-1	Optical fibres, Part 1-1: Measurement methods and test procedures - General and guidance
SANS 10131	Above-ground storage tanks for petroleum products
SANS 780	Transformer Testing
SANS 1084-1/2	Electric Motor Standards
SANS 10131	Fuel Tank Design and Construction
SANS 10198	Cable Trenching
SANS 1804	Induction Motors
SANS 2001 (collection)	Construction works

4. DESIGN DOCUMENTATION AND DRAWINGS

Within the period as stipulated per the contract conditions, after the commencement date, the Contractor must supply the following minimum information for approval before commencing manufacturing:

a) Working or “Shop” drawings of the proposed plant, including all main items of equipment to be installed, as well as all cable and wiring diagrams.

b) MV line survey and proposed adjustments

c) MCC layouts and single line diagrams detailing all control metering and indication circuits inclusive of a description of circuit operation

d) Functional Design Specification (FDS) and system specific control philosophy

e) Network design and equipment drawings/layouts

f) Selected instrumentation and incorporation into network, MCCs and control philosophy

g) First round HMI/IPC/SCADA screenshots

h) Generator design, including sound levels, footprint drawings and components

NOTE:

Drawings and documentation must be neat and clearly legible. Circuit diagrams must be done on a grid system with elements of control equipment referred to applicable (grid) line numbers in a schedule directly below the relevant control device.

5. CONTRACT IMPLEMENTATION

All contract and construction implementation requirements are set out in the general section of this document. This would relate to items such as factory and witness testing, site commissioning, trial and operational period, As-Built documentation and training.

All electrical components must comply in full to these specifications and priced accordingly in the allocated BOQs.

SECTION 3: ELECTRICAL

PART 1 : MEDIUM VOLTAGE ELECTRICAL

1. GENERAL SCOPE

This part of the electrical works must be read in conjunction with all other electrical parts, including standard specifications and applicable drawings.

The Supply Authority in the town of McGregor is the Langeberg Municipality, with 50Hz 400/230V supply to site. A new MV supply line will have to be built to the WTW, which will act as the main point of supply.

All Supply Authority coordination must be allowed for under the tender.

The following work is required under this section of the project:

- Construction of a new overhead MV-line network from the existing line to the new WTW building, whilst keeping existing LV overhead line live
- New 11kV/420V pole-mounted transformer, complete with H-Pole configuration
- Removal of old and obsolete 400V overhead line and pole sections, as well as existing transformer and metering kiosk, including transport to Municipal stores in Robertson
- All required line and cable connections, excavations, earthing, plinth and ancillaries for a fully compliant installation
- SANS 10142-2 regulatory compliance, including all compliance tests and reporting.

2. STANDARDS

The installation must comply with all respective Standards as set out in Section 1 above (latest versions applicable), including but not limited to:

- SANS 10142-2: Wiring of Premises Medium Voltage (≤22kV and 3MVA)
- SANS 780: Transformer
- SABS 555: Mineral oil for transformers and switchgear
- SANS 137: Bushings
- NRS 003&006/SANS 1885&1874 and SANS 62271-100/200 – MV Switchgear standards
- SANS 0280: Overhead power lines for conditions prevailing in South Africa
- NRS 022: Electricity distribution – stays and associated components
- NRS 033: Electricity distribution - guidelines for the application, design, planning and construction of medium voltage overhead power lines up to and including 22kV using wooden pole structures and bare conductors
- NRS 039: Surge arrestors for use in distribution systems

3. NEW OVERHEAD MV AND LV-LINES

This section of the scope comprises the construction of the new 11kV wooden-pole overhead-line, from the existing line to the new location inside the WTW boundary, at the new WTW building.

Refer MV site layout drawing for recommended route and general configuration.

A short section of overhead LV line must be built, with the existing line utilised up to the WTW Feed PS. Most of the existing poles can be re-used, with a new end-pole and stay provided at the line end at the WTW. A new section of 35mm^2 ABC must be installed from the WTW to WTW Feed PS, with the tender offer to include all pole and cable transition clamps and ancillaries.

3.1 Material

3.1.1 Poles

Poles must be of the wooden, Creosoted Eucalyptus type, with a total length of 11m and a planting depth of 1.8m - 2m. Pole top diameters may not be less than 160mm for intermediate poles and 185mm for termination and strain poles. Poles must be of the group strength 'A', comply with SABS 753 and must bear the SABS mark of quality.

The LV pole must be a 9m unit.

3.1.2 Anchors and Stays

Stays must be used to anchor and support the overhead assembly and installation. Stay rods must supplied complete with all equipment required for a fully functional installation. This must include, but not limited to, rods, thimbles, washers and guy grip bow heads. All required anchors, baseplates, tensioning and excavations must be provided as part of the tender offer.

Stays rods must be made from mild steel and malleable cast iron, and galvanised to SANS 763. Stay wires to be galvanised and of the stranded conductor type, with minimum conductor size of 22m for maximum breaking load.

3.1.3 Overhead Conductor

Conductors must be ACSR Fox type, with rates given for Weasel and Ferret. Conductors must comply with SABS 182 Part 2.

Note that for sake of pricing, conductor linear length will be measured and paid for. All sagging, off-cuts and terminations must be provided for in the final item rate. The BOQ length is provisional for tender only and final lengths must be confirmed on-site.

3.1.4 Support Structure

3.1.4.1 Frame Configuration

A-frame configuration must be used for this installation, conforming to Eskom's standards. All frames, nuts, bolts and cross-arms must be hot dipped galvanized.

Insulators must be rated for 12kV, compliant with SABS 177. Intermediate support insulators must be of the Cullinan Class A, 4kN porcelain or silicon line-post type. Strain insulators must be of the silicon (Elbroc) type.

Depending on the application, various configurations of frame and cross-arm assemblies are required for this installation, as per the attached layout drawing. The frame type is depicted by a letter, as set-out below:

- Type B: For an intermediate strain assembly, comprising A-Frame and six strain insulators, one support insulator, conductors terminated (and tied-in) with through links.

- Type C: For a horizontal assembly, comprising steel cross-arm with three strain insulators and three support insulators, conductors terminated (and tied-in) with through links.

- Type D: For a line-end strain termination, comprising A-Frame and three strain insulators with conductors terminated.

- Type T: For an intermediate assembly, comprising A-Frame and three support insulators, complete with conductors tied in.

3.1.4.2 Drop-out Fuses

The fuse links, for the main line, must be rated for the total load of equipment supplied from the new overhead line.

The sets must be mounted on a hot-dipped galvanized steel cross-arm, of estimated dimensions 1000mm x 160mm x 65mm, to be confirmed with the Engineer before ordering.

The price for the fuse link sets must include fuse carrier and fuse, cross-arm fixed to the pole, all ancillary hardware and conductors links connected through.

3.1.4.3 Surge Arrestors

Surge arresters must be of the silicon-housed type, rated for distribution class at 24kV. The sets must be mounted on a hot-dipped galvanized steel cross-arm, of estimated dimensions 1000mm x 160mm x 65mm, to be confirmed with the Engineer before ordering.

The surge arrester sets must be suitably earthed to the ground at each point to create a low resistance in order to protect both the overhead line and the underground cable installation. Note the earthing cable must be protected against the pole in the same way as the MV cable.

3.2 Surveyor

As the MV and LV overhead line route is provisional, it is imperative that a Local Surveyor be included with this project, before any construction work on site is started. The surveyor must will be responsible for surveying the complete new overhead line route, with the following main components required:

- Route selection and fixing

- Profiling

- Pole pegging

- Optimization of design

- Providing the Engineer with final route drawings (DWG and PDF), including geo-referencing and spanning-sheets

- Pricing to include all travel, material, labour and accommodation

Note that the responsibility remains with the Contractor to coordinate with the Engineer and Client regarding when going to site and determining the final route for surveying. No claims in this regard will be entertained due to a lack of coordination.

3.3 Construction

3.3.1 Conductor Work

3.3.1.1 Installation

Conductors must be run out using freely rotating drums on jacks and axles, but care must be taken to provide braking so as to not put unnecessary tension on the conductor. At no point may the conductor run on the ground.

Note that the manufacturer's installation requirements must be met at all times.

Tensioning and regulation of the conductors must be by means of suitably sized and rated line grips, with all lines tensioned simultaneously.

Note that the conductors may not be tensioned at more than 25% of their breaking strength.

3.3.1.2 Connection

Pistol-grips are the only means allowed for overhead conductor connections and terminations. Tying-in of conductors must be by means of a pre-made suited type binding for the conductor and insulator used.

No slipping or damage to the conductor is permitted in using tension clamps. The clamps must be suited for the thimble clevises to be utilised and no adaptors are permitted.

3.3.2 Structure Earthing

Only structures containing cable connections, fuses, surge arrestors and transformers must be suitably earthed. All metalwork on these structures must be bonded by 10mm^2 bare stranded copper. One 35mm^2 common bare stranded copper must run down the applicable pole, stapled every 500mm.

Two trenches of 10m in opposite directions must dug, with a 1.8m earth spike provided at each end. These spikes must be connected to the earth cable running down the pole, with all bonding to be provided to ensure a suitable earth (less than 1ohm).

3.3.3 Excavations

Excavation openings for all poles and stays must be open for as short a period as possible. Due to the depths of these excavations, H&S concerns are very real and must be treated with critical importance. All required signs, demarcation tape and lights at holes and spill piles must be provided. Any confined space requirements must be adhered to.

Backfilling of the holes must be done at no more than 200mm at a time and each layer must be rammed as solidly as possible. In the instance where the backfill material does not properly consolidate, then a 1:8 ration of cement may be used, at the Engineer's approval.

Holes will be paid per unit, regardless of the soil type (it must be noted though that soil conditions in the area are very hard and at a minimum, the use of compressors must be utilised and offered in the drilling of the holes). Only in the instance where hard rock is encountered, will a pro-rate amount be paid, based upon the rate as included in the document. Note that suitable proof must be recorded and provided to the Engineer regarding this hard rock claim (and applicable hole) and no work may commence if not approved. Failure to comply in this regard will result in no additional payment.

4. TRANSFORMER

4.1 New Step-Down Transformer

The outdoor oil-filled, low-loss, pole-mounted transformer offered must bear the SANS mark, in compliance with SANS 780 (latest revision) and nominally comply with the following requirements:

- Rating : 200kVA
- Rated (nominal) voltage ratio : 11 000V / 420V
- Vector Group : DyN11
- Cooling : ONAN
- Type : Hermetically sealed
- Neutral earthing : Solid
- Tap-changer (voltage control) : Manual off-load
- Cable Terminations : Suited for pole-mounting connections
- Mounting : H-Pole Configuration

4.2 Material

The transformer must have copper windings and the tank made of sheet metal.

All surfaces (internal and external) must be properly treated to prevent corrosion, including approved paint or varnish for the internal tank against transformer oil corrosion. Zinc spray must also be applied before the final paint finish.

Any welding in the manufacturing process must be of the same or better quality than the base metal.

The final transformer finish must be achieved by means of using an electrostatic epoxy powder process, with the colour as mentioned above. All oil and air heat exchangers must be galvanized to SANS 763, with the paint finish as per above.

Provision must be made on all sides of the transformer, at a height of 500mm above the base of the tank, for earthing positions.

4.3 Core

The electrical continuity of the core laminations shall not be interrupted. Adequate mechanical strength must be provided in its design to withstand all potential mechanical forces acting on it during transport and the occurrence of electrical faults.

The noise and vibration levels may also not exceed the local authority's requirements, in conjunction with NEMA.

4.4 Oil

The transformer must be filled with oil in compliance with SANS 555.

4.5 Terminations

MV bushings must be suited to an outdoor, pole-mounted configuration.

4.6 Ancillaries

4.6.1 Signage

All signage as required by the OHS Act must be provided as part of the offer. The unit must further clearly be marked by its designated name, weight, size (kVA) and voltage (V).

4.6.2 Name Plate

The transformer and tap changer must both be provided with clearly visible name plates, bearing the SANS 780 logo (latest standards, low-loss unit).

5. EXISTING OVERHEAD LV-LINE REMOVAL

There is another on-site, obsolete 400V line that must be removed. This can however only be done after the new MV line has been constructed and made live, as a section of the existing line will be re-used, for supplying LV power back from the WTW, to the WTW Feed PS.

All components must be safely secured and delivered to the Municipal stores in Robertson. A detailed inventory of all equipment must be made, photos taken and all must be signed off by a Municipal Electrical Representative at the stores. No payment will be made without the necessary documentation in place.

The line comprises of wooden poles, frames and associated conductor spans. The poles must be pulled by crane and all conductors and frames rolled and secured, before delivery. The on-site holes must be closed and secured. The existing transformer and metering kiosk, currently supplying the plant, must also be removed and delivered to the Client's stores.

6. DRAWINGS AND INSTALLATION

The following detailed drawings must be submitted as set out in Section 1 of this document:

- Dimensions of the transformer, all associated equipment and final civil requirements
- Single line diagrams
- Transformer name plate details, including protections offered

7. COORDINATION AND SHUT-DOWNS

7.1 Specialist Contractor Scope

The on-site medium voltage work must be performed by a specialist contractor. The overall compliance responsibility remains that of the main Contractor, but all on-site work must be performed by the specialist entity, with the tender pricing making adequate provision.

7.2 Project Coordination

This section of work will require several stages and trips to site. All associated work and coordination, including travels and P&G items, must be allowed for in the tender offer, and programmed with the Main Contractor's overall program.

It remains the Contractor's responsibility to allow for all required temporary works, coordination, change-over and associated costs, and no additional claims in this regard will be entertained.

7.3 Supply Authority

It is the responsibility of the Contractor to make all necessary connection, switching, installation and approval arrangements timeously with the Supply Authority. No switching may be done by the Contractor and all MV connections must be done in the presence of a Municipal representative.

Once connected, the Contractor must ensure that the supply and connections in terms of earthing, voltage and conductivity are in order before requesting Municipality to switch power onto the system. Damage claims as a result of non-compliance in this regard will not be entertained.

The Municipality requires a minimum of one week notice, to organise shut-downs on the existing lines/network. This must be communicated timely and no additional claims will be entertained due to a lack of coordination.

8. EARTHING

All earthing must be done in-line with the applicable SANS standards.

The transformers must be properly earthed at both its MV and LV points, to provide an earth resistance of not more than 1 ohm. The transformer neutral and cable armouring must also be connected to the respective transformer earthing points.

The transformer earthing must be done by means of a copper earth mat, with all joints Cadwelded. The mat must be a minimum of 1m x 1m in dimensions, comprising an internal grid of no more than 100mm x 100mm. All conductors must be 70mm2 bare copper, including the cable between the transformer earthing point and the earth mat.

Should the required earthing resistance be more than accepted, then additional 1.2m copper earth spikes (rods) must be installed, complete with cables and connections to the earth mat.

All required excavations, earth resistivity testing, compaction and final earth readings and certification proof must be provided as part of the Contractor's offer.

9. TESTING AND COMMISSIONING

The Contractor, by means of the manufacturer, must be provided all required type tests certificates, in line with the applicable SANS standards. These must be verified and tested, before confirm in writing to the Engineer that all documentation is in place and the testing can take place.

9.1 Transformers

The following tests must be conducted:

- Winding ratio
- Megger
- Tap changer mechanical operation
- Leakage current
- Vector group
- Oil and winding temperature indication and functional tests

SECTION 3: ELECTRICAL

PART 2 : LOW VOLTAGE ELECTRICAL

1. GENERAL SCOPE

This part of the electrical works must be read in conjunction with all other electrical parts, including standard specifications and applicable drawings.

The low voltage electrical scope of works consists of the following main components:

- New Metering and Changeover DB for:
    - Mains incoming CB
    - Municipal billing class meter
    - Generator incoming CB
    - Distribution feeds to MCC and associated pump stations
- New Motor Control Centres (MCCs) for:
    - Main Process Control Building with:
        - Various starters and protections for feed, backwash plant, mixers, service water and final reservoir feed pumps
        - Feeders for chemical dosing pumps
        - PLC controlled system with local HMI display
        - Uninterruptible power supply (UPS)
        - Remote telemetry system
        - Small power and lighting for buildings
        - General site power and lighting distribution
    - WTW Feed PS with:
        - VFC starters for WTW feed pumps
        - Remote telemetry system
        - Small power and lighting for building
    - Transfer PS with:
        - VFC starter for manual transfer pump
- Power, control, instrumentation and network cable installation to all required points of supply and equipment
- Plant instrumentation for monitoring, control and general system feedback (detailed in Part 3)

- Field-mounted local control stations for local equipment control
- Instrumentation field-mounted enclosures, complete with signal and power requirements
- Holistic plant, MCC and equipment earthing design and implementation
- Installation ancillaries such as cable tray, sleeving, isolation foam, junction boxes and all other items required for a complete and compliant installation
- Emergency outdoor generator.

2. BULK ELECTRICAL SUPPLY TO SITE

As per Part 1 above, Medium Voltage scope.

2.1 Main Metering and Changeover DB

A new site metering and changeover DB must be supplied and installed, in line with the requirements below, in compliance to the standard specifications.

The DB must be floor-standing, installed within the MCC room. It must be rated 10kA, with the following configuration (standard MCC specifications apply):

- Main CB, rated for full transformer load 350A
- Generator CB, rated for full generator capacity (provisionally 200A)
- Metering compartment, with Landis & Gyr ZMD meter
- Load CBs:
    - 160A for Main MCC
    - 40A for WTW Feed MCC
    - 25A for Transfer Pump MCC
    - 2 x 40A TP Spare CBs

The Mains and Generator CBs must be electrically and mechanically interlocked, to ensure only one source of supply at any one time.

It is envisaged that the unit consist of three tiers, but final configuration must be provided by the tenderer. Mains and metering to be combined in one tier, the generator CB in a tier (Red), with the Load CBs grouped into another.

3. MOTOR CONTROL CENTRES (MCCs)

MCCs must be provided in compliance to the standard specifications, including all associated costs for manufacturing, testing, transport, rigging, installation and final site commissioning. Note the requirements for items to be claimed.

All equipment and feeds noted below are provisional, subject to final Main Contractor design and detailed tender offer. It is the responsibility of the final Main Contractor to design and size the MCC and ensure that the MCC tier arrangement is aligned in such a way (e.g. if the MCC is required to be L- or U-shaped) that it fits the space and position allocation. The final MCC design, layouts, equipment sizes and number of feeds must be coordinated with final equipment offered, and no claims will be entertained for a lack of coordination between the Contractor parties during tender stage.

3.1 New Main Building MCC Construction

A new indoor MCC of the front and back access, bottom feed, floor-standing type must supplied and installed in the position as indicated on the drawings. The stand, support and all support pieces pricing must be included as part of the MCC's pricing.

The MCC design, steelwork and all required switchgear fault rating must be minimum 10kA, to be confirmed with the Engineer before construction.

The PLC, HMI, managed network switch(es) and associated equipment must be installed within a dedicated tier at the end of the MCC, with all connections and terminals mounted in the rear. Any heating and cooling requirements, specifically for the UPS, must be included as part of the MCC design and final tender offer. The HMI must be door-mounted.

Note all network and control equipment detailed in Part 2: Control System Integration.

Refer single line diagrams for detailed motor equipment sizing, subject to final Main Contractor equipment offering.

The MCC must consist of the following:

3.1.1 **Incoming Section**

a) Main incoming CB sized for full equipment load

b) Class 3 surge arrestors

c) Phase failure protection

d) E-Stop with indication light

e) Ethernet networked power meter

3.1.2 **Outgoing Section for Dosing Mixers (3 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Direct On Line (DOL) with specified protections.

3.1.3 **Outgoing Section for Flocculation Mixers (3 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.4 **Outgoing Section for Filter Feed Pumps (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.5 **Outgoing Section for Backwash Pumps (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.6 **Outgoing Section for Backwash Blowers (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.7 **Outgoing Section for Service Water Pumps (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.8 **Outgoing Section for Final Reservoir Lift Pumps (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.1.9 **Distribution Feeds to Chemical Dosing Pumps (3 off)**

3.1.10 **Outgoing Section for local fans, chlorination extraction fans, aircons and other ancillary equipment**

3.1.11 **Outgoing Section for filter actuated valves**

3.1.12 **Distribution Feed to MCC-mounted UPS, for PLC, HMI, network and instrumentation feeds – Essential Section**

3.1.13 **Outgoing Section for Local Lighting and Power – Non-Essential Section**

a) Local MCC-mounted socket outlet, with E/L

b) Local DB supply

c) Site lighting, with bypass and photocell circuits

3.1.14 **Networked remote monitoring and control signals for all required MCC status, instrumentation and process parameter signals for central plant monitoring and control.**

3.2 **New WTW Feed PS MCC Construction**

A new indoor MCC of the front access, bottom feed, floor-standing type must supplied and installed in the position as indicated on the drawings. The stand, support and all support pieces pricing must be included as part of the MCC's pricing.

The MCC design, steelwork and all required switchgear fault rating must be minimum 6kA, to be confirmed with the Engineer before construction.

The control must be relay-based only, with displays for level and pressure.

Note all network and control equipment detailed in Part 2: Control System Integration.

Refer single line diagrams for detailed motor equipment sizing, subject to final Main Contractor equipment offering.

The MCC must consist of the following:

3.2.1 **Incoming Section**

a) Main incoming CB sized for full equipment load

b) Class 3 surge arrestors

c) Phase failure protection

d) E-Stop with indication light

e) Ethernet networked power meter

3.2.2 **Outgoing Section for WTW Feed Pumps (2 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.2.3 **Outgoing Section for local fans and other ancillary equipment**

3.2.4 **Outgoing Section for Local Lighting and Power – Non-Essential Section**

a) Local MCC-mounted socket outlet, with E/L

b) Local DB supply

c) Site lighting, with bypass and photocell circuits

3.2.5 **Networked remote monitoring and control signals for all required MCC status, instrumentation and process parameter signals for central plant monitoring and control.**

3.3 **New Transfer PS MCC Construction**

A new outdoor MCC of the front access, bottom feed, floor-standing type must supplied and installed in the position as indicated on the drawings. The plinth, stand, support and all support pieces pricing must be included as part of the MCC's pricing.

The MCC design, steelwork and all required switchgear fault rating must be minimum 6kA, to be confirmed with the Engineer before construction.

The control must be relay-based only, with displays for level and pressure.

Note all network and control equipment detailed in Part 2: Control System Integration.

Refer single line diagrams for detailed motor equipment sizing, subject to final Main Contractor equipment offering.

The MCC must consist of the following:

3.3.1 **Incoming Section**

a) Main incoming CB sized for full equipment load

b) Class 3 surge arrestors

c) Phase failure protection

d) E-Stop with indication light

3.3.2 **Outgoing Section for Transfer Pump (1 Off), Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

3.3.3 **Outgoing Section for Local Lighting and Power – Non-Essential Section**

a) Local MCC-mounted socket outlet, with E/L

b) Site lighting, with bypass and photocell circuits

3.3.4 **Networked remote monitoring and control signals for all required MCC status, instrumentation and process parameter signals for future central plant monitoring and control.**

4. SYSTEM CONTROL

All plant and system control will be done by means of the PLC, with operational inputs and system adjustments to be made at local HMI. The individual control systems and overall network requirements are detailed in Part 2: Control System Integration.

Provision must however be made within the MCCs for local manual mode, with all associated protections. Should there be a communication failure, or faulty PLC, provision must be made to run the various individual components in manual mode. All available protections, whether it be field or electrically based, must continue to protect the equipment.

All required network communication, monitoring and control signals as well as protocols must be coordinated and provided between the MCC manufacturer, System Integrator and specialist instrumentation and OEM suppliers. No claims will be entertained for lack of coordination and signal/voltage disparities. This includes all inter-plant control and network cables, protocols and I/O allowances.

5. GENERAL ELECTRICAL WORK

The general electrical installation covers the supply, installation and connection of equipment provided under this contract, as well as the connection of other MCCs and control panels provided by others.

Refer standard specification SSE02 for further technical requirements.

5.1 CABLES, TRAY, EXCAVATIONS AND SUNDRIES

The Contractor must allow for the supply and installation of all required electrical, control and instrumentation cables, heavy duty cable ladder outside and within the plant as per the schedule in the Bill Of Quantities (BOQ).

Excavations on-site, including restoration and compaction of surfaces, must comply to the standard specifications.

5.2 INSTALLLATION SCHEDULE

A detailed cable, wiring and tray schedule must be compiled and maintained by the Contractor. The purpose of the schedule it to log and monitor all re-measurable items. The schedule must be complete with sections stating to and from feeds and broken down into the specific components, so as to be able to trace and audit all re-measurable components installed.

The schedule must remain live and up to date throughout the installation procedure. No payment will be made without evidence of an up to date schedule.

5.3 INSTRUMENTATION ENCLOSURES

Instrumentation housing enclosures must be manufactured from 3CR12, including all nuts, bolts, handles and hinges. The mounting configuration must be as detailed below per specific application. The equipment housing/junction box, including mounted devices, must be of the IP67 type. 50mm overhang hoods/covers must be provided for all outdoor applications in addition to the requirements above.

Internal space must be designed as such that all necessary field terminals, relays, power supplies, terminations as well as 20% spare capacity is provided for. Stations must be lockable, or only accessible by means of a tool.

These housing stations must be provided with a see-through window, to view instrumentation data. However in being mounted outdoors, sunlight degrades this window to such an extent that it becomes completely opaque. The design of this enclosure must therefore provide a window that will not degrade over time, or a latching cover must be provided that can be opened to then view through the window. An adequate solution must be presented to the Client, and approved, before any construction can commence.

Detailed labels must be provided throughout pertaining to station name, equipment designation as well as incoming and outgoing cable feeds.

5.4 LOCAL CONTROL STATIONS

Local control stations must be manufactured from Stainless Steel (SS) 304, including all nuts, bolts, handles and hinges. The mounting configuration must be as detailed below per specific application. The equipment housing/junction box, including mounted devices, must be of the IP67 type. 50mm overhang hoods/covers must be provided for all outdoor applications in addition to the requirements above.

Internal space must be designed as such that all necessary field terminals, relays, timers, terminations as well as 20% spare capacity is provided for. Stations must be lockable, or only accessible by means of a tool.

Detailed labels must be provided throughout pertaining to station name, equipment designation as well as incoming and outgoing cable feeds.

The control station must consist of:

- Green start push-button

- FWD/REV push-button (where required)
- Red Mushroom-type E-Stop with separate release mechanism

6. SYSTEM EARTHING

Where specified and indicated on the drawings and in the BOQ, dedicated Bare Copper Earth Conductors (BCEC) must be installed alongside and strapped to its associated electrical supply cable. The size of the BCEC is provisional along with the supply cable size. BCEC must be fitted crimped lugs and must be solidly bolted at both ends.

All required electrical points and paths along the installation must be solidly bonded, with the return path solidly connected to the MCC's main earth.

In addition, a dedicated earth mat must also be supplied and connected to the main MCC's earth bar. The mat must be a minimum 1m x 1m with 70mm^2 BCEC Cadwelded together, with internal grids of no more than 200mm x 200mm. The earth mat must be installed adjacent to the MCC and connected by means of a 70mm^2 BCEC to ensure an earth resistance of one ohm or less. All required excavations, connections and coordination must be included as part of the earth mat price.

Note that should the mat be installed without the initial supply cable earth wire readings provided to Engineer, then no compensation will be provided to the Contractor for the earth mat nor ancillaries.

Note that for mechanical strength reasons no BCEC may be smaller than 4mm^2.

All ancillary equipment such as nuts, bolts, hinges, etc. must be manufactured from stainless steel.

7. SMALL LIGHTING AND POWER

A Local DB must be provided, wall-mounted within the respective building, as indicated on the applicable drawings. All lighting and small power feeds must be taken from the relevant DB. The general installation must recess-mounted, including conduit and final fittings. All coordination and recessed installation requirements and coordination to be priced as part of the tender offer.

Socket outlets must be of the double type, provided with weatherproof cover, mounted at a minimum of 1200mm AFL.

Lights must be installed as detailed in the BOQ, per respective building. All indoor lights must be of the LED, IP65 type (with built-in surge protection and opaque diffuser), with all outdoor lights of the LED, IP66 type (with marine-grade body, built-in surge protection and indirect reflector). Wall-mounted fittings must generally be mounted at an accessible height of between 2.8-3.5m, measured from the applicable floor-level. Ceiling or roof-mounted fittings must be installed in such a position that they can again be accessed for maintenance purposes. Lights must be manufactured in RSA, bearing the SABS logo and be provided with a minimum 5-year warranty.

All internal lighting circuits to utilise a minimum of 1.5mm^2 wire, outdoor lighting circuits to utilise a minimum of 2.5mm^2 wire, with power circuits being a minimum of 2.5mm^2 wire.

Bosal must be used throughout the industrial areas, on suitable spacers, for lighting and power installation. In the areas where possible corrosion could occur (chlorination or potential water leakage areas), PVC conduit must rather be utilised.

A Certificate of Compliance (COC) must be provided for the plant as a whole.

8. SITE LIGHTING

The new site lighting poles must be stepped, galvanised steel and not fibreglass. Poles must be sized to provide at least a 7.5m mounting height of luminaires, with a minimum burying depth of 1.5m. The cost of the poles must included for all required excavations and compactions to supplier requirements.

Each of these poles must be provided with a double-mounted, outdoor floodlight, of the LED, IP66 type. The fittings must be a minimum 100W, marine-body, flood-light type, complete with suited mounting-brackets. Final angles of spread to be determined on-site with the Client and Engineer, before any equipment can be ordered.

SECTION 3: ELECTRICAL

PART 3 : CONTROL SYSTEM INTEGRATION

1. GENERAL SCOPE

The control system integration scope of works consists of the following main components:

- Utilisation of a specialist System Integrator (SI), as part of the tender offer, for holistic network and control design through overall plant integration:
- New network and control system hardware with:
    - Managed switches connecting Main Process Building MCC to telemetry, networked equipment and HMI
    - Control network cabling, complete with adequate protection
    - PLC for new MCC, with required network and I/O cards
    - MCC-mounted HMI for viewing and parameter inputs
    - Filter control panel, for remote backwash initiation
- New network and control system software and programming with:
    - PLC control programming
    - HMI programming
    - Holistic and complete network design, MCC as well as plant-network
    - All required software once-off license fees
- Compilation of detailed Functional Design Specification (FDS), in line with plant control and process requirements, as well as final Contractor design offer
- Implementation and optimisation of final plant control, liaising with and coordinating all sub-contracting role-players
- Assist with design and coordination on all other electrical components

2. PLANT CONTROL

The new portion of the WTW must be designed to operate on a continuous, automated basis, through the use and control of a PLC, allowing for system parameter changes by means of HMI. Note that the separate WTW Feed and Transfer pumps are only relay controlled from their respective MCCs.

Note that manual control and protection must remain in place should the PLC be faulty.

The control philosophies below are intended requirements complying to the plant's process demands. Any changes relating to final Contractor design must be allowed for as part of the tender offer. The structure below includes a common control requirement section, applicable to all, with specific plant sections thereafter.

The control narrative must be read in conjunction with the proposed Process Flow Diagram as well as all other issued specifications and drawings.

All required monitoring and control signals must be coordinated and provided between the MCC manufacturer, System Integrator and the specialist SCADA/telemetry supplier and no claims will be entertained for lack of coordination and signal/voltage disparities. This includes all inter-plant network, control and I/O allowances.

2.1 Functional Design Specification (FDS)

The Contractor and associated electrical sub-contractors will be responsible for compiling a plant FDS, in conjunction with the mechanical and main contractor respectively. The specification must be a combination and integration of all various electrical, control, instrumentation, network, telemetry and SCADA requirements, along with process and mechanical, as detailed in these project and standard specifications.

The FDS must detail the Contractor's final design offer, along with equipment list and sizing, OEM system incorporation and control and protection philosophies.

Provision must be made for an iterative approval process with the Engineers and Client.

2.2 Plant-Wide General Control

2.2.1 Control modes

The specific equipment can either be run in manual or automatic mode, with automatic mode via process specific instrumentation feedback, or via HMI specific operator intervention.

Each equipment motor panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running piece of equipment must stop when switched to off and no equipment can be initiated to run with the selector switch in the off position.

2.2.1.1 Manual Mode

Each piece of equipment must be started and stopped via a start and stop pushbutton on the MCC, as well as from the local control station in close proximity to the respective unit in the field.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.2.1.2 Automatic Mode

2.2.1.2.1 Primary Control

Each plant specific component must primarily be controlled by either a specific instrument function, or a combination thereof. An indication light must be provided on the common control panel, illuminating and indicating the process specific parameter controlling that equipment.

Setpoints must be adjustable and optimised as part of the Contractor's commissioning process, with adjustable timers provided for any transient conditions.

2.2.1.2.2 Secondary Control

Secondary control must be introduced where more than one parameter must be measured. All requirements as per primary control apply.

2.2.1.2.3 Duty Selection

Equipment must be provided with a common selector switch labelled Alt/P1/P2/P3 etc (depending on the amount of units per plant section), door-mounted in the common control section. With the switch in Alt mode, the equipment must alternate their duty cycle after every 24 hours.

Should a running unit trip, be switched off (CB and selector switch) or fail to start, then the standby unit must takeover and start immediately. Should the tripped unit be fixed/reset, then it must not start up again and act as the standby unit.

In P1, P2, P3 (etc.), that selected unit must start first. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.2.1.2.4 HMI Control

HMI control is applicable in auto mode only, provided the secondary control conditions are met.

Provision must be made for HMI manual input and control only.

2.2.1.3 Emergency Control

Emergency control must be provided for all applicable plant areas, to act as a backup in case of normal control failure, incorrect parameters or excessive plant deviation. Emergency control could include:

Delivery High Level

Float level switches in demand tanks / sumps to prevent overflows

Suction Low Level

Protection in suction tanks / sumps to prevent equipment running dry

Delivery High Pressure

To be provided per common pumping system, to protect line pressures from failure (coordinated with individual pump pressures to prevent system nuisance tripping)

2.2.2 **Protections**

All equipment must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC (or Aux Overload with DOL Starters)
- Pump no-flow protection by means of the common inline electromagnetic flow meter. Individual pump protection must be provided, with the standby control functionality remaining in effect, or
- No-flow protection by means of limit switch on non-return valve's counter-weight arm
- Pump high pressure protection by means of a pressure switch
- Over-torque protection
- Overheat in motor (refer mechanical specification for specifics)
- Seal-fail for submersible applications
- Earth leakage for submersible applications, or areas where possible flooding can occur

Should the equipment offered, for warranty or other purposes, require different or additional protection, then this protection, along with mechanism, indication lights, control cables and control functionality updates must be provided complete as part of the tender offer and no additional claims in this regard will be entertained.

2.2.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Equipment Panel

- RUN
- STARTER TRIP
- NO-FLOW
- HIGH PRESSURE
- LOW LEVEL
- E-STOP
- Etc, as per specific unit protection requirements

b) Common Control Panel (per system)

- START DEMAND
- SUCTION ENABLE
- START DUTY PUMP
- HIGH LEVEL
- SYSTEM DELIVERY HIGH PRESSURE
- Etc, as per common system protection requirements

c) Common Control HMIs

- ALL DISCRETE PUMP AND SYSTEM STATUS SIGNALS (AS ABOVE)
- LEVEL DISPLAYS
- PUMP/SYSTEM PRESSURE
- PUMP FLOW
- INDIVIDUAL PUMP and MOTOR WINDING and BEARING TEMPERATURES
- ANALYTICAL DATA
- TRENDS
- Etc

2.2.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.3 Transfer Pump Control

This self-priming pump draws water from the middle dam and pumps towards the top dam, on a manual control basis only. The operators will start and stop the pump, based upon season and dam level requirements. The operator will adjust the VFC to set a specific flow, but not additional control is required.

The pump is situated in a dedicated, remote pump station enclosure and controlled from the dedicated, relay-based MCC.

No telemetry nor remote signal integration required.

2.3.1 Manual Mode

The pump must be started and stopped via a start and stop pushbutton on the MCC., as well as from the local control station in close proximity to the pump.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.3.2 Protections

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of pressure sensor
- Pump no-flow protection by means of limit switch on the non-return valve, counterweight arm

2.3.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (1 No)

- RUN
- STARTER TRIP
- MOTOR OVERHEAT
- HIGH PRESSURE

- NO-FLOW
- E-STOP
- FLOW DISPLAY
- PRESSURE DISPLAY

2.3.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.4 WTW Feed Pump Control

These pumps draw water from the top dam and pump towards the WTW. The pumps are situated in a dedicated, remote pump station building and controlled from their dedicated, relay-based MCC.

Signals between the two sites must be related via telemetry.

2.4.1 Control modes

The pumps can either be run in manual or automatic mode, with automatic mode via the relay and display control in the MCC.

Each pump panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running pump must stop when switched to off and no pump can be initiated to run with the selector switch in the off position.

No more than one pump can run at any time.

2.4.1.1 Manual Mode

Each pump must be started and stopped via a start and stop pushbutton on the MCC., as well as from the local control station in close proximity to the respective pump.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.4.1.2 Automatic Mode

Primary Level Control

The duty pump must start and stop, based upon level in the final clearwater sump at the WTW.

The level control must be derived by means of a 4-20mA signal from the level sensor in the sump. The level in the sump must remain within a safe band (not too high or low), then a LEVEL START DEMAND indication light must switch on and the flow PID loop must remain in effect until the level has reached a high/low stop value, at which point the indication light must switch off.

The sump level must be displayed on the display on the MCC door, with start/stop levels set on the relays, to control the pumps.

The minimum allowable frequency of the pumps, when ramping down due to the system getting to its permissible stop/flow level, must be evaluated on-site so that the required flow and pressure is still available through the delivery pipeline (and motor cooling is managed accordingly), in conjunction with the equipment supplier.

Duty Selection

The pumps must be provided with a common selector switch labelled Alt/P1/P2, door-mounted in the common control section. With the switch in Alt mode, the pumps must alternate their duty cycle after every 24 hours.

Should a running pump trip, be switched off (CB and selector switch) or fail to start, then the standby pump must takeover and start immediately. Should the tripped pump be fixed/reset, then it must not start up again and act as the standby pump.

In P1 or P2 that selected pump must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.4.2 Protections

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of pressure sensor
- Pump no-flow protection by means of limit switches on the individual non-return valve, counterweight arms

2.4.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (2 No)

- RUN
- STARTER TRIP
- MOTOR OVERHEAT
- HIGH PRESSURE
- PUMP DELIVERY PRESSURE DISPLAY
- NO-FLOW
- E-STOP

b) Common Control

- LEVEL START DEMAND

- LOW LEVEL
- HIGH LEVEL
- FLOW DISPLAY
- LEVEL DISPLAY
- COMMON SUCTION PRESSURE DISPLAY

2.4.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.5 Filter Feed Pump Control

2.5.1 Control modes

The pumps can either be run in manual or automatic mode, with automatic mode via the PLC and HMI sequence.

Each pump panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running pump must stop when switched to off and no pump can be initiated to run with the selector switch in the off position.

No more than one pump can run at any time.

2.5.1.1 Manual Mode

Each pump must be started and stopped via a start and stop pushbutton on the MCC., as well as from the local control station in close proximity to the respective pump.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.5.1.2 Automatic Mode

Primary Level Control

The duty pump must maintain a constant level in the suction tank (with setpoints adjustable) by means of a PID control loop. The idea is that the incoming raw water must be pumped through the filters, balancing the system accordingly.

The level control must be derived by means of a 4-20mA signal from the level sensor in the tank. The level in the tank must remain within a safe band (not too high or low), then a LEVEL START DEMAND indication light must switch on and the PID loop must remain in effect until the level has reached a high/low stop value, at which point the indication light must switch off.

The tank level must be displayed on the HMI, including pump flow.

The minimum allowable frequency of the pumps, when ramping down due to the system getting to its permissible stop level, must be evaluated on-site so that the required flow and pressure is still available through the delivery pipeline (and motor cooling is managed accordingly), in conjunction with the equipment supplier.

Duty Selection

The pumps must be provided with a common selector switch labelled Alt/P1/P2, door-mounted in the common control section. With the switch in Alt mode, the pumps must alternate their duty cycle after every 24 hours.

Should a running pump trip, be switched off (CB and selector switch) or fail to start, then the standby pump must takeover and start immediately. Should the tripped pump be fixed/reset, then it must not start up again and act as the standby pump.

In P1 or P2 that selected pump must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.5.2 **Protections**

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of pressure sensor
- Pump no-flow protection by means of the common inline electromagnetic flow meter (refer section 6 instrumentation below). Individual pump protection must be provided, with the standby control functionality remaining in effect.

2.5.3 **Alarm and Status Indication**

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (2 No)

- RUN
- STARTER TRIP
- MOTOR OVERHEAT
- HIGH PRESSURE
- NO-FLOW
- E-STOP

b) HMI

- LEVEL START DEMAND
- LOW LEVEL
- HIGH LEVEL
- FLOW DISPLAY

- LEVEL DISPLAY
- PRESSURE DISPLAY

2.5.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.6 Backwash Pump Control

2.6.1 Control modes

The pumps can either be run in manual or automatic mode, with automatic mode via the PLC and HMI sequence.

Each pump panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running pump must stop when switched to off and no pump can be initiated to run with the selector switch in the off position.

No more than one pump can run at any time.

2.6.1.1 Manual Mode

Each pump must be started and stopped via a start and stop pushbutton on the MCC., as well as from the local control station in close proximity to the respective pump.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.6.1.2 Automatic Mode

PLC / HMI Control

The PLC will start and stop the pumps as required in the backwashing sequence, with a backwashing sequence initiated by an operator.

Only a pump start demand signal will be sent to the pump MCC. The selected duty pump at that time must then start and only stop once the pump start demand signal has fallen away.

Duty Selection

The pumps must be provided with a common selector switch labelled Alt/P1/P2, door-mounted in the common control section. With the switch in Alt mode, the pumps must alternate their duty cycle after every 24 hours.

Should a running pump trip, be switched off (CB and selector switch) or fail to start, then the standby pump must takeover and start immediately. Should the tripped pump be fixed/reset, then it must not start up again and act as the standby pump.

In P1 or P2 that selected pump must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.6.2 Protections

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of a pressure sensor
- Pump no-flow protection by means of the common inline electromagnetic flow meter (refer section 6 instrumentation below). Individual pump protection must be provided, with the standby control functionality remaining in effect.

2.6.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (2 No)

- RUN
- STARTER TRIP
- MOTOR OVERHEAT
- HIGH PRESSURE
- NO-FLOW
- E-STOP

b) HMI

- START DEMAND
- LOW LEVEL
- HIGH LEVEL
- FLOW DISPLAY
- LEVEL DISPLAY
- PRESSURE DISPLAY

2.6.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.7 Blower Control

2.7.1 Control modes

The blowers can either be run in manual or automatic mode, with automatic mode via the PLC and HMI sequence.

Each blower panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running blower must stop when switched to off and no blower can be initiated to run with the selector switch in the off position.

No more than one blower can run at any time.

2.7.1.1 **Manual** Mode

Each blower must be started and stopped via a start and stop pushbutton on the MCC, as well as from the local control station in close proximity to the respective blower.

Note that even in manual mode, the respective hard-wired blower and motor protections must remain active to protect said equipment.

2.7.1.2 **Automatic** Mode

PLC / HMI Control

The PLC will start and stop the blowers as required in the backwashing sequence, with a backwashing sequence initiated by an operator.

Only a blower start demand signal will be sent to the blower MCC. The selected duty blower at that time must then start and only stop once the blower start demand signal has fallen away.

Duty Selection

The blowers must be provided with a common selector switch labelled Alt/B1/B2, door-mounted in the common control section. With the switch in Alt mode, the blowers must alternate their duty cycle after every 24 hours.

Should a running blower trip, be switched off (CB and selector switch) or fail to start, then the standby blower must takeover and start immediately. Should the tripped blower be fixed/reset, then it must not start up again and act as the standby blower.

In B1 or B2 that selected blower must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.7.2 Protections

The blower must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of a pressure switch

2.7.3 **Alarm and Status Indication**

Each item monitored must be provided with the relevant indication as detailed below:

a) Blower Panel (2 No)

- RUN
- STARTER TRIP
- MOTOR OVERHEAT
- HIGH PRESSURE
- E-STOP

b) HMI

- START DEMAND
- PRESSURE DISPLAY
- FLOW DISPLAY

2.7.4 **Remote monitoring and control**

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.8 **Filter Backwashing**

All new sand filters are equipped with several valves, each fulfilling a specific role. All valves must be electrically actuated and controlled (quarter-turn, so discrete OPEN/CLOSE only).

The actuated valves can be manually opened and closed physically at the actuator, or remotely from the MCC's HMI. Each valve must be able to be individually opened and closed from this control station (via push-buttons), with individual valve feedback provided (Open, Closed and Fault indication lights).

The applicable valves, per filter, are:

- Filter Inlet Valve (FIV)
- Air Inlet Valve (AIV)
- Backwash Water Inlet Valve (BIV)
- Filtered Water Out Valve (FOV)

- Backwash Water Outlet Valve (BOV)
- Rinse Water Outlet Valve (ROV)

In addition to the valve control from the PLC, blower and backwash pump control and feedback must also be provided. A START and STOP pushbutton must be provided per pump and blower set, with the MCC deciding which pump and blower to then start (depending on the flip-flop duty selection cycle at that time). Pump/Blower RUN and TRIP feedback must also be provided per blower/pump set.

Only one sand filter can be backwashed at any one time.

2.8.1 Backwashing Control modes

The valves must only be provided with a power supply from the respective MCCs.

No interlocking is required between specific valve and pump/blower control, as the operator must be trained in the correct backwashing sequence. Individual pump, blower and valve protection must be provided in the instance where the wrong sequence is carried out.

2.8.1.1 Manual (Local) Mode

Opening and closing of the valve on the actuator only. Feedback must still be displayed on the control station.

Starting and stopping of an individual blower/pump either on the MCC or at the local control station near each blower/pump.

2.8.1.2 Manual (Remote) Mode - Valves

Each individual valve must be provided with as OPEN VALVE and CLOSE VALVE push-button on the dedicated control station.

Once the OPEN VALVE pushbutton is pressed, the valve must start opening and only stop once the valve has completely opened and the VALVE OPENED feedback is provided from the valve.

Once the CLOSE VALVE pushbutton is pressed, the valve must start closing and only stop once the valve has completely closed and the VALVE CLOSED feedback is provided from the valve.

A valve in either the opening or closing position must first stop, before changing direction, should one of the pushbuttons be pressed during an operational cycle.

2.8.1.3 Manual (Remote) Mode - Blowers

The blowers must be provided with one BLOWER START and BLOWER STOP push-button on the HMI.

Once the BLOWER START pushbutton is pressed, the duty selected blower must run, providing a BLOWER RUN feedback indication signal.

Once the BLOWER STOP pushbutton is pressed, the duty selected blower must stop, with the BLOWER RUN feedback indication signal falling away.

Other system checks must remain in place, to ensure no damage to equipment/sequences.

2.8.1.4 Manual (Remote) Mode – Backwash Pumps

The pumps must be provided with one PUMP START and PUMP STOP push-button on the HMI.

Once the PUMP START pushbutton is pressed, the duty selected pump must run, providing a PUMP RUN feedback indication signal.

Once the PUMP STOP pushbutton is pressed, the duty selected pump must stop, with the PUMP RUN feedback indication signal falling away.

Other system checks must remain in place, to ensure no damage to equipment/sequences.

2.8.1.5 Auto Mode – Backwash sequence

Each filter must be able to be selected individually, and once the process interlocks have confirmed that all equipment status is ready for initiation, the operator should be able to start a backwash sequence.

The sequence must initiate and run through all the contractor defined steps, for all associated valves, pumps and blowers. All associated timers, valve and pump status checks and associated speeds of the equipment must be catered for. The sequence must comply with the process design requirements.

A dedicated Filter Control Panel must be provided, installed on the filter higher level platform. The operator must be able to initiate a filter backwash cycle (each filter individually selectable), with only filter being able to be backwashed at any time.

2.8.2 **Protections**

The valve must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the valve must STOP and a FAULT indication light must energize. For pump and blower protection, refer individual sections below.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Integral Overload protection
- Integral Over-Torque protection

2.8.3 **Alarm and Status Indication**

Each item monitored must be provided with the relevant indication as detailed below:

a) 4 x Sand Filters (3 Now and 1 Future - HMI)

- FIV VALVE OPENED
- FIV VALVE CLOSED
- FIV VALVE FAULT
- AIV VALVE OPENED
- AIV VALVE CLOSED
- AIV VALVE FAULT
- BIV VALVE OPENED
- BIV VALVE CLOSED

- BIV VALVE FAULT
- FOV VALVE OPENED
- FOV VALVE CLOSED
- FOV VALVE FAULT
- BOV VALVE OPENED
- BOV VALVE CLOSED
- BOV VALVE FAULT
- ROV VALVE OPENED
- ROV VALVE CLOSED
- ROV VALVE FAULT
- BLOWER RUN
- BLOWER TRIP
- BACKWASH PUMP RUN
- BACKWASH PUMP TRIP

2.8.4 **Remote monitoring and control**

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.9 **Service Water System**

2.9.1 **Pump Station Control modes**

The pump station can either be run in manual or automatic mode, with automatic mode via pressure sensor for a constant pressure system.

Each pump panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running pump must stop when switched to off and no pump can be initiated to run with the selector switch in the off position.

No more than one pump can run at any time.

2.9.1.1 Manual Mode

Each pump must be started and stopped via a start and stop pushbutton on the MCC, as well as from the local control station in close proximity to the respective pump.

2.9.1.2 Automatic Mode

Primary Pressure Control

The duty pump must maintain a constant pressure in the network (provisionally 4bar, with setpoints also adjustable) by means of a PID control loop.

The pressure control must be derived by means of a 4-20mA signal from the pressure sensor in the common delivery pipework. Once the pressure in the network has dropped to a pre-determined point, then a PRESSURE START DEMAND indication light must switch on and the PID loop must remain in effect until the pressure has reached a high/stop value, at which point the indication light must switch off.

The system pressure must be displayed on the HMI.

The minimum allowable frequency of the pumps, when ramping down due to the system getting to its permissible stop pressure, must be evaluated on-site so that the required flow and pressure is still available through the delivery pipeline (and motor cooling is managed accordingly), in conjunction with the equipment supplier.

Duty Selection

The pumps must be provided with a common selector switch labelled Alt/P1/P2, door-mounted in the common control section. With the switch in Alt mode, the pumps must alternate their duty cycle after every 24hours.

Should a running pump trip, be switched off (CB and selector switch) or fail to start, then the standby pump must takeover and start immediately. Should the tripped pump be fixed/reset, then it must not start up again and act as the standby pump.

In P1 or P2 that selected pump must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.9.1.3 Emergency Control

Suction Low Level

A new float level switch mounted in the suction tank will act as the low level for the pump suction protection. This switch must stop (latch) a running pump in both auto and manual modes, with indication light labelled SUCTION LOW LEVEL to come on in this condition.

The pump must be manually reset and provision must be made for local reset.

Delivery High Pressure

A new pressure sensor on the common pump delivery line must be utilised for system pressure protection. The same sensor that is used for the PID loop control must also be used to stop a duty pump if the pump pressure rises above a certain value (metres, to be confirmed with the equipment supplier on-site, in line with the system curve and conditions).

At this condition, a Delivery High Pressure indication light must switch on (latch) and can only switch off once the fault has been assessed and manually reset on the MCC (only).

2.9.2 **Protections**

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection
- Motor overheat protection by means of thermistors in the motor windings
- Pump no-flow protection by VSD under-current
- Individual pump high pressure protection by means of pressure switches, set slightly lower than the system high pressure to prevent nuisance tripping

2.9.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (2 No)

- RUN
- STARTER TRIP
- OVERHEAT
- NO-FLOW
- HIGH PRESSURE
- E-STOP

b) HMI

- SUCTION LOW LEVEL
- SUCTION LEVEL DISPLAY
- PRESSURE START DEMAND
- DELIVERY PRESSURE DISPLAY
- FLOW DISPLAY
- HIGH PRESSURE ALARM

2.9.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.10 Dosing Pumps

There are a number of dosing pumps, each fulfilling a specific role.

2.10.1 **Control modes**

The respective dosing pumps are either single-phase or three-phase, positive displacement type pumps, that will receive a power supply and flow meter signal (4-20mA). The flow meter signal is provided from the applicable incoming water line electromagnetic meter

2.10.1.1 **Manual** Mode

Each pump must be started and stopped via the local control provided on the pump interface.

2.10.1.2 **Automatic** Mode

The applicable dosing pump must run when flow is detected in the pipe, at the given 4-20mA flow signal (preset within the pump). Proportional dosing will be done on the skid-mounted units themselves.

2.11 **Dosing Mixers**

There are several mixers required for the dosing system, with their control all the same.

2.11.1 **Control modes**

The mixers can either be run in manual or automatic mode, with automatic mode via timer.

Each mixer panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running mixer must stop when switched to off and no mixer can be initiated to run with the selector switch in the off position.

2.11.1.1 Manual Mode

Each mixer must be started and stopped via a start and stop pushbutton on the MCC, as well as from the local control station in close proximity to the respective mixer.

2.11.1.2 Automatic Mode

Primary Timer Control

The mixers must each be controlled by means of an adjustable timer on the HMI, able to be set for specific ON and OFF times, as well as RUN times. Once the timer is enabled, then a TIMER START DEMAND indication light must switch on and the mixer must run. Once the timing cycle has stopped, the mixer must stop, at which point the indication light must switch off.

The applicable timing cycle must be displayed on the HMI.

2.11.2 **Protections**

The mixer must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Motor overload protection

2.11.3 **Alarm and Status Indication**

Each item monitored must be provided with the relevant indication as detailed below:

a) Mixer Panel (3 No)

- RUN
- OVERLOAD TRIP
- E-STOP

b) HMI

- TIMER START DEMAND

2.11.4 **Remote monitoring and control**

The required monitoring and control signals for the plant system must be provided by means of industrial network.

2.12 **Flocculation Mixers**

There are several mixers required for the flocculation system, with their control all the same. These units will be provided with VFC's, to allow for commissioning adjustments and correct rotational speeds.

No automatic speed adjustments are required.

2.12.1 **Control modes**

The mixers can either be run in manual or automatic mode, with automatic mode via timer.

Each mixer panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running mixer must stop when switched to off and no mixer can be initiated to run with the selector switch in the off position.

2.12.1.1 Manual Mode

Each mixer must be started and stopped via a start and stop pushbutton on the MCC, as well as from the local control station in close proximity to the respective mixer.

2.12.1.2 Automatic Mode

Primary Timer Control

The mixers must each be controlled by means of an adjustable timer on the HMI, able to be set for specific ON and OFF times, as well as RUN times. Once the timer is enabled, then a TIMER START DEMAND indication light must switch on and the mixer must run. Once the timing cycle has stopped, the mixer must stop, at which point the indication light must switch off.

The applicable timing cycle must be displayed on the HMI.

2.12.2 **Protections**

The mixer must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection

2.12.3 **Alarm and Status Indication**

Each item monitored must be provided with the relevant indication as detailed below:

a) Mixer Panel (3 No)

- RUN
- STARTER TRIP
- E-STOP

b) HMI

- TIMER START DEMAND

2.12.4 **Remote monitoring and control**

The required monitoring and control signals for the plant system must be provided by means of industrial network.

3. **INDUSTRIAL NETWORK**

Refer Standard Specifications E02 for detailed technical requirements, as well as drawings indicating proposed network configurations.

All required PLC and HMI hardware and software components, including licensing, programming and configuration costs must be included as part of the tender offer. Further provision must be made in the pricing for three iterations of the HMI layout and trending requirements with the Client and Engineer.

3.1 **Site Network Design**

The network design must be done by a specialist System Integrator, with a proven track-record. Network design would include a detailed network drawing, equipment layout, protocol summary as well as HAZOP-type fault-finding analysis.

In all instances, the entire site network, must remain both live and self-healing (ie removal of one component may not affect the rest of the equipment in any way). Allowance must be made for at least a one-hour power backup. Refer standard specifications for ring-redundancy throughout the plant.

3.2 Software Licensing

Any software required for the network tender offer must be allowed for and accurately priced. Note that only once-off license solutions will be accepted and that no yearly-subscription offers will be accepted.

Licensing must allow for all required scan points as well as the number of operator access points at the plant.

3.3 PLC and HMI

The PLC with associated equipment must be mounted in a dedicated tier within the Main MCC. All terminals and connections must be provided for in the rear section (except in a front-access only MCC, where the terminals must be mounted in the front and bottom of the tier). A weatherproof RJ45 connection point must be door-mounted for laptop access.

The PLC offered must be of the Siemens, ABB, Schneider and/or similar type, with 25% spare capacity in terms of hardware and software capacity. All heating and ventilation requirements to be taken into account as part of the design process.

The general intent and system configuration must be that the inlet works equipment can be run in manual, with required protections in place, should the PLC be faulty. All protections must therefore be hard-wired.

A 21.5” touch-screen HMI, of the Siemens, ABB, Schneider and/or similar type, setup and configured as per the standard specification requirements must be door-mounted at the PLC tier, for the Main MCC.. All licensing costs must be provided for under this contract. The HMI must be specifically suited for industrial conditions (IP65), being fanless and stainless.

All required PLC and HMI hardware and software components, including licensing, programming and configuration costs must be included under the MCC price in the BOQ.

Note graphic requirements for the HMI, as detailed below (as a minimum). Provision must be made for an iterative approval process, with three submission and Client comment rounds to be provided as part of the tender offer:

3.3.1 Main Menu

To provide an overview of the Plant as a whole, including the various new MCCs and control nodes, existing plant link, housekeeping, alarm page, trending, dashboards, process inputs, and other specification requirements.

3.3.2 New Plant - Overall

This screen displays:

- A schematic line diagram of the scheme as a whole (From PFD)
- General fault page
- Pump/Motors status
- System analogues status

3.3.3 Raw Water Feed

This screen displays:

- A schematic line diagram of this section of the plant/pump station and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.4 Filter Feed System

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.5 Backwash System

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motor/Blower status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.6 Dosing Systems (x2)

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Mixer status
- Each valve status
- System analogues status

- Analytical process displays
- Emergency stop active.

3.3.7 Final Pumping Reservoirs and Flow

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.8 Service Water System

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.9 Analytical Summary and Comparison

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.3.10 Plant Water and Flow Balance

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.4 Network Switches

Network switches must be provided for at the new MCC node. They must be managed, Layer2 units, of the Moxa and or similar type. The switch sizing and design must be specific per node, depending on the amount of units to be connected at that node. Spare ports must be allowed for (minimum 2). The final switch design remains the responsibility of Contractor and SI.

3.5 Component Programming

As the plant will be dependent upon the PLC and control implementation, careful consideration must be placed on the programming and implementation portion of the project.

The programming will be a function of these specification requirements but optimised and adjusted as per final Contractor design offer.

3.6 Filter Control Panel

A new filter control panel must be supplied and installed under this contract, should the operator wish to initiate a backwash cycle whilst standing on top of the filters.

Initiating a backwash cycle may only be possible if all components are in auto and all process interlocks healthy.

The control panel must be made from 3CR12, with the following main components:

- Floor-standing, with stand(s) high enough to operate panel from a normal, standing position
- Outdoor enclosure, with 50mm hood overhang and external, lockable door
- Filters 1, 2, 3 & 4 (future) Backwash Start and Stop push-buttons
- E-Stop
- Necessary terminals and ancillary components, in dedicated section of panel

SECTION 3: ELECTRICAL

PART 4 : TELEMETRY AND SCADA

1. GENERAL SCOPE

This section of the Project Works requires a dedicated and specialist sub-contractor to execute the required Works. Close cooperation is critical between the Main Contractor, specialist sub-contractor as well as MCC manufacturer and no claims in this regard will be entertained.

The project specification covers the related design, construction, supply, delivery, installation, testing, commissioning and site optimisation of a radio telemetry and central SCADA system in line with the Municipality's current supplier, contract and standard of operations. The current supplier must be utilized as the specialist sub-contractor so as to ensure continuity of service and modifications of the central and critical SCADA control system.

This project's scope of works is summarised as follows:

- New telemetry outstation to cater for all required signals for the new Main MCC and associated equipment
- New telemetry outstation to cater for all required signals for the new WTW Feed MCC and associated equipment
- New telemetry outstation to cater for all required signals for the existing Remote Reservoir 3 and associated equipment
- All required interfacing, coordination and control between the outstations and MCCs
- Updating of the central SCADA system at the Municipality's office (with licensing costs where required)

2. TELEMETRY OUTSTATIONS

2.1 ENCLOSURE

A full, new, suitably sized, wall-mounted enclosure must be priced as part of the upgrade at the Main MCC, as well as WTW Feed MCC and Remote Reservoir (in compliance to the standard specifications). The enclosure must be installed inside the new MCC rooms and existing reservoir building respectively.

2.2 RADIO

The existing Municipal communication medium is by means of a combination of GSM and digital radios between the various outstations and central SCADA, within this area.

These new outstations must be equipped with the correct radio and GSM combination, to transmit all required signals back to the central station in McGregor. All communication path analysis and associated requirements must be allowed for under the tender offer and no additional costs in this regard will be entertained during the contract.

2.3 CONFIGURATION

The telemetry RTU configuration must be housed on a dedicated backplane within the enclosure. The CPU, both digital and analogue I/O cards as well as counters must be provided in line with the project specifications and requirements. Special attention must be placed upon the system control and how the SCADA, outstation and MCC must work together for a fully functioning system. The RTU must be equipped with serial and network

communication and be of the programmable type, to comply to the control and monitoring requirements as set out below in Section 3.

Integration with the site PLC must be via Ethernet and/or similar network means, with voltage free and analogue communication to the WTW Feed MCC and Reservoir components.

All field I/O must be galvanically isolated and provided with surge protection.

Provision must be made to house the final single line diagram in a door-mounted pouch. Note that a generic drawing will not be accepted and all applicable I/O, with corresponding descriptions, must be indicated on the drawing (applicable to the manuals as well).

2.4 ANTENNA

New antennas for the digital radios/GSM modules must be provided.

2.5 POWER SUPPLY

Separate battery must be provided, per outstation.

3. SYSTEM CONTROL

3.1 OVERVIEW

The overall scheme description as well as monitoring requirements are set-out in Section 3, part 4. This section must be studied in detail by the specialist sub-contractor and a final I/O list, as well system control responsibility, must be deduced from here. The I/O list below is a general indication only and tenderers cannot determine their final bid on this list alone.

The overall scheme involves the upgraded McGregor WTW site, consisting of existing as well as new equipment. The telemetry system is responsible for the respective monitoring of the entire plant on the central SCADA at the Municipality's offices, in-line with their newest standards.

3.2 I/O SCHEDULE

The indicative system I/O schedule below is as follows for the new equipment under this scope only.

	PARAMETER	I/O TYPE
A	Telemetry door	Digital In
B	Power failure	
C	Communication failure	
D	WTW	
	• All pumps and mixers • All analogue and discrete instrumentation • All analytical instrumentation • All flow meters (networked), with totaliser • Generator	Ethernet / Modbus from PLC and Generator Controller
E	WTW Feed PS	

	• All pumps and mixers • All analogue and discrete instrumentation • All analytical instrumentation • All flow meters (networked), with totaliser	Discrete and analogue from MCC
F	Reservoir	
	• Level sensor • 2 x Float Level Switches	Discrete and analogue

4. CENTRAL SCADA

4.1 OVERVIEW

The Client's central station is existing with the SCADA system being installed in McGregor.

It remains the responsibility of the Contractor to determine that the current software version is capable of handling the modified outstation and that adequate scan points are available. If the available capacity is to be exceeded by this contract then it must be qualified with all financial implications stated and included as part of the tender offer.

4.2 SCREEN UPDATES

All existing standards, displays and graphics must be utilised as the standard for the upgraded WTW. All other equipment displays, parameter indications, colours and status changes must be as per the existing layouts.

The overall screen must be updated to include the newest plant layout, as an accurate graphical representation.

Graphic display of status and analogue parameters monitored, as well as trend screens, must be provided as per Standard Specifications. Minimum guidelines are given below and allowance must be made within the tender price for liaison with the client and Engineer in this regard. It will be regarded that the System Integrator (if separate entity) is familiar with the Employer's standards and software configuration and no claims for additional payment in this regard will be entertained.

Graphic layouts must be designed for local operator touch-screen interfacing in the field. Text sizing, drop-down menus, ergonomics, button selection, to but name a few, must be carefully considered and designed with this end-user interface in mind.

The following graphic screen layouts must be provided (as a minimum):

- Refer HMI screen graphics above for detailed screen and graphic requirements

5. GENERAL

All preliminary and general matters must be referred to Section 1 for detailed descriptions and requirements, in-line with the Main Contractor's tender offer.

Additional and specific items are detailed below.

5.1 TESTING AND COMMISSIONING

Provision must be made for a fully automated factory test at the premises of the MCC manufacturer, before site implementation can commence. Only after the system has been functionally tested and found to be in-line with the specification can the site work commence.

Site commissioning not only relates to installation and testing of the system on-site, but also to running and optimising of the system in-line with the general requirements as set-out in Section 1, 7.2.

Note that all drawings, approvals, construction, testing and site commissioning must be in accordance with the program of the Main Contractor. It remains the responsibility of the specialist sub-contractor to confirm said program and fall in-line accordingly.

5.2 MANUALS

Note Section 1, Part 8 relating to all manuals requirements. Further note the detailed layout that must be included at each telemetry outstation, as detailed in 2.3 above.

The following items must specifically be included:

- Overall system layout (graphical)
- I/O schedules
- Wiring diagrams (with applicable I/O descriptions)
- Cable and connection schedules
- Software I/O configuration
- Technical hardware description
- SCADA screenshots

SECTION 3: ELECTRICAL

PART 5 : BACKUP GENERATOR

1. GENERAL SCOPE

A new outdoor generator must be provided for the existing WTW, complete with plinth adjacent to the WTW supply transformer.

The unit must be of the 'super-silent' type, applicable to residential areas.

5.1 BROAD SCOPE

The standby generating set will act as a back-up in the event of a power failure and must automatically transfer the load between mains and emergency power. The set must be able to run the full electrical load as stated and the design and sizing of the set, by the specialist supplier, must accommodate all load and site factors.

The complete set, which relates to the engine, alternator, coupling, cooling, fuel and control system, must be capable of producing the specified output, continuously, without overheating. In addition, the set must be able to run at 110% capacity for one hour every 12 hours in compliance with BS5514.

The engine and alternator must be flange-mounted, via a high-quality coupling, to operate as a unit on a common frame, complete with anti-vibration mountings. The frame must be of the duplex type. A drip tray must be provided (removable), slope to one side, to catch any spills. The fuel tank must be free-standing within the room, inside a bunded area.

All paintwork and material selection must be specifically designed for the intended application, including storage of fuel and coming to contact with fuel and oils. Due to the close proximity to the see, the generator base, fuel tank, canopy and any and all exposed material must be suitable for both corrosive environments, as well as treated and provided with a protective coating as an additional protective layer.

5.2 QUALITY AND SUPPORT

The proposed sets and associated equipment must be from a reputable manufacturer/service provider in the Western Cape, with local support within a four-hour driving radius. The sets must be designed to have the same equipment configuration in all, to assist with Municipal standardisation of possible parts and overall system control.

The equipment offered, within each of the sets, must be of a high and durable quality, with preference for European/American designed products and parts. An experience list, with installed sites and equipment, must be included as part of the tender offer, to indicate installed base and service provider experience.

5.3 SET OUTPUT

The generating sets must have an output of 420/230V at 50Hz. The output must be constant and be capable of handling the loads as indicated below, as well as taking the starter types into consideration.

The estimated site load is as follows:

- Combination of pumps and starters — 80kW (3-phase, VFC and DOL Starters)
- General L&P: — 10kVA (single phase)

The estimated site conditions are as follows:

- Altitude: 275m above sea level
- Temperatures: -1°C - 45°C

The final sizing and design of the set configurations must be done by the specialist supplier with the responsibility of the set performance and compliance being that of the Contractor.

The load is mostly motors (inductive) and starting characteristics must be taken into account to prevent a voltage output dip of no lower than 370V.

Any de-rating for the site conditions must be included in the set sizing and clarified at tender stage.

5.4 ENGINE

5.4.1 General

The engine must run at a speed not greater than 1500rpm, operating on the internal combustion principle by means of atomic injection and compression ignition type.

The set must be started by means of an electric starter and must be able to be started from cold, taking the full load, in one step, within 15 seconds. Water-cooled machines must compensate for freezing conditions by means of suitably sized heaters, thermostatically protected, and supplied directly from the switchboard via a CB.

The battery system must be of the lead-acid, heavy-duty, low-maintenance type, specifically designed for this cold-start, high torque application. It must further be sized to attempt three cold starts before providing a generator start fault indication. The battery (single or more) may be no smaller than 120Ah and must be housed in a battery enclosure, out of the way of any potential engine spill onto the unit. The enclosure must be lockable.

The battery charger must be housed within the switchboard, fed from the mains or alternator and generally be purpose-built to provide an optimal trickle charge to battery to both prolong the life of the battery and maintain the output and voltage of the battery set. Battery charger status and fault must be monitored.

5.4.2 Engine Management and Protection

The engine and associated components must be protected against all possible means of failure, with output monitoring to suit. There are two distinct and acceptable management means, either by means of an integral Engine Control Unit (ECU), or discrete via dedicated and dispersed sensors, switches and other gauges required for full protection and operational feedback.

Although the ECU is preferred, a simpler and more robust digital offer will also be accepted, provided that no functionality not protection features are compromised.

The speed of the engine must be by means of a governor and the speed variation may be no more than 4% between no- and full load.

Individual component protection, with engine cut-out and distinct controller display, must be provided for:

- Oil level and pressure, as well as cut-out
- Radiator level, with warning and cut-out
- Over-temperature

- Over-speed

5.4.3 Cooling

Both air and water cooled sets can be offered. In either case, adequate protection against over-heating must be provided for with corresponding fault indication at the controller.

Water-cooled sets must further be protected against low water level by means of a separate warning and cut-out switches. This can either be via an analogue signal programmed at two separate setpoints, or digital signals from specific cut-out switches.

All required cooling ducting must be provided for and care must be taken in the design that no exhaust air can be re-circulated back into the cooling air supply. Removable air filters must be included in the design of the set.

5.4.4 Fuel and Lubrication

The fuel system must be suited for normal available fuel (diesel) in South Africa. The fuel tank must be housed within the enclosure, sized for at least 24-hours standby time at full load.

The fuel tank must be sloped to one single point and provided with a drainage point at least 150mm above ground level, by means of a lockable ball valve and threaded plug. The fuel tank must be provided with dedicated access for re-fuelling, the fuel pump supply as well fuel level monitoring. Both fuel level analogue level as well as low level cut-out, by means of a switch must be provided. A low fuel warning must be programmed in the controller and made available for remote monitoring. An additional site glass must be provided.

Both a hand re-fuelling pump, as well as electrical fuel pump must be provided. All required brackets as well as fuel pump control must be provided for in the controller. A 5m hose, with non-return valve and stand-pipe, must be provided for re-fuelling purposes. The fuel system must be equipped with the necessary removable filters, and interconnecting pipework must be by means of armoured, flexible tubing.

That the both the fuel tank as well as pumps must be located within a drip-proof, bunded area, at least 10% larger in volume than the full capacity of the fuel tank.

Lubrication of bearings and other moving parts must be by means of a dedicated force-feed system, complete with removable filters and pumping action for priming purposes. The lubrication status (level and pressure) must be made available, with separate low level cut-out protection visible on the controller.

5.4.5 Exhaust System

The exhaust system must be directed up and outward, preventing any rain ingress. It must be provided with a silencer, with the exhaust system suitably cladded to prevent heat and noise transfer. The exhaust system must further be flexibly connected to the engine to prevent the transfer of vibrations. All material to be SS316 or similar and equal.

5.5 ALTERNATOR

The alternator must be of the self-excited, brushless type, in a ventilated, drip-proof housing. It must be capable of running continuously at full load without exceeding permissible temperature rise of either the stator or rotor.

The windings must be fully impregnated for a ‘tropical climate’ and must have oil resisting finishing varnish. Overheat protection, by means of thermistors in the windings, must be provided for, with winding insulation being of the ‘Class H’ type. The alternator neutral must solidly be connected to the switchboard earth bar.

The alternator must be self-regulating within a range of no more than 5% of the nominal output, at a power factor of 0.8. The excitation system must be designed for rapid voltage recovery after the application of a sudden full load.

Individual component protection, with cut-out and distinct controller display, must be provided for:

- Winding over-temperature
- Overload (controller setpoint)

5.6 CANOPY, LOUVRES AND SOUND ATTENUATION

The complete generating set as described above must be housed within a lockable, weatherproof canopy. The canopy must be made from 3CR12, with a minimum thickness of 1.8mm.

The canopy must comply with the following main criteria:

- Sloped roof, with lifting lugs
- Removable and lockable panels/doors, with at least two handles and adequately numbered and sized to easily access any section of the generator
- Prevent any rainwater ingress onto the doors by means of channel or other diversion mechanism (from the top)
- Provision for all louvres, exhaust, cable access and sound attenuation material.

The area is deemed residential, thus sound design and verification must be done for 60dBA at 5m, running at full load. The verification must include a summary report, with measurements taken every two meter around the generator (circular at the 5m distance). Note any additional sound attenuation changes and/or requirements must be included in the generator pricing. No additional claims in this regard will be entertained.

The louvres and attenuators (intake and outlet) must be made from HDG and finished with a suitable epoxy and paint. Final louvre sizing to be specified by the generator supplier, in-line with air-flow requirements.

Fire-proof attenuating material must be utilised only throughout.

5.7 SWITCHBOARD AND CHANGEOVER SYSTEM

The switchboard offered must be SANS compliant, with provision made to house the controller and all other control gear. A dedicated separate section must be provided for the change-over mechanism and CBs.

The general switchboard requirements as set out in the electrical section 4 above are applicable to this section as well. This includes alarm notice, E-Stop various labels as well as earth bar labelled EARTH, pre drilled for at least 6 possible connections.

The controller must be mounted on the generating set switchboard and must be of the Lovato or Deep Sea type. Only values or feedback from the set not seen on the main display of the controller must be provided for as analogue instruments on the switchboard door. The unit must be provided with Modbus 485 communication. The following signals must be provided, as a minimum:

- Fuel level (4-20mA)
- Low fuel warning
- Low fuel cut-out
- Generator common fault
- Generator run
- Mains failure
- Set selector switch (Man/Off/Auto/Test)
- Battery voltage
- Battery or charger fail

The switchgear layout must be such that sufficient space is made available for cable connections, glanding and the mounting of CTs. The following switchgear, all suitably rated in line with the full load requirements, must be provided in a dedicated section of the switchboard:

- Alternator CB
- Mains CB
- Load CB
- Changeover will take place inside the New Main Metering and Changeover DB (refer LV electrical Part 2 above)

All CTs, wiring and mains sensing must be provided for, connected to the controller. CBs must be of the moulded case type, adjustable and complete with over-current and short-circuit protection.

The change-over mechanism must be able to detect a mains failure, break the normal supply before making connection to the generating set, and vice-versa. At no point may it possible to connect the mains and generator supply onto the same point. These control inputs to the changeover mechanism must be provided by the Controller.

The following system control must be available from the controller, integrated with the switchgear listed above:

- Off: the set is completely isolated, cannot start-up and safe for cleaning purposes
- Test: the set can be started and stopped, but cannot be switched onto the load, even with a power failure occurring
- Manual: the set must be started and stopped on the controller by means of dedicated buttons. A two-action process is however required transferring the generator to the load. The first step would be to start the set with the second step being the transfer of the load onto the generator. The stopping process must be the same, but in reverse.
- Auto: the set must start automatically when a power or phase failure is detected. The set must stop after normal power has been restored. Mains sensing must be done on the incoming normal CB side. Delay timers must be provided for both the starting and stopping scenarios, to prevent unnecessary starting and/or stopping of the set. Only

after this time delay must the generator start or stop and the changeover switch operate as required. An additional cooling period must be provided for, after the changeover switch is back on normal power, for the set to cool down. Should another power failure occur in this period, then the set must stop the cooling period and proceed as if from cold.

5.8 COMPLIANCE

Compliance to all local, national as well as health and safety requirements must be adhered to. This relates to signage and warning labels, fire extinguishers, material, and design selection as well as equipment spacing.

Any deviations required from the specification must be fully itemised and costed for in the tender offer.

5.9 TESTING

The complete set must be tested at the manufacturer's premised by the Contractor and confirmed in writing to the Engineer that the set is complete and compliant with the specification. The Engineer and Client will then visit the factory to test the set, before it goes to site. Any travelling, disbursement and testing costs, on behalf of the Client and Engineer, must be provided for by the Contractor, as part of their formal offer.

All protections must be simulated for operational correctness, change-over mains failure demonstrated, and load testing data provided for full load and overload conditions.

5.10 TRAINING, DRAWINGS AND MANUALS

Refer section 1 of the project specifications for submission and compliance requirements.

5.11 MAINTENANCE

Provision must be made for two maintenance trips to site during the retention period of the contract, per generating set. The trips must be carefully coordinated with the responsible Municipal personnel, so they can be in attendance and witness.

The maintenance actions performed must include replacement of all required filters, checking and topping up oil levels, running a full diagnostic of the various components, run the set for an hour and provide a formal report to the Client as to the current state and run-time of the set.

C3.5 Management

CONTENTS

3.5.1. FORMS FOR CONTRACT ADMINISTRATION
3.5.2. HEALTH AND SAFETY

3.5.1. FORMS FOR CONTRACT ADMINISTRATION

The Contractor shall complete, sign and submit with each monthly statement for payment, the following updated returns (the format of which are attached in C3.6 Annexes as amended from time to time):

a) Monthly Project Labour Report (Annex 1)
b) B-BBEE Sub-contract Expenditure Report (Annex 2)
c) Joint Venture Expenditure Report (Annex 3)

The Monthly Project Labour Report must include details of all labour (including that of sub-contractors) that are South African citizens earning less than **R350.00** per day, as adjusted from time to time (excluding any benefits), who are employed on a temporary or contract basis on this contract in the month in question.

In addition to the Monthly Project Labour Report the Contractor shall simultaneously furnish the Employer's Agent with copies of the signed employment contracts entered into with such labour, together with certified copies of identification documents, proof of attendance in the form of attendance register or timesheets as well as evidence of payments to such labour in the form of copies of payslips or payroll runs. If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it and proof of such acknowledgement shall be furnished to the Engineer.

The Monthly Project Labour Reports shall be completed and submitted in accordance with the instructions therein and copies of all submitted documents must be kept on site be made available to the employer's agent upon request.

The **B-BBEE Sub-contract Expenditure Report** is required for monitoring the prime contactor's compliance with the sub-contracting conditions of the **Preference Schedule**.

The Joint Venture Expenditure Report is required for monitoring the joint venture's compliance with the percentage contributions of the JV partners as tendered, where the joint venture has been awarded preference points in respect of its consolidated B-BBEE scorecard.

The Expenditure Reports shall be verified by the Employer's Agent/Employer's Agent's Representative.

In respect of Annexes 2 and 3, the Employer shall, in addition to any other sanctions available to it, apply the financial penalties applicable to breach of preferencing conditions in the **Preference Schedule** Preference Schedule in Part T2.2 Returnable Schedules. In the case of joint ventures (Annex 3), the contractor shall prove his compliance with item 6 in Section 2 of the Preference Schedule by providing a consolidated scorecard at his own cost on instruction from the Employer's Agent.

3.5.2. HEALTH AND SAFETY

Particular Specification C6: Health and Safety Specification is attached hereto.

Part C4: Site Information

PART C4: SITE INFORMATION 449

LANGEBERG MUNICIPALITY

TENDER NO. 46/2025

UPGRADING OF MCGREGOR WTW

SITE



The site is located outside McGregor approximately 0.4km.

LOCALITY PLAN 01

The coordinates below can be used for directions to the sites.

McGregor
33°57'21.32"S
19°49'9.35"E

GONDWANA GEO SOLUTIONS
Consulting Geotechnical Engineers & Engineering Geologists
Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975



Report to Lyners Consulting Engineers on a Geotechnical Investigation Upgrade of McGregor Wastewater Treatment Works, Western Cape

Project No.: 25-065R01

Date Issued: July 2025

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	PREPARED:
DATE:	**July 2025**
NAME:	**Mark Richter**
SIGNATURE:	

Report to Lyners Consulting Engineers on a Geotechnical Investigation Upgrade of McGregor Wastewater Treatment Works, Western Cape

1. INTRODUCTION

Gondwana Geo Solutions (Pty) Ltd (or GGS) was requested by Mr Henri Blignaut of Lyners Consulting Engineers to provide a cost estimate for a geotechnical investigation for the proposed upgrade of the Wastewater Treatment Works in McGregor, Western Cape. The cost estimate was submitted to Mr Blignaut who subsequently appointed GGS on the 28th May 2025 via Purchase Order C24193-02 to proceed with the investigation as proposed.

As required in the scope of works, three trial pits were dug at positions selected by Mr Blignaut. Dynamic probe (light) tests were also carried out adjacent to each trial pit. The trial pits were logged and sampled. Laboratory testing was carried out on selected samples.

This report contains the results of the geotechnical investigation as well as recommendations for earthworks, excavation requirements, lateral support, foundations, groundwater and materials classification and usage.

2. INFORMATION SUPPLIED

The following information was provided electronically for use in the investigation:

- Request for Quotation document *"24193C-04 RFQ for Geotechnical Investigation-Signed"*
- Google kmz file *"C24193 - Layout of Proposed Upgrades"*
- Google kmz file *"C24193 - McGregor WTW - Geotechnical Investigation"*

3. SITE DESCRIPTION

The McGregor Water Treatment Works is situated to the southwest of McGregor CBD, on the outskirts of the town. Entrance is off the gravel road which ultimately goes to the Riviersonderend Mountain Reserve. The site is largely flat but slopes to the east towards the catchment area of the two storage dams.

Trial pits TP1 and TP2 are located near the entrance to the WTW premises and near the existing settlement tanks, respectively, while TP3 is located at the base of the earth wall embankment and overflow trench of the upper storage dam wall, and near the shoreline of the bottom storage dam.

The site is shown in Figure 1 below.



Figure 1: General layout of the site including geotechnical test pit positions

The following plates provide a more detailed perspective of the site.





Plates 1 & 2: Location of trial pit TP1







Plates 3 to 5: Location of trial pit TP2



Plates 6 to 11: Location of trial pit TP3

4. FIELDWORK

The fieldwork was carried out on the 4th June 2025 and comprised the following:

- Test pits, and
- Dynamic Cone Penetrometer Light (DPL) tests

The positions of the above tests are shown in Figure 1 above.

4.1 Test Pits

Three test pits, designated TP1 to TP3, were excavated using a JCB 3CX Super TLB at the approximate positions shown in Figure 1 to allow soil identification and sampling of the insitu material.

The test pits were dug to refusal depths ranging between 0.60 and 1.90 metres below existing ground level (mbegl).

The test pits were profiled[1] by an Engineering Geologist and representative soil samples were recovered for later laboratory testing.

The detailed logs are attached in Appendix A summarised in Table 1 below.

Table 1
Summary of Test Pit Details

TP No.	Depth (mbegl)	Comments
TP1	0.60	0.00-0.05m: Stone gravel layer. Wearing Course. 0.05-0.60m: Yellow streaked brown and red highly weathered intensely laminated very closely jointed very soft becoming soft to medium hard rock with depth SILTSTONE. Gydo Formation. **Final depth at 0.60m. Refusal.** **No groundwater seepage.** **No sidewall collapse.**
TP2	0.80	0.00-0.60m: Slightly moist reddish brown medium dense to dense slightly silty gravelly SAND. Gravel comprises shale / siltstone pieces. Colluvium. 0.60-0.80m: Reddish brown streaked green highly weathered soft to medium hard rock SILTSTONE. Gydo Formation. **Final depth at 0.80m. Refusal.** **No groundwater seepage.** **No sidewall collapse.**
TP3	1.90	0.00-0.80m: Very moist brown soft becoming firm with depth sandy gravelly CLAY. Colluvium. 0.80-1.90m: Olive green streaked yellow intensely laminated very soft rock to soft rock SHALE. Gydo Formation. **Final depth at 1.90m. Refusal.** **Groundwater seepage at 1.10m.** **No sidewall collapse.**

Note: mbegl = metres below existing ground level



Plates 12 & 13: Soil profile TP3: clayey residual soils overlying relatively shallow weathered shales of the Gydo Formation: Note groundwater seepage

[1] Guidelines for Soil and Rock Logging in South Africa, *Proceedings, Geoterminology Workshop organised by AEG, SAICE and SAIEG*, 1990

4.2 Dynamic Cone Penetrometer Light (DPL) tests

Five Dynamic Cone Penetrometer (Light), or (DPL), tests, designated DPL1 to DPL3 and DPL3B and DPL3C, were carried out at the approximate positions shown in Figure 1 to determine the consistency of the soils underlying the site and possible depth to bedrock or a competent founding substrate.

The DPL test comprises a 25mm diameter solid steel retractable cone driven vertically into the ground using a 10 kg hammer dropped through a height of 550mm. The resistance to penetration is measured in terms of number of blow counts per 300mm advance. The DPL test can refuse on boulders, cemented layers as well as bedrock. Due to the nature of the test no soil samples are recovered from the DPL equipment.

The DPL tests were advanced to refusal depths of between 0.00 and 0.90 mbegl.

The results of the DPL tests, consisting of blow count and inferred consistency against depth are attached in Appendix B and summarised in Table 2 below.

Table 2
Summary of DPL Test Results

DPL No.	Depth (mbegl)	Comments
DPL1		Refusal
DPL2	0.30	Medium dense to 0.30m Refusal
DPL3	0.90	Very soft to 0.30m Soft to 0.60m Stiff to 0.90m
DPL3B	0.90	Soft to 0.60m Firm to 0.90m Refusal
DPL3C	0.90	Very soft to 0.30m Soft to 0.90m Refusal

Note: mbegl = metres below existing ground level

5. SITE GEOLOGY

The geology beneath the McGregor wastewater treatment works site is shown by the geological map applicable to the area[2], and consists of a thin, erratic mantle of transported soils overlying a thin horizon of residual soils and shale bedrock of the Gydo Formation of the Ceres Subgroup, Bokkeveld Group, Cape Supergroup.

From the results of the fieldwork the following typical geological profile can be inferred for the site:

Depth (m)	**Inferred Geology**
0.00-0.80m:	Very moist brown soft becoming firm with depth sandy gravelly CLAY. Colluvium.
0.80-1.90m:	Olive green streaked yellow intensely laminated very soft rock to soft rock SHALE. Gydo Formation.

From the results of the DPL tests the following general trend in soil consistency can be expected:

Soft to 0.60m
Firm to 0.90m
Very stiff >3m

[2] 1:250 000 Geological Map Series 3319 Worcester published by the Council of Geosciences

6. GROUNDWATER

Groundwater seepage was encountered in only one test pit, i.e. TP3 at a depth of 1.10m.

Note that the groundwater level at the time of investigation was at a seasonal low as the winter rains had not yet arrived. It can generally be expected that perched groundwater seepage will occur at the interface between the colluvial and residual soils and/or bedrock during or after the wet season and heavy rainfall events.

7. LABORATORY TESTING AND MATERIALS EVALUATION

7.1 Materials Usage

In order to classify materials and to assess their suitability for the construction of earthworks, pipe bedding materials and roads, the following laboratory testing was conducted on soils taken from the test pits.

- Foundation Indicator testing to determine Atterberg Limits, Particle Size Distribution and clay activity, and
- Compactibility factor tests

The results of the laboratory tests are provided in Appendix C and summarised in Table 3 below.

Table 3
Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and CBR tests

TP No	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Compactibility Factor	Classification & Activity
			Clay	Silt	Sand	Gravel	LL	PI	LS%			
TP2	0.00-0.60	Slightly moist reddish brown slightly silty gravelly SAND. Colluvium.	5	15	56	24	18.4	5.4	2.9	1.91	0.2237	A-1-b; SC; Anticipate G9 quality; Low heave; Type E Gravel Wearing Course
TP3	0.00-0.80	Very moist brown soft becoming firm with depth sandy gravelly CLAY. Colluvium.	23	26	46	5	25	10	4.6	0.95		A-5-6; CL; Low heave; Type A Gravel Wearing Course
	0.80-1.90	Olive green streaked yellow intensely laminated very soft rock to soft rock SHALE. Gydo Formation.	5	12	47	36	26.5	9.3	4	2.08		A-2-4; CL; Low heave; Type E Gravel Wearing Course

LL - Liquid Limit
PI - Plasticity Index
LS - Linear Shrinkage
GM - Grading Modulus
MDD - Maximum Dry Density
OMC - Optimum Moisture Content

Classification in Terms of:
AASHTO Soil Classification System [3]
Unified Soil Classification System[4]
COLTO[5]
Van der Merwe[6]
TRH20 (1990)[7]
Suitability for Gravel Wearing Course
A - Erodible Materials
B - Ravels and Corrugates
C - Ravels
D - Slippery when Wet
E - Good

[3] AASHTO Soil Classification System (from AASHTO M 145 or ASTM D3282): American Association of State Highway and Transportation Officials
[4] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006
[5] COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998)
[6] Van der Merwe, D M 1964. The prediction of heave from the plasticity index and percentage clay fraction of soils. *The Civil Engineer in South Africa*, 6(6): 103–107
[7] TRH20 (1990) - The Structural Design, Construction and Maintenance of Unpaved Roads, Committee of State Road Authorities

8. DEVELOPMENT RECOMMENDATIONS

8.1 Proposed Development

The proposed upgrade to the McGregor Water Treatment Works will comprise the following new works:

- Sludge dams
- Backwash recovery tanks
- Existing pump station to be upgraded
- New Filtration ponds, and
- New flocculator

8.2 Excavation Requirements

Location: Test Pits TP1 & TP2

In this part of the site the shale bedrock is very shallow, i.e. within 0.1m of the existing ground level, and resulted in refusal of the TLB excavator at about 0.6m below existing ground level. Thus, the materials beneath this area to about 0.6m depth classify as Soft Excavation[8]. Below this depth, excavation of the shale bedrock of very soft to soft rock strength is expected to classify as Intermediate Excavation.

Excavations may be cut to a slope not steeper than 1V:1.5H in the soil, and 1V:1H in the shale rock, respectively. It is important that where the shale bedding plane joints 'daylight' or dip into the excavation, the sidewalls be cut not steeper than the dip angle of the shales which is about 60 to 70 degrees in a southwest direction.

Location: Test Pit TP3

The shale bedrock caused refusal of the TLB excavator at 1.9m below existing ground level, thus the materials to this depth classify as Soft Excavation. Below this depth, excavation of the shale bedrock of very soft to soft rock strength is expected to classify as Intermediate to Hard Rock Excavation.

Excavations may be cut to a slope not steeper than 1V:1.5H in the soil, and 1V:1H in the shale rock, respectively. It is important that where the shale bedding plane joints 'daylight' or dip into the excavation, that the sidewalls be cut not steeper than the dip of the shales which is about 40 to 50 degrees in a southern direction.

Daily inspections of the slopes and excavation trenches should be made to ensure that they are safe for entry by workers.

8.3 Site Materials

The results of the laboratory tests yielded the following:

Colluvium (TP1 & TP2)

Soil Description: Reddish brown slightly silty gravelly SAND

- Clay = 5%
- Silt = 15%
- Sand = 56%
- Gravel = 24%
- Plasticity Index: 5.4
- Grading Modulus value of 1.91
- Classifications: A-1-b in terms of the AASHTO system and SC in terms of the Unified Soil Classification System
- Anticipate G9 quality (COLTO)
- TRH20 gravel wearing course classification: Type E (good)
- Compactibility factor = 0.23

[8] SANS634:2012: Geotechnical Investigations for Townships: pp16, Table 5 - Classification of material for machine excavation

Recommended Usage:

- This material is suitable for use as a selected subgrade material in the construction of roads and paved areas
- Material will be suitable for use as bedding material for cables, and buried flexible pipelines consisting of uPVC, HDPE and GRP, as well as steel and ductile iron pipes.
- It will be suitable as a backfill material behind retaining walls and structures.

Colluvium (TP3)

Soil Description: Brown sandy gravelly CLAY

- Clay = 23%
- Silt = 26%
- Sand = 46%
- Gravel = 5%
- Plasticity Index: 10
- Grading Modulus value of 0.95
- Classifications: A-5-6 and CL
- Less than G9
- Gravel wearing course classification: Type D (slippery when wet)

Recommended Usage:

- This material is a poor subgrade material, not suitable for use in the construction of roads and paved areas,
- Not suitable for pipeline bedding
- Suitable as a general backfill over pipelines or foundations
- It is relatively resistant to erosion, and may be used for landscaping and earth embankment walls for dams, flood defence berms, agricultural drains etc

Weathered Shale

Soil Classifications: Olive green streaked yellow intensely laminated very soft to medium hard rock SHALE.

- Clay = 5%
- Silt = 12%
- Sand = 47%
- Gravel = 36%
- Plasticity Index: 9.3
- Grading Modulus value of 2.08
- Classifications: A-2-4 and CL
- Gravel wearing course classification: Type E (good)
- Likely to classify as G9

Recommended Usage:

- This material will be suitable for use as a general subgrade material in the construction of roads and paved areas
- Not suitable for pipeline bedding
- Suitable as a general backfill over pipelines or foundations
- May be used for gravel wearing course (Type F)

8.4 Earthworks

The following general recommendations are made where earthworks are required for the formation of building platforms for the proposed structures.

- All earthworks to be carried out in accordance with SABS1200DM.
- The upper approximate 150 to 200mm of topsoil containing noticeable organic content should be removed and stockpiled for later topsoiling of fill banks or general landscaping purposes.
- All fills should be placed in layers not exceeding 300mm loose thickness, compacted to minimum 93% Modified AASHTO maximum dry density.
- Generally, all cuts will yield clayey materials. These sandy clays are very poor subgrade materials and when encountered they should be cut to spoil or stockpiled for landscaping purposes.
- Fills should be compacted with a stud-foot roller because of the clayey materials on site.
- Any boulders, builders' rubble or rock pieces in excess of 2/3 of fill layer thickness (i.e. larger than 200mm) encountered in the materials should be windrowed to spoil during fill construction.
- Final cut and fill slopes should not be steeper than 1V:1.5H, given the generally clayey composition of the site materials.
- All terraces and earthworks in general should be sloped to a gradient of not less than 1 vertical in 100 horizontal to prevent ponding and ingress of water into the subsoils.
- New fills should be benched into the insitu ground where natural slope gradients are steeper than 1V to 6H.
- Surface drainage should be directed away from the crests of fill embankments to prevent over-topping and erosion of fill slopes.
- Cut and fill slopes should be top-soiled and planted with grass as soon as possible after formation. This will limit erosion of the slopes, and the problems associated with wash-away of fill embankments.

8.5 Foundations

The following foundation recommendations are provided:

- Where possible all foundations should be placed in the weathered shale bedrock of at least very soft rock strength, which occurs at the following depths (metres below existing ground level):
  - TP1: 0.2mbegl
  - TP2 & TP3: 0.6 to 0.8mbegl

  A maximum allowable bearing pressure of 80kPa is recommended for the design of all foundations. Differential settlement for the structure founded in this way will be less than 5mm.

- Where localised bedrock levels occur deeper than the anticipated depths given above, the soils should be excavated to the bedrock and backfilled with a suitable sandy material such as from the general TP1 & TP2 site area, stabilised with cement, to required founding level. It should be compacted to at least 95% MDD. A minimum UCS = 0.75MPa is likely to be obtained by adding at least 5% cement by mass to the soil.

  A maximum allowable bearing pressure of 100kPa is recommended for the design of foundations resting on the stabilised soil mattress. Differential settlement for the structure founded in this way will be less than 5mm.

  If there is a shortfall of suitable material, then a material of say G8 quality will need to be imported to site.

  Note that appropriate cement stabilization tests on the soil are recommended to verify the required UCS value.

It is recommended that GGS inspect and approve the excavation to confirm depth of founding and bearing pressure.

8.6 Retaining Walls

The colluvial materials in TP1 & TP2 (northern part of the site near the entrance to the WTW works) are generally suitable for use as backfill to retaining walls, with the following shear strength parameters considered applicable (minimum compaction 93% MDD):

Angle of shearing resistance:	30^0
Cohesion	0 kPa
Bulk density	1 700 kg/m^3

Note: The weathered shale material in general and the more clayey materials from the area of TP3 should not be used as backfill materials.

8.7 Recommended Subgrade Treatment – Roads, Paved and Parking Areas

Paved Roads:
Given the relatively good subgrade quality of the soils beneath the areas of TP1 & TP2 of the site, being of estimated G9 quality (COLTO), the subgrade treatment beneath roads, paved and parking areas should comprise ripping to 300mm and re-compacting to minimum 93% MDD. A CBR value of 7 may then be adopted for design.

None of the materials in the TP3 area are suitable for use in the construction of paved roads. Suitable materials will need to be imported to this part of the site.

Unpaved Roads:
At TP1 & TP2 the insitu colluvial material may be used for gravel wearing course. The weathered shale may also be used although it may be slippery when wet.

At TP3 the colluvial materials are not suitable for use as a wearing course. Suitable materials will need to be imported to this part of the site.

9. CONCLUSIONS

This report contains the results of a geotechnical investigation carried out for the proposed upgrade of the Wastewater Treatment Works in McGregor, Western Cape. The proposed upgrade will comprise the following new works:

- Sludge dams
- Backwash recovery tanks
- Existing pump station to be upgraded
- New Filtration ponds, and
- New flocculator

The findings of the geotechnical investigation are presented.

The site geology consists of a thin, erratic mantle of transported soils overlying a thin horizon of residual soils and shale bedrock of the Gydo Formation of the Ceres Subgroup, Bokkeveld Group, Cape Supergroup. Bedrock occurs in the range 0.4 to 0.8m below existing ground level beneath the areas tested.

Recommendations are given for earthworks, excavations, foundations, materials usage and subgrade treatment.

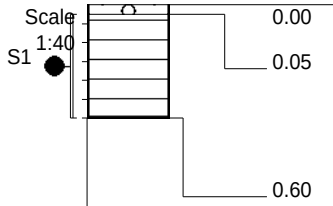
Finally, the ground conditions described in this report refer specifically to those encountered in the trial pits done on site. It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is therefore important GGS carry out periodic inspections of the earthworks and open foundation excavations. Any change from the anticipated ground conditions can then be taken into account to avoid unnecessary expense.

APPENDIX A

LYNERS CONSULTING ENGINEERS
McGregor Wastewater Treatment Works

HOLE No: **TP1**
Sheet 1 of 1

JOB NUMBER: 25-065



Stone gravel layer. Wearing Course.

Yellow streaked brown and red highly weathered intensely laminated very closely jointed very soft becoming soft to medium hard rock with depth SILTSTONE. Gydo Formation.

NOTES

1) Final depth at 0.60m. Refusal.

2) No groundwater seepage.

3) No sidewall collapse.

4) Samples taken :
S1 0.05--0.60m (1 x Bulk)

5) Joints are closed and dip 60-70/220 degrees.

CONTRACTOR :
MACHINE : JCB 3CX Super
DRILLED BY :
PROFILED BY : MVR

INCLINATION :
DIAM :
DATE : 04/06/2025
DATE : 04/06/2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP1**

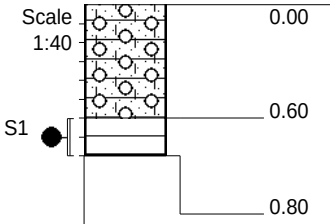
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LYNERS CONSULTING ENGINEERS
McGregor Wastewater Treatment Works

HOLE No: **TP2**
Sheet 1 of 1

JOB NUMBER: 25-065



Slightly moist reddish brown medium dense to dense slightly silty gravelly SAND. Gravel comprises shale / siltstone pieces. Colluvium.

Reddish brown streaked green highly weathered soft to medium hard rock SILTSTONE. Gydo Formation.

NOTES

1) Final depth at 0.80m. Refusal.

2) No groundwater seepage.

3) No sidewall collapse.

4) Samples taken :
S1 0.60--0.80m (1 x Bulk)

CONTRACTOR :
MACHINE : JCB 3CX Super
DRILLED BY :
PROFILED BY : MVR

INCLINATION :
DIAM :
DATE : 04/06/2025
DATE : 04/06/2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP2**

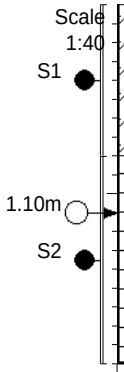
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LYNERS CONSULTING ENGINEERS
McGregor Wastewater Treatment Works

HOLE No: **TP3**
Sheet 1 of 1

JOB NUMBER: 25-065



0.00 Very moist brown soft becoming firm with depth sandy gravelly CLAY. Colluvium.

0.80 Olive green streaked yellow intensely laminated very soft rock to soft rock SHALE. Gydo Formation.

1.90

NOTES

1) Final depth at 1.90m. Refusal.

2) Groundwater seepage at 1.10m.

3) No sidewall collapse.

4) Samples taken :
S1 0.00--0.80m (1 x Bulk)
S2 0.80--1.90m (1 x Bulk)

5) Joints dip 45/175 degrees.

CONTRACTOR :
MACHINE : JCB 3CX Super
DRILLED BY :
PROFILED BY : MVR

INCLINATION :
DIAM :
DATE : 04/06/2025
DATE : 04/06/2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP3**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

DATE : 02/07/2025 07:33
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APPENDIX B

GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

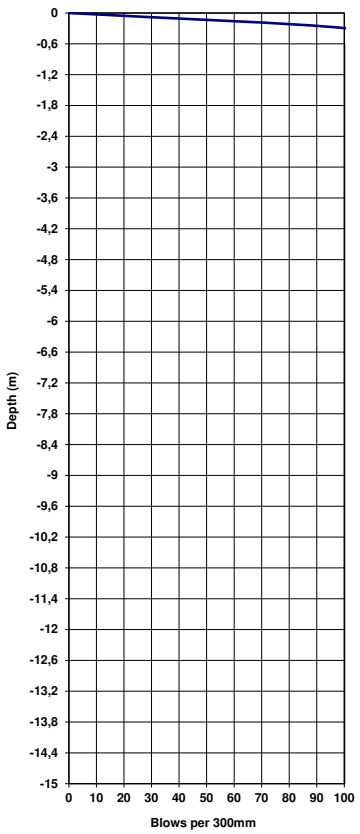
Client: LYNERS CONSULTING ENGINEERS
Project: McGregor Wastewater Treatment Works
Section:

Ref.No. 25-065
Date: 04/06/2025
Operator: PT

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 1***

Depth metres	Blows per 300mm	Inferred Consistency
0		
	Ref	

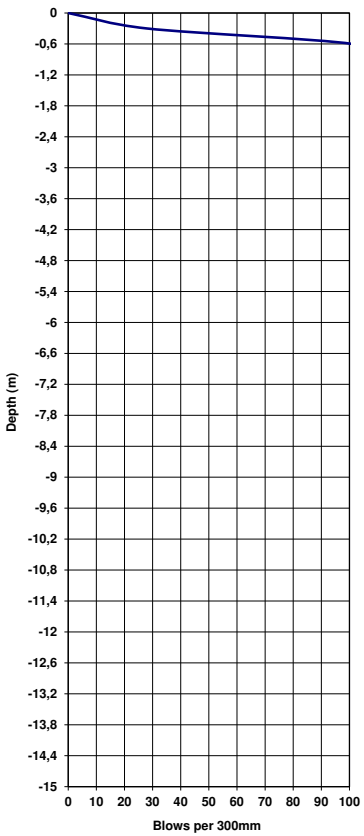
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 2***

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	28	Med.Dense
	Ref	

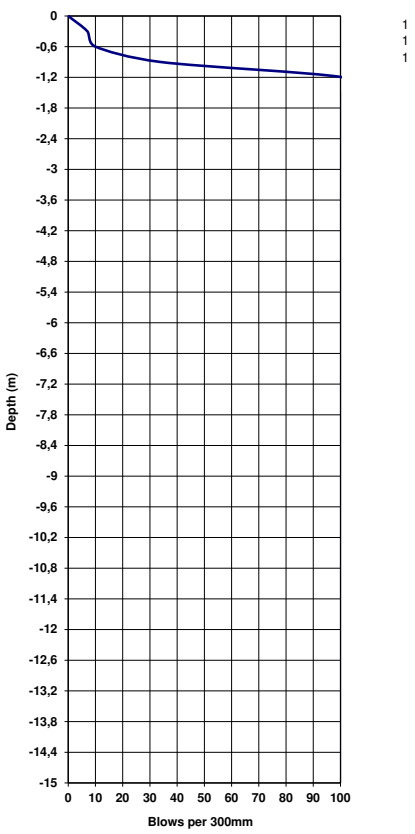
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 3***

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	7	Very Soft
0,6	10	Soft
0,9	34	Stiff
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: LYNERS CONSULTING ENGINEERS
Project: McGregor Wastewater Treatment Works
Section:

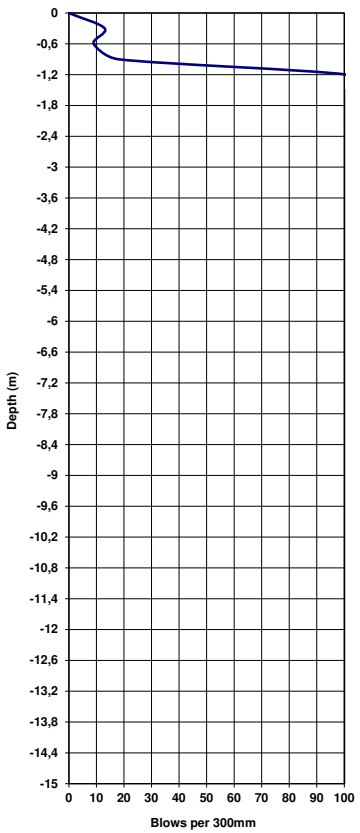
Ref.No. 25-065
Date: 04/06/2025
Operator: PT

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 3B**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	13	Soft
0,6	9	Soft
0,9	18	Firm
	Ref	

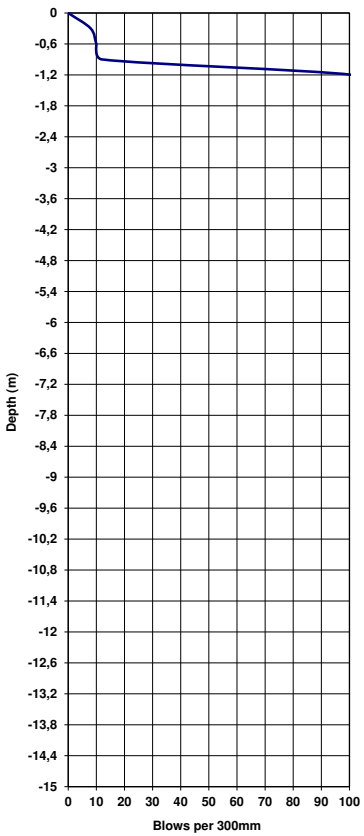


Light Dynamic Penetrometer Probe ---------- **Test No. DPL 3C**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	8	Very Soft
0,6	10	Soft
0,9	12	Soft
	Ref	

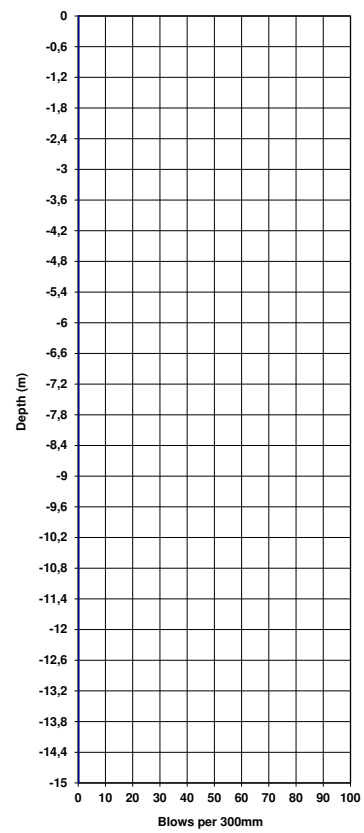


Light Dynamic Penetrometer Probe ---------- **Test No. DPL**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

APPENDIX C

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

sanas Testing Laboratory T0835

11 Gooderson Road Blackheath
PO Box 58 Blackheath 7581
Tel: 021 905 0435
Fax: 086 499 9482
Email: info@steynwilson.co.za
Web: www.steynwilson.co.za

Client: **Gondwana Geo Solutions**

Project: Mc Gregor WWTW

Attention: Mr M Richer

Your Ref. No: -

Date Reported Tuesday, 17 June 2025

TEST REPORT REFERENCE NUMBER / JOB NUMBER : SWL42999

Dear Sir / Madam

Herewith please find the original reports pertaining to the above mentioned project.

Test Requested

3 x FOUNDATION INDICATOR

1 x COMPACTIBILITY

Site Sampling and Materials Information

Sampling Method	*Specimens delivered to Steyn Wilson Laboratory.*
Environmental Condition	*Cold*
Deviation from the prescribed test method	*No deviation from standard test method.*
Responsibility of information disclaimer	*The sample information was received from the customer. Results apply to the sample as received from the Customer.*

FINAL REPORT

We would like to take this opportunity to thank you for your valued support.
Should you have any further enquiries please don't hesitate to contact me.

Yours Faithfully
STEYN-WILSON LABORATORIES (PTY) LTD

Mr. R.Wilson
Technical Signatory

Remarks:

1. Information contained herein is confidential to STEYN-WILSON PTY LTD and the addressee
2. Opinions & Interpretations are not included in our schedule of Accreditation.
3. The samples where subjected and analysed according to ASTM.
4. The results reported relate only to the sample tested, Further use of the attached information is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.
5. This document is the correct record of all measurements made, and may not be reproduced other than with full written approval from a director of STEYN-WILSON LABORATORIES (PTY) LTD.
6. Measuring equipment is traceable to national standards (Where applicable).
7. Should there be any deviation from the prescribed test method comments will be made thereof, pertaining to the test on the relevant materials report.
8. Uncertainty of measurement is calculated and corresponds to a coverage probability of approximately 95%. Available on request.
9. The decision rule states that the measurement of uncertainty can be applied by the customer to the test results, on request. It is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.

DIRECTORS: **Mr. J. Steyn ND-Civil (Managing) | Mr. R. Wilson B-Tech Civil (Operations)**

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

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Email: info@steynwilson.co.za
Web: www.steynwilson.co.za

Customer :	**Gondwana Geo Solutions**	Project :	Mc Gregor WWTW
	13 Rocklands Road	Date Received :	04 June 2025
	Simonstown	Date Reported :	17 June 2025
	7975	Req. Number :	-
Attention :	Mr M Richer	Date Sampled:	04 June 2025

FOUNDATION INDICATOR ASTM D422 : 2007

Material Description:	Slightly moist reddish brown slightly silty gravelly SAND. Colluvium	Sample Number:		42999/1	
Position:	TP2	Liquid Limit (Cassgranda SANS 3001 GR12)	**18,4**	Linear Shrinkage	**2,9**
Depth:	0,0-0,6m	Plasticity Index	**5,4**	Insitu M/C%	**6,1**

PH (TMH1 A20)		Conductivity s.m^{-1} (TMH1 A21T)	0,2237	SG (TMH1 A12T)*	2,636

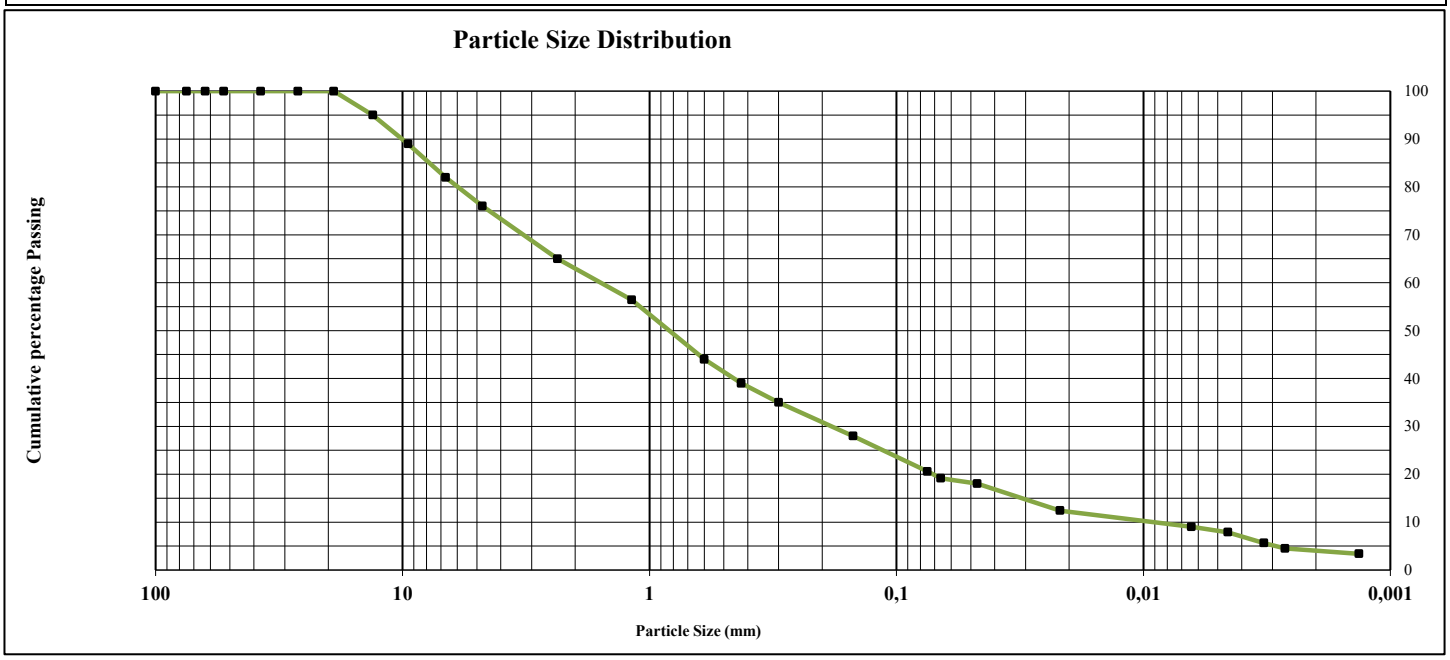
SIEVE ANALYSIS (TMH 1 A1a)*

100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075
100	100	100	100	100	100	100	95	89	82	76	65	56,4	44	39	35	28	20,6

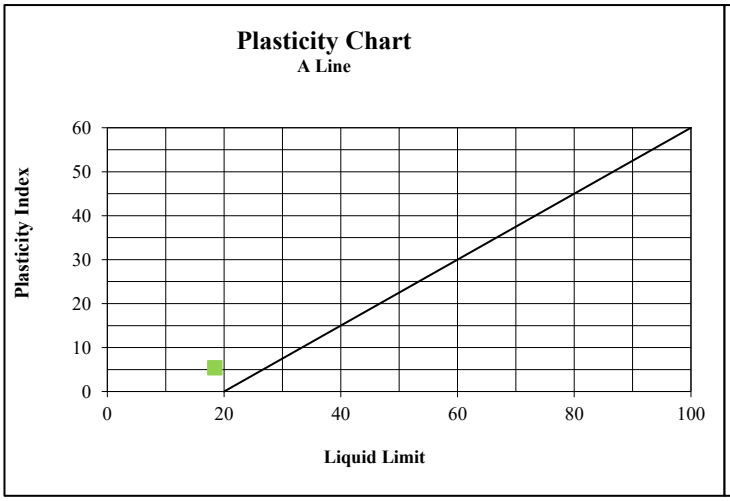
HYDROMETER ASTM D422

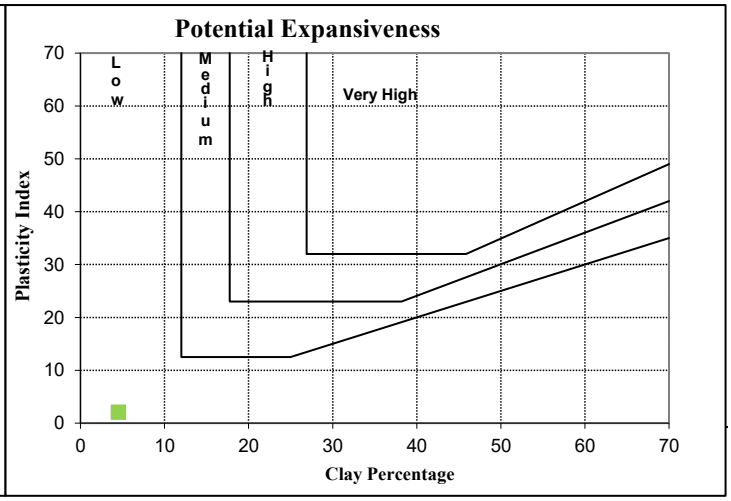
0,066	0,047	0,022	0,006	0,005	0,003	0,003	0,001
19,18	18,05	12,41	9,024	7,896	5,64	4,512	3,384

% Passing



% Gravel	24	% Sand	56	% Silt	15	% Clay	5





NOTE: All tests marked with (*) means that those test methods are not accredited.

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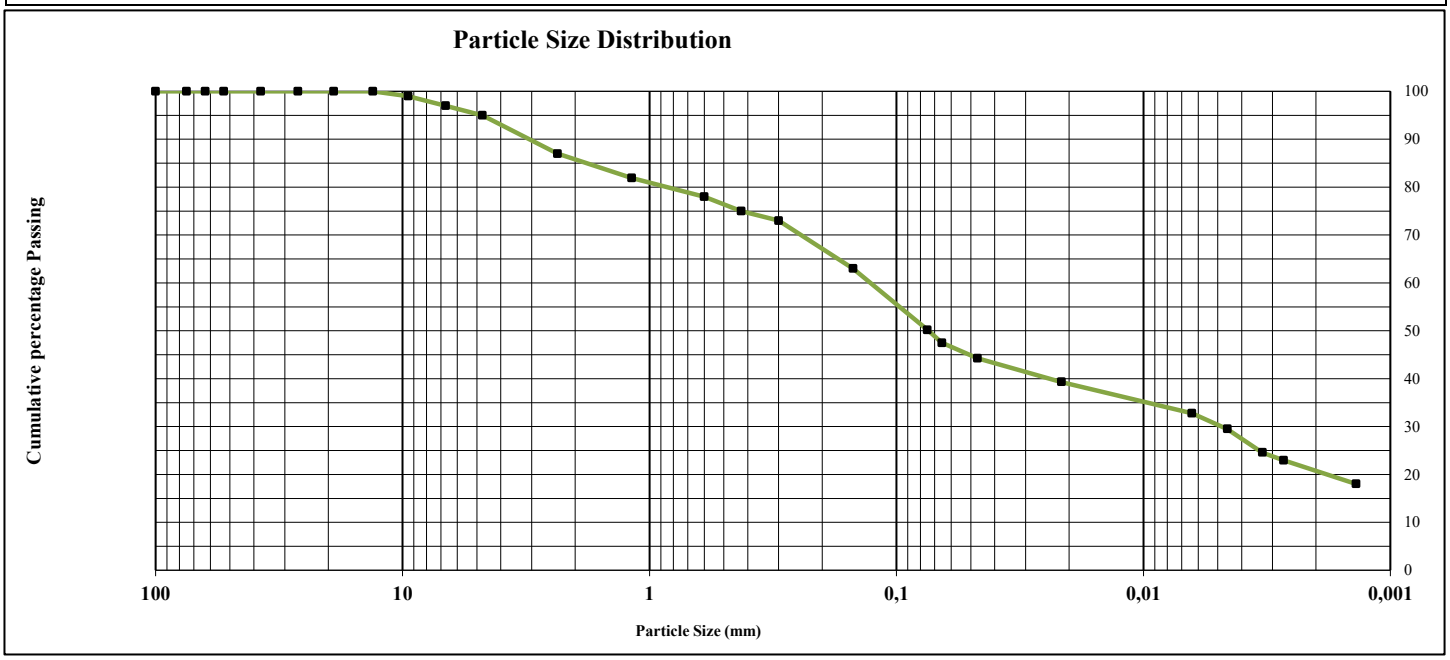
Customer :	**Gondwana Geo Solutions**	Project :	Mc Gregor WWTW
	13 Rocklands Road	Date Received :	04 June 2025
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	7975	Req. Number :	-
Attention :	Mr M Richer	Date Sampled:	04 June 2025

FOUNDATION INDICATOR ASTM D422 : 2007

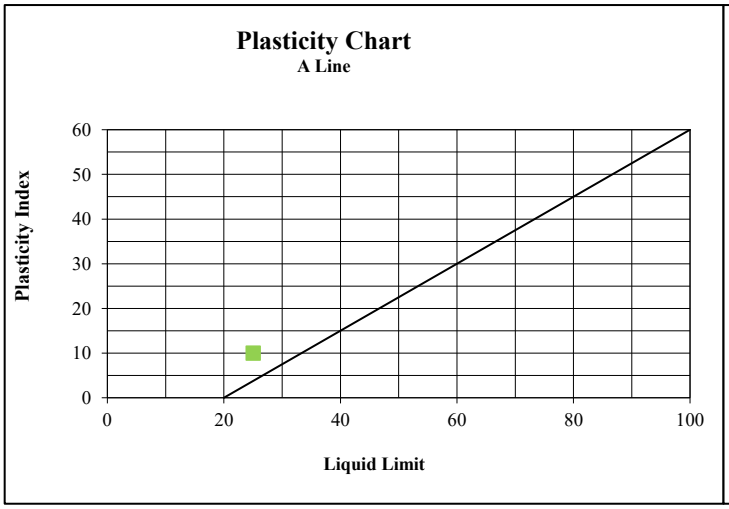
Material Description:	Very moist brown soft becoming firm woth depth sandy gravelly CLAY. Colluvium	Sample Number:	42999/2		
Position:	TP3	Liquid Limit (Cassgranda SANS 3001 GR12)	**25**	Linear Shrinkage	**4,6**
Depth:	0,0-0,80m	Plasticity Index	**10**	Insitu M/C%	**13,9**

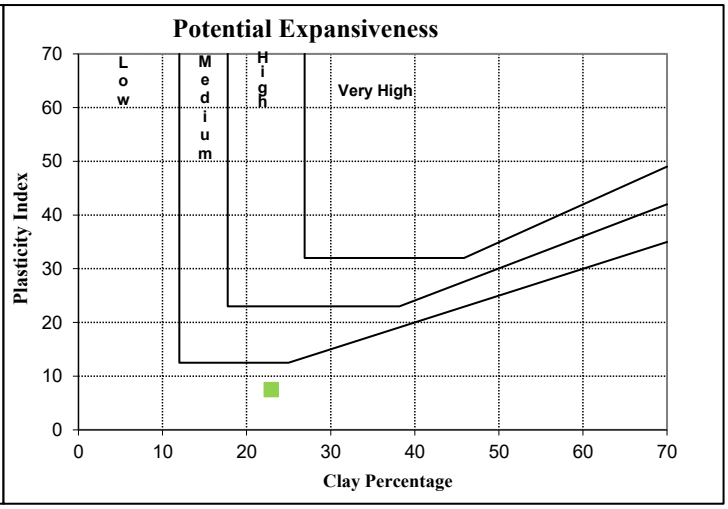
PH (TMH1 A20)		Conductivity s.m^{-1} (TMH1 A21T)		SG (TMH1 A12T)*	2,411

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,065	0,047	0,021	0,006	0,005	0,003	0,003	0,001
100	100	100	100	100	100	100	100	99	97	95	87	81,9	78	75	73	63	50,2	47,50	44,23	39,31	32,76	29,48	24,57	22,93	18,02
% Passing																									



% Gravel	5	% Sand	46	% Silt	26	% Clay	23





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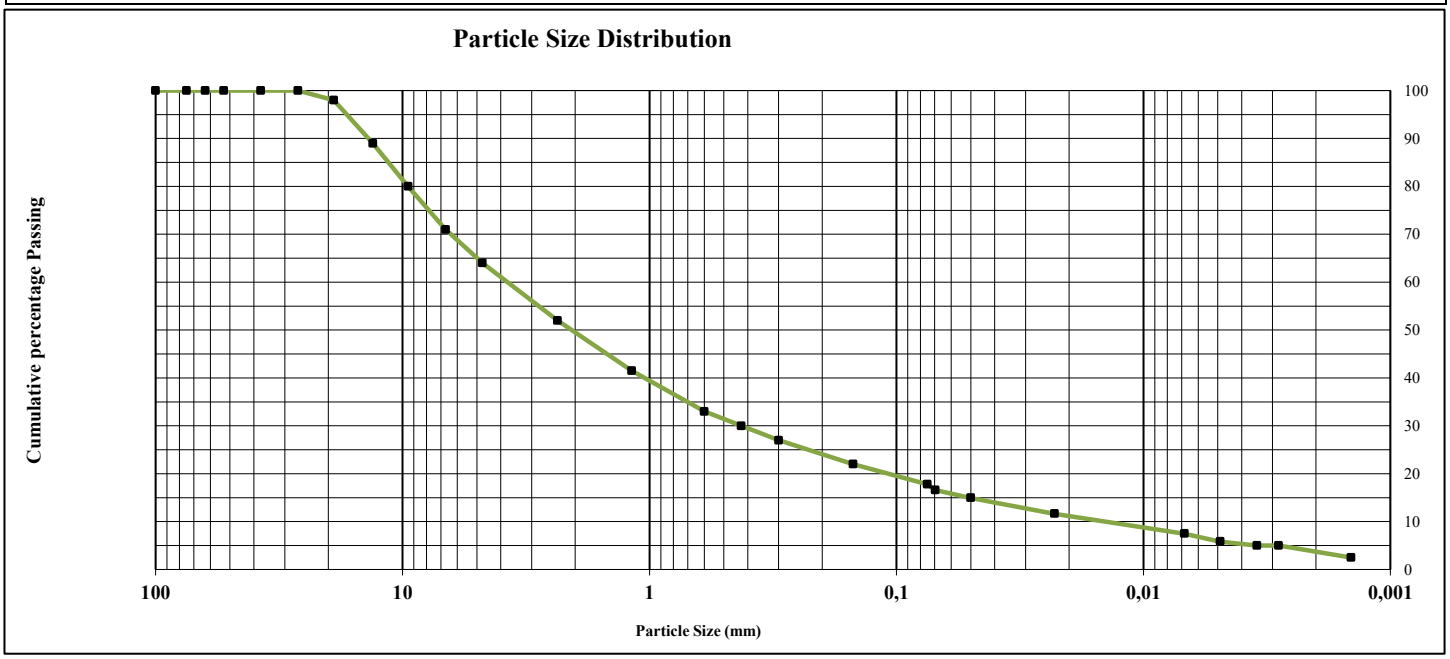
Customer :	**Gondwana Geo Solutions**	Project :	Mc Gregor WWTW
	13 Rocklands Road	Date Received :	04 June 2025
	Simonstown	Date Reported :	17 June 2025
	7975	Req. Number :	-
Attention :	Mr M Richer	Date Sampled:	04 June 2025

FOUNDATION INDICATOR ASTM D422 : 2007

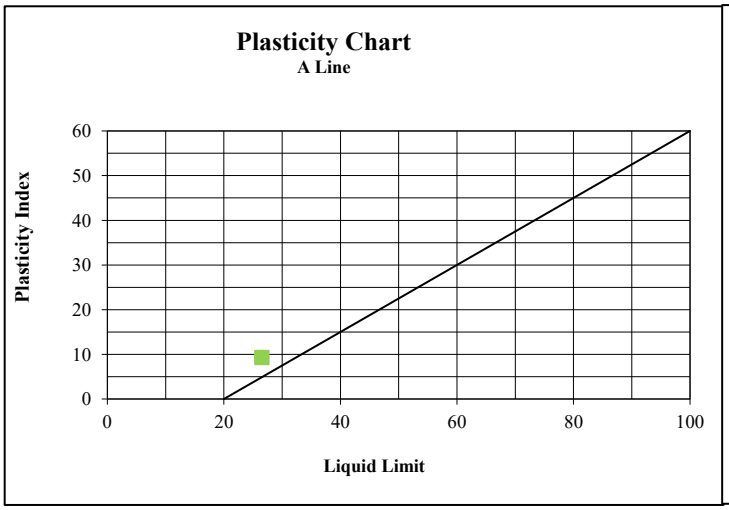
Material Description:	Olive green streaked yellow intensely laminated very soft to medium hard rock SHALE.	Sample Number:	42999/3		
Position:	TP3	Liquid Limit (Cassgranda SANS 3001 GR12)	**26,5**	Linear Shrinkage	**4**
Depth:	0,80-1,90m	Plasticity Index	**9,3**	Insitu M/C%	**14,9**

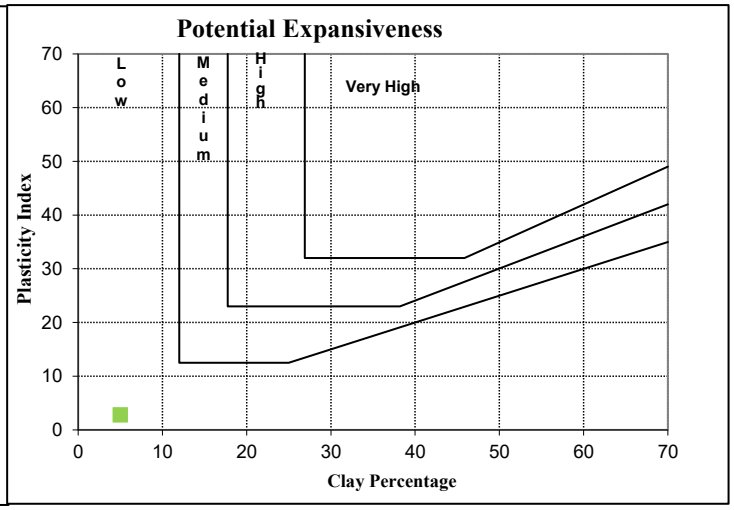
PH (TMH1 A20)		Conductivity s.m^{-1} (TMH1 A21T)		SG (TMH1 A12T)*	2,413

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,070	0,050	0,023	0,007	0,005	0,003	0,003	0,001
100	100	100	100	100	100	98	89	80	71	64	52	41,5	33	30	27	22	17,8	16,6	14,94	11,62	7,47	5,81	4,98	4,98	2,49
% Passing																									



% Gravel	36	% Sand	47	% Silt	12	% Clay	5





NOTE: All tests marked with (*) means that those test methods are not accredited.

Part C5: LANGEBERG Municipality Supply Chain Policy

PART C5: LANGEBERG MUNICIPALITY SUPPLY CHAIN POLICY 451

(The Supply Chain Policy can also be obtained from https://www.langeberg.gov.za)

Part C6: Health and Safety Specifications

PART C6: HEALTH AND SAFETY SPECIFICATIONS 166

CAIRNMEAD

HEALTH & SAFETY

Specification Report for

Project: Upgrading of McGregor WTW

Our Offices

Building C1
Waterkloofrand Corporate Park

358 Buffelsdrift Street
Erasmusrand
Pretoria, 0165

Contact Us

012 346 5752
admin@cairnmead.co.za

CAIRNMEAD

Health and Safety Specifications in terms of Construction Regulation 5 (1)(a) & (b)	REV	24 Oct 25
	Project Number	25386--HS-0001

The Principal Contractor will have to prove that they comply with the Occupational Health & Safety Act – Act 85 of 1993 and Regulations as well as all the incorporated safety standards, when appointed, by proving to the appointed Health and Safety Agent that they have a documentation management system to deal with all the aspects of the requirements of the Act, Regulations and Safety Standards. The Cairnmead representative will take photos of all the documents during documentation audits, personal records of all employees will only be taken once as example and all the details will be expected that the Principal Contractor keep record, these photo records will serve as a consolidation which can be submitted to the client at the end of the project. These photo records of the documents will be summarized by the Agent on a one-page document "Contractors Matrix" which will indicate the compliance status of the responsibilities of the Principal Contractor and their appointed Contractors (Sub-Contractors) audited at the time of the site visit once a month. Any non-compliance can result in a specific activity of the Contractor being stopped, and that stoppage will be for the account of the Principal Contractor or the appointed Contractor. The Health and Safety Agent will do audits on-site at agreed intervals to determine whether the Principal Contractor and the appointed Contractors do comply with the legal requirements. Cairnmead has developed a site auditing system to measure the compliance of sites, this is called high-risk activities, we have identified 16 high-risk activities that commonly occur on sites and the front page of the report provides the high-risk activity statistics for the project. It is expected from the Principal Contractor and appointed Contractors to supply their employees all the required personal protective equipment and clothing required for the applicable task.

This specification is copyrighted by Cairnmead and should not be copied, in full or partially, or used for any other purpose than the original intended purpose for the specific project.

1. Project Information

1.1. Project Name: Upgrading of McGregor WTW

1.2. Client Name: Langeberg Municipality

1.3. Project Address: N/A

1.4. Principal Contractor: Tender

2. List special conditions on site:

2.1 (The special conditions on site are items that need special attention or items that are agreed upon between the Client and Principal Contractor or principal contractor and Contractor before the start of the construction activities, for example, underground services, overhead power lines, site access control (fencing), etc.

3. Construction Work Permit

Is applicable due to the duration of the contract.

4. Notification of Construction

4.1 The Principal Contractor must submit a Notification of Construction to the Department of Labour in the form of Annexure 2 at least 7 days before the work is carried out.

4.2 The Principal Contractor must upon receipt of the stamped Notification of Construction ensure that it is placed in their Health and Safety file and made available upon request.

5. Client Documentation

5.1 The Principal Contractor must on receipt of the Client's baseline risk assessment ensure that is signed off by the Construction Manager and placed in their Health and Safety File and made available upon request.

5.2 The Principal Contractor must ensure that the Client Health and Safety Specification is included in the tender documentation sent out to all protentional sub-contractors in the tender phase of the project.

5.3 The Principal Contractor must ensure that the Baseline Risk assessment is included in the tender documentation from their side.

5.4 The Principal Contractor will be appointed under CR5(1)(k) in writing, the Principal Contractor will ensure that this appointment is placed in their Health and Safety File and made available upon request.

5.5 The principal contractor should provide their health and safety file to Cairnmead at least one week before the commencement of work, for a file approval audit to be conducted, this is to ensure that the file is compliant before work commencing on site to prevent any delays in the starting of the project.

5.6 Cairnmead will keep a record of the Health and safety documentation on the Contractor matrix to report on the legal requirements of the site. The Contractor matrix got an assessment with it and these assessments will be done every month (See Annexure 1 attached to this document for guidelines on the legal compliance audit).

5.7 The Principal Contractor must ensure that a close-out report is issued to Cairnmead within three working days after a Cairnmead report was issued to the site.

5.8 Cairnmead has developed a site auditing system to measure the compliance of sites, this is called high-risk activities, we have identified 16 high-risk activities that commonly occur on sites and the front page of the report provides the high-risk activity statistics for the project, when issued with this report the principal contractor and contractor should close out the report within three days after the issue date of the report.

5.9 The Principal Contractor should ensure that Project monthly statistics (Principal Contractor and all subcontractors) are recorded in writing regarding the hours worked, near-miss incidents, first aid cases, medical treatment, lost time incidents, etc. Cairnmead will collect these statistics from the Principal Contractor. (See Annexure 2 attached to this document that can be used as guidance regarding the collection of site statistics).

5.10 The Client must in cases where a substantial risk exists that the workplace may be flooded, take measures to be informed forthwith of any imminent flooding risk.
The Client shall take measures to be informed of any imminent flooding from constructions for conserving water, or which may cause water to converge or accumulate on the premises, and shall, prior to the erection of such a construction, give notice in writing to all persons situated in the danger zone below such construction of the possibility of flooding owing to such construction.

5.11 The Principal Contractor and their appointed Contractors must take note that if it is found that an employee committed an unsafe act or caused an unsafe condition on-site Cairnmead will take action against the foreman/management/legal appointee responsible for this activity. The most likely action will be that Cairnmead will instruct the foreman/management/legal appointee in question to stop that activity with immediate effect. It will not be tolerated that management allows unsafe conditions and acts on site.

6. Duties of the Designer

6.1 All Appointed Designers will take into consideration the requirements of the OHS Act, applicable Regulations, By-laws and Health and Safety specifications in their designs.

6.2 All Appointed Designers must before the tender phase ensure that a report is issued to the client outlining the health and safety information applicable to the structure that may influence the costing, the Load that the structure is designed to with stand, and where appropriate the geotechnical science aspects of the project.

6.3 All Appointed Designers will in writing inform the Client of any Hazards or damages in the building prior to and during the project should they arise on a later stage of the project and supply the client and the contractor intended for the task with the relevant information to ensure that work is safely executed.

6.4 Any Temporary Work Designer must ensure that all structures designed are done in the manner that such structure can support all anticipated lateral and vertical loads that may be applied and identified in such design.

6.5 Any Temporary Work Designer must ensure that such design is done in close reference to the structural design.

6.6 Any Temporary Work Designer must ensure that a record is kept of all drawings and calculations about such design and made available upon request.

6.7 All Appointed Designers will be required to sign a design declaration for the intended designs if the project will be working under a construction permit.

6.8 All appointed Designers must ensure that they take Regulation 6 (Duties of designers, manufacturers, importers and suppliers) of the Noise Exposure Regulations, 2024 into consideration and incorporate into their design when designing the building.

6.9 All appointed Designers must ensure that they take Regulation 5 (Duties of designers, manufacturers, importers and suppliers) of the Physical Agents Regulations, 2024 into consideration and incorporate into their design when designing the building.

6.10 As per the Government Gazette - 6 March 2025: notice regarding amendment to General Safety Regulations, the appointed Designers must ensure that they take the regulation into consideration and incorporate into their design when designing the building.

7. Principal Contractor and Contractors

7.1 The Principal Contractor is to ensure that a medical fitness certificate, in the form of an Annexure 3 issued by a registered Occupational Practitioner is available for every employee on site, the medical fitness certificates are to be kept secure at all times. As part of the Incident Management Procedure there must also be a written procedure available to indicate how the certified ID copies and next-to-kin information of each individual will be made available during an incident on site where such information will be needed, the procedure must outline who can be contacted to access the information for each Contractor working on site, and where the information will be kept to secure the privacy of each individual.

7.2 The Principal Contractor must implement a documented medical screening programme as per Noise Exposure Regulations, 2024, specifically Regulation 9, for any employee who may be exposed to noise at or above the noise-rating limit or noise action level, particularly when there is simultaneous exposure to ototoxic chemicals and/or whole-body vibration. Additionally, for vulnerable employees, the employer must seek the opinion of an occupational medicine practitioner to assess whether medical screening is necessary.

7.3 The Principal Contractor must ensure compliance with Regulation 14 of the Noise Exposure Regulations, 2024, regarding the maintenance of records.

7.4 The Principal Contractor must implement a physical agent exposure monitoring programme as per Physical Agent Exposure Regulations, 2024, where required in terms of Regulation 7 of Physical Agent Exposure Regulations.

7.5 The Principal Contractor must ensure an employee is placed under a documented medical screening programme if required in terms of Regulation 8 (Medical screening and medical surveillance) of the Physical Agent Exposure Regulations, 2024 and that all requirements which is applicable in terms of the regulation are complied with.

7.6 Where applicable, the Principal Contractor must ensure that cold stress is eliminated at the source if reasonably practicable and if this cannot be done, then the requirements of Regulation 9(2) of the Physical Agent Exposure Regulations must be complied with.

7.7 Where applicable, the Principal Contractor must ensure that heat stress is eliminated at the source if reasonably practicable and if this cannot be done, then the requirements of Regulation 10(2) of the Physical Agent Exposure Regulations must be complied with.

7.8 The Principal Contractor must ensure that they provide illumination in the workplace / construction site in the form of either natural light, artificial light or a combination thereof, and that the illumination complies with the Regulation 11 of the Physical Agent Exposure Regulation.

7.9 Where applicable, the Principal Contractor must ensure that risk of exposure to hazardous biological, chemical and physical agents impacting indoor air quality is eliminated at the source, where reasonably practicable as required in terms of Regulation 12 (1) of the Physical Agent Exposure Regulation. Where this is not reasonably practicable, the Principal Contractor must control indoor air quality to guidance levels as required in terms of Regulation 12(2) of the Physical Agent Exposure Regulation.

7.10 Where applicable, the Principal Contractor must ensure that hand-arm vibration or whole-body vibration is eliminated at the source, where reasonably practicable as required in terms of Regulation 13(1) of the Physical Agent Exposure Regulation. Where this is not reasonably practicable, the Principal Contractor must take relevant action as required in terms of Regulation 13(2) and 13(3) of the Physical Agent Exposure Regulation.

7.11 The Principal Contractor must ensure compliance with Regulation 18 of the Physical Agent Exposure Regulation, 2024, regarding the maintenance of records.

7.12 The Principal Contractor is responsible for the access/security control to the construction site and only persons with a unique identification, which they have received during the induction for the site, must be allowed into the site and this includes the Client representative and the professional team. This induction must include as a minimum emergency procedure what construction activities are currently on site, and how a person must identify and behave to not be exposed to this hazard. The Principal Contractor must however ensure that every person on site can be identified by means of a tag/access card or the construction company name on their overalls.

7.13 Before any commencement of work, the Principal Contractor must submit proof that they are in Good Standing with the Compensation Fund, such documentation must be kept in their Health and Safety file and made available upon request.

7.14 The Principal Contractor must ensure that before the commencement of any contractors they are in Good Standing with the Compensation fund, such documentation must be kept in their Health and Safety file and made available upon request.

7.15 The Principal Contractor will appoint all Contractors under CR7(1)(c)(v) in writing and ensure that this is placed on their Health and Safety file and made available upon request.

7.16 The Principal Contractor will ensure that a signed Sect 37(2) Mandatary agreement is available between the Principal Contractor and their appointed contractors, and a copy of such agreement is placed in their Health and Safety file and made available upon request.

7.17 The Principal Contractor will ensure that an approved copy of their Health and Safety Plan which has been communicated to all employees is available in their Health and Safety File.

7.18 The Principal Contractor will ensure that their contractor's Health and Safety Plans have been approved and a copy of such Health and Safety Plan which has been communicated to all employees is available in the Health and Safety File of each contractor.

7.19 The Principal Contractor along with their appointed Contractors will ensure that a Health and Safety Policy which has been signed off and communicated is placed in their Health and Safety File and made available upon request.

7.20 The Principal Contractors will conduct health and safety audits and document verification with their Contractors, this will be placed in their Health and Safety file and made available upon request.

7.21 The principal contractor will in the case of found unsafe activity stop such activity which is not by the Safety Regulations and by-laws, the Client's specification, and the Principal Contractors Health and Safety Plan.

7.22 The Principal Contractor must ensure that all Health & Safety files are updated for the month during the first week of the month.

7.23 Task-specific PPE is required to be used for specific scope of work, such as welding, working at heights, confined space work, etc. These PPE requirements must be addressed in the task-specific risk assessment of each contractor.

7.24 Pre-task analysis is to be completed by each contractor to ensure that sufficient task planning is done regarding PPE, equipment, and tools required for each task.

7.25 As per Construction Regulation 7, the principal, contractor must ensure that they audit the health & safety files of their contractors at least once every 30 days.

8. Management and Supervision on Site

8.1 The Principal Contractor must appoint in writing a full-time Construction Manager in terms of CR8(1) who will be responsible for managing all construction work on a site. This appointed Construction Manager must have the required formal tertiary qualifications relevant to construction management or be registered as a Construction Manager with the SACPCMP.

8.2 The Principal Contractor and their appointed Contractors must appoint in writing a Construction Supervisor in terms of CR8(7) who will be responsible for supervising all construction work on site

8.3 The Principal Contractor must always have supervision on site for all construction activities then, which include work after hours and weekends, under no circumstances may a subcontractor be allowed on site without supervision being available from the appointed principal contractor.

8.4 The Principal Contractor must in writing appoint a Part Time Health & Safety Officer (registered with SACPCMP) to monitor the Health and Safety compliance on site.

9. Risk Assessments

9.1 The Principal Contractor and his appointed Contractor must in writing appoint a Risk Assessor in terms of CR9(1) whose competency is in line with the required unit standard.

9.2 The Principal Contractor and his appointed contractor must have a Risk Assessment which is compiled based on their methodology and processes, for each of the items as listed in the Clients Baseline Risk Assessment, to reduce the high rating of the activity which will be placed in their Health and safety file and made available upon request.

9.3 The Principal Contractor and his appointed contractor must ensure that all their activities are addressed in the site and task-specific risk assessments and must be available in their Health and Safety File.

9.4 The Principal Contractor and his appointed contractor must ensure that all method statements, risk assessments safe work procedures, and, job hazard analyses are signed off by the risk assessor, construction manager, and construction supervisor, and proof of this must be available in their Health and Safety File.

9.5 The Risk Review and Monitor Plan must also be available in the Health and Safety File.

9.6 The Principal Contractor and their appointed Contractor must ensure that all Method Statements, Risk Assessment and Safe Work Procedures, and Job Hazard Analysis have been communicated to all employees and proof of such communication is placed in their Health and Safety file and made available upon request.

9.7 As part of the risk assessments the contractors are to ensure that they include in their risk assessments the following items that may require permits from the principal contractor before the work can commence; hot work, confined space entry work, excavation work, critical lifting/rigging, energized electric work, working at heights, ladders, and energy isolation.

9.8 Apre-task analysis shall be completed for each task prior to starting the task and prepared with the employees who will be involved in the task.

9.9 The Principal Contractor must in respect of the workplace / construction site under their control, cause a noise exposure risk assessment to be done as far as is reasonably practicable, before exposure to noise and then thereafter where applicable at intervals not exceeding 24-months. This risk assessment must be conducted by a competent person.

9.10 The Principal Contractor must ensure that Regulation 7(2), Regulation 7(3), Regulation 7(4) and Regulation 7(5) of the Noise Exposure Regulations, 2024 is taken into consideration and complied with regarding the noise exposure risk assessment.

9.11 The Principal Contractor is responsible for ensuring the implementation of a noise exposure monitoring programme if the noise exposure risk assessment, or a review of the assessment, reveals that any employee may be exposed to noise levels at or above the noise-rating limit or the noise action level, especially when there is simultaneous exposure to ototoxic chemicals and/or whole-body vibration, as outlined in the Noise Exposure Regulations.

9.12 The Principal Contractor must ensure that Regulation 8(2), Regulation 8(3), and Regulation 8(4) of the Noise Exposure Regulations, 2024 is taken into consideration and complied with regarding the noise exposure monitoring.

9.13 The Principal Contractor must ensure when applicable as per Regulation 6 (Physical agent exposure risk assessment) of the Physical Agents Regulations, 2024 that a documented physical agent exposure risk assessment is conducted as far as is reasonably practicable, before exposure to a physical agent; thereafter where applicable at intervals not exceeding 24-months and this risk assessment must be conducted by a competent person.

9.14 The Principal Contractor must ensure the physical agent exposure risk assessment includes at least all items as listed in Regulation 6(2) of the Physical Agents Regulations, 2024.

9.15 The Principal Contractor and his appointed contractors must ensure that all risk assessment templates include the tasks being performed, hazard and risks, raw or initial risk ratings, control measures / preventative measures and residual risk ratings.

10. Fall Protection

10.1 The Principal Contractor must in writing appoint a Fall Protection Plan Developer in terms of CR10(1)(a) whose competency is in line with the required unit standard to develop a Site-Specific Fall Protection plan in line with CR10(2).

10.2 The Principal Contractor and their appointed Contractors must ensure that the Construction Manager CR8(1) has a copy of such Fall Protection Plan.

10.3 The Principal Contractor and their appointed contractors must ensure that all employees at a fall-risk position, have in place a valid working at heights training certificate which has been done in line with the required SAQA unit standard.

10.4 The principal and their appointed Contractors will ensure that all fall arrest equipment is inspected by a competent person before use and recorded on a register which will be kept in the Health and Safety file and made available upon request.

10.5 The fall arrest equipment used must be fitted with a self-rescuing kit where it is not possible for an alternative rescue method to take place due to height or location

10.6 The Principal Contractor and their appointed contractors will ensure that all fall arrest equipment will be hooked at all times on a structure or similar secured anchorage point that has been approved as suitable with the necessary stability and sufficient strength to safely support the equipment and any person who could fall. A 100% tie-off is required if a worker will be working at a fall risk position of 1.8 meters or greater, measured from the floor to the feet of the employee where the employee cannot be safeguarded from the fall risk.

10.7 Fall risk positions must be barricaded/fenced with a solid material (for example scaffold tubing, not just plastic barricading) at a height of 1 m, the use of safety netting is not permitted as a sole means of fall protection.

10.8 The Principal Contractor must have a daily inspection record on site for the barricading of all fall dangers specific to each fall risk area identified.

10.9 Any openings in a floor or roof not otherwise protected by a handrail must be closed and secured with a solid guarding or cover system.

10.10 All edge barricading used on site must be of solid material, if scaffold tubing or a similar method is being used, it must be installed that a knee and handrail are fitted, scaffold tubing or similar material must also be securely fixed to the posts being used.

10.11 Drop-off edges of decking, and all platforms must be fitted with toe-boards to prevent material from falling from the edges onto working areas below, where these toe-boards are not able to be used. An exclusion zone must be demarcated below the required working area to prevent any employees from accessing the area while the work is taking place on the level above.

10.12 Exclusion zone planning must be done when activities are planned for the day/week to ensure that high risk work areas are securely closed off to restrict access to the high-risk activity.

10.13 The employees conducting any steel erection are prohibited from climbing of columns and all steel erection employees must always maintain 100% tie-off while at a fall risk position of 1.8metres or greater, measured from the floor to the feet of the employee.

10.14 Overhead work required to take place must be planned in such a manner that exclusion zones are created to prevent access below the working area, tools used while working in overhead positions should also be tied-off and secured at all times

10.15 The Principal Contractor will ensure that all work at heights which is exposed to the elements will be stopped at the immediate sign of inclement weather conditions or any hazardous health and safety conditions.

11. Structures

11.1 A Contractor must take all reasonable steps to prevent an uncontrolled collapse of an existing or new structure.

11.2 Ensure that a structure is not bearing any additional weight over the limit which has been indicated by the Designer or Engineer.

11.3 All designs issued for construction intended for such structure is kept on site and made available upon request.

11.4 The Client must ensure that the structure is inspected periodically by a competent person to ensure the safety of such structure for further use.

11.5 The Client must ensure that any new structure for the first 2 years inspected at least every 6 months by a competent person and at least once a year after the first 2 years.

11.6 The Client must ensure that record is kept of the maintenance and inspections of such structure and made available upon request

12. Temporary Works

Not Applicable

13. Excavations

13.1 All excavations must be barricaded/fenced with a solid material (for example scaffold tubing, not just plastic barricading) with a minimum height of 1 meter. if scaffold tubing or a similar method is being used, it must be installed that a knee and guard rail/handrail is installed at the open edges. The scaffold tubing or similar material must also be securely fixed to the posts being used.

13.2 The Principal Contractor will in writing appoint a competent person as per Regulation to supervise all excavation work on site who will evaluate as far as reasonably practical the stability of the ground before the excavation work begins.

13.3 The Principal Contractor will have a daily inspection record of excavations showing the integrity of the soil and that requirements are followed and checked as per all applicable regulations on-site.

13.4 The Principal Contractor will not allow any person to work or enter any unsafe excavation which has not complied with all requirements as per Construction Regulation 13.

13.5 No spoil material may be permitted to be placed on the edge of the excavation within at least 1 meter from the excavation edge.

13.6 Safe and secured means of access must be provided to each excavation and may not exceed 6 meters from the point where any person is working inside the excavation.

13.7 The contractor is responsible for locating services and utilities prior to commencing with excavation work, these services or utilities must be clearly marked, and measures should be implemented to safeguard the employees from the services or utilities.

13.8 Where a Deep Excavation is taking place, the Principal Contractor must ensure that there is safe and secured pedestrian access created to ensure that the safety of pedestrians is not affected, and separation of pedestrians and construction vehicles must be implemented as far as is reasonably practicable, especially at the access areas to the site.

13.9 Access on the ramp must also be controlled by means of stop / go operations, the employees selected for this purpose must be appointed and trained. No pedestrians can be allowed on the ramp if there is a vehicle driving on the ramp at the same time.

13.10 If the walkway as described above is not practical, then access scaffold stairs must be provided.

13.11 The ground conditions of all excavations must be assessed and precautionary measures in terms of shoring, bracing or similar means must be implemented before employees can be allowed inside and excavation should the ground conditions require such measures.

13.12 The contractor conducting excavation work must have a detailed rescue plan available in case of an emergency for assisting and rescuing any employees inside the excavation.

14. Demolition Works

Not Applicable

15. Tunnelling and Confined Space

Not Applicable

16. Scaffolding

Not Applicable

17. Suspended Platforms

Not Applicable

18. Rope Access Works

Not Applicable

19. Material Hoist

Not Applicable

20. Bulk Mixing Plants

Not Applicable

21. Explosive Actuated Fastening Device

Not Applicable

22. Cranes and Lifting Equipment

22.1 Whenever making use of an external Contractor to do lifting work the Principal Contractor must ensure that the operator is competent and appointed in writing.

22.2 Before using any lifting machines or tackle the operator should inspect it and confirm is it suitable for use.

22.3 All lifting machines must have in place proof of LMI inspection by an accredited person/company at intervals not exceeding 12 months.

22.4 The Principal Contractor and their appointed contractor must ensure that all lifting equipment is inspected at intervals not exceeding 3 months by a competent person with a valid training certificate in line with the required SAQA unit standard and appointed in writing.

22.5 All lifting tackle should be recorded on a register.

22.6 All hooks shall be fitted with a safety latch/catch. Hooks may never be used until a damaged latch is replaced.

22.7 Alock out system should be implemented to ensure that only an approved operator/user who is competent can obtain access to lifting machines.

22.8 All lifting tackle should be conspicuously and clearly marked with identification particulars and the maximum mass load that it is designed for.

22.9 No person shall be moved or supported by means of a lifting machine unless such a machine is fitted with a cradle approved by an inspector.

22.10 Atrained and certified banksman must be appointed in writing for any crane or similar operations required on site, and this person must be in constant communication with the operator, able to always track the load, and if using hand signals only, must be in full unobstructed view of the operator.

22.11 The Principal Contractor must ensure that where specialised rigging operations / intricate rigging is required, or where rigging of 5 tons or more must be done, a competent Rigger must be appointed in writing with the required qualifications.

22.12 The Principal Contractor must also ensure that a rigging study is compiled for any rigging to be done and must have a detail risk assessment available and conducted by a trained and certified risk assessor competent in rigging activities specific to the work at hand. This rigging study must include the communication protocols that will be used and followed by the banksman, rigger, and operator.

22.13 Trained and appointed flagman must be positioned at each public area that will be affected by construction activities on the roadside where crane activities is affecting the area.

22.14 Any crane activities that may come in close contact to overhead power lines as defined in the Electrical Regulations and SABS Standards must have the required permits and wayleaves in place from the local authority before any such crane activities may commence on site, the safe work distances as specified in SANS 10280-1 must be complied with at all times.

22.15 No suspended loads may be lifted over personnel, buildings, processes, or electrical conductors.

22.16 When loads are being lifted on site, clear signalling and indicators must be used to warn the surrounding personnel that loads are being lifted.

22.17 No workers are allowed under a suspended load, and the signalling of suspended loads should be done by appointed banksmen by means of whistles or similar devices.

22.18 All loads shall have a tag line / guide rope attached for control, and controlling loads by hand is not permitted. The guide rope used must be of adequate length to ensure that it is long enough for safe control of the loads, the length of the guide rope should also be assessed not to be an excessive length that can cause a risk to the surrounding areas while being used.

22.19 Loads wider than 2.5metres must be fitted with two tag lines / guide ropes at opposite ends of the load to ensure safe and secured control of the load.

22.20 Rigging from the bucket or booms of mobile plant (such as excavators, front end loaders, TLB's etc.) to pick and / or carry loads is prohibited unless a properly installed, certified and tested lifting lug has been attached to the bucket or boom by the manufacturer of the plant for such a specific purpose.

22.21 No rigging from the bottom of the tines / forks of fork trucks is allowed under any circumstances.

22.22 The contractor is to ensure that when mobile elevated working platforms are used that the manufacturer's posted and certified capacity of the lift will not be exceeded by combination of personnel, tools, and material. Acopy of the load test of the platform must be available at all times.

22.23 Mobile elevated working platforms fitted with outriggers must have the outriggers fully extended and set before the platform is raised.

22.24 Fall restraint equipment must always be used and must be tied-off at all times while making use of the mobile elevated working platform.

22.25 Where it may be required for a person to climb out of or onto the platform to or from an elevated work position when using a mobile elevated working platform such a person shall utilize additional fall protection equipment to ensure the person maintains 100% fall protection tie-off as soon as their feet leave the platform. The fall protection equipment must be secured and anchored to a structure exterior to the elevated working platform and must be of suitable strength and design to act as a fall arrest anchorage point.

22.26 No rigging or lifting from the mobile elevated working platform is permitted.

22.27 Mobile elevated working platforms may only be operated by formally SAQA trained and appointed personnel and must be inspected daily prior to use and must have all emergency preparedness equipment fitted and in working condition.

23. Construction Vehicle, Mobile Plant and Public Roads

23.1 The Principal Contractor must ensure that if any construction vehicle, which parks in the street, for delivering materials and / or lifting operations by mobile cranes and / or concrete pumping or any similar operations that effects the public roads get done in such a manner that the members of public are not exposed to any of the construction activities, and must further have cones with a flagman on both sides and warning signage displayed.

23.2 Sufficient firefighting equipment must be available inside each of the construction vehicle and mobile plant being used on site.

23.3 The Principal Contractor / sub-Contractors to comply with the National Road Traffic Act 93 of 1996 at all times when carrying out their disciplines on roads, intersections, cross overs etc.

23.4 The Principal Contractor must ensure that the construction vehicles get cleaned off on the sides, between double wheels and the back to prevent loose soil and stones falling from the truck into the public road while driving out of the site.

23.5 The Principal Contractor must despite the cleaning of the trucks ensure that there is at all times someone to clean the public road surface from the soil that might be brought onto the road by the wheels of the construction vehicles. Dump trucks should cover loads or loose dirt or gravel when exiting the site.

23.6 Trained and appointed flagman must be positioned at each public area that will be affected by construction activities on the roadside.

23.7 Any road closure or lane restrictions that may be required must have the regulated wayleave in place before the work commences.

23.8 The temporary road signage and construction warning signage in line with the wayleave requirements must be installed as per the requirements of the wayleave and traffic management plan for the project.

23.9 There must be a detailed traffic management plan available for any lane restrictions or road closures that may be required throughout the project. This traffic management plan must be communicated to all contractors working on site.

23.10 Each construction area effecting the public roadway by means of construction vehicles turning into the public way must have designated flagmen positioned in line with the required vehicle turning signage to ensure safe and controlled construction vehicle integration onto the public roads.

23.11 Only trained and appointed operators may be allowed to operate construction vehicles and mobile plant on site. Each operator must be in position of a medical fitness certificate issued by an occupational practitioner in the form of Annexure 3 as per the Construction Regulations 23.

23.12 All construction vehicles and mobile plant must be fitted with a working acoustic warning device and automatic reverse warning device as per Construction Regulations 23.

23.13 Seatbelts must be used whenever the equipment and vehicles is in use and the use of cell phones or similar devices are prohibited while driving.

23.14 The operator of construction vehicles and mobile plant are not permitted to use earphones / headphones to listen to music while operating any construction vehicle of mobile plant. The operator must be able to hear instructions while in control of the vehicle or plant on site. The use of ear protection is the only permitted items allowed to be used where applicable.

23.15 All construction vehicles used on site must comply to the requirements of Construction Regulation 23, any vehicle not up to standard are not permitted on site.

23.16 The use of cell phones, tablets or similar devices are prohibited by operators and working near mobile plant and equipment in use.

23.17 Exclusion zones from the mobile plant and equipment are to be established and clearly demarcated to ensure that there is always safe separation between mobile plant and pedestrians on the entire site. This must be done by means of barriers or similar equipment. Each crossover point must also be provided with a designated flagman to control the flow of traffic at each pedestrian crossing, flagmen should also be utilised where construction vehicles and mobile plat are operating in enclosed areas and high traffic routes on site.

23.18 Designated locations for planned maintenance and repairs must be provided on site for the mobile plant and equipment and these areas are to be controlled and only authorised personnel may enter the area.

23.19 Mobile plant and equipment must be fully locked out by the operator when the operator exits the cab, under no circumstances may any mobile plant or equipment be left with the engines running without the operator inside the cabin control of the equipment.

23.20 Mobile plant and equipment left unattended must be kept in a state to prohibit any unintended movement, all booms and buckets must be lowered, and wheels locked, and brakes set to prevent movement.

23.21 Speed limit signs must be posted on site at appropriate locations and the required speed limit must be determined in the site traffic control plan.

23.22 Adetailed site traffic management plan must be drafted by the principal contractor and all contractors on site must comply to the site traffic management plan. This plan must always also include the separation of vehicles and pedestrians and must indicate how this will be achieved on site for example temporary barriers in designated pedestrian walkways.

23.23 No riding on equipment or the back of LDV's are permitted.

23.24 When the vehicles on site are not in use, they must be fully locked out with the parking brake set.

23.25 Dust control measures must be implemented on site, there should be a dust control schedule available to indicate the frequency of dust control taking place daily.

24. Electrical Installations

24.1 The Principal Contractor will ensure that all electrical installations on site will have a signed COC which will be made available upon request.

24.2 The Principal Contractor will ensure that all DB Board will be fitted with a cover plate, earth leakage and trip switch along with a lockout procedure, that must be specific for the type of work required to take place on the electrical components and must detail the measures that will be taken if such work will be required.

24.3 All switches on the DB Board will be labelled to identify the functions of such connection.

24.4 All Temporary Electrical connections will be inspected on a Weekly basis by the Competent person appointed in terms of Construction Regulation 24.

24.5 The Principal Contractor will ensure that no live electrical connection is exposed to the elements which can cause a risk to any person or the property of the client (e.g., rain, open flames, etc).

24.6 The electrical supply cables of all temporary electrical installations must be protected from the construction activities such as plant and machinery being operated near such cables.

24.7 Temporary lighting must be provided to working areas that does not have sufficient lighting available. Each contractor is required to plan their activities and ensure that sufficient lighting is available before the commencement of the planned work.

24.8 It is the responsibility of each contractor to ensure that their working area complies to the lighting requirements as stipulated under the Environmental Regulations for Workplaces - Illuminance Schedule

24.9 Workers are not allowed to work on any electrically energized components.

25. Hazardous Chemicals

25.1 The Principal Contractor must appoint a Hazardous Chemical Substance Controller in writing, to control and manage the hazardous chemicals on site

25.2 The Principal Contractor must ensure that a Material Safety Data Sheet for all chemicals on site is kept in the file and communicated to all site employees.

25.3 Where applicable spill kits will be made available by the Principal Contractor and their appointed Sub-Contractors in case of a chemical spill in order to contain the area from causing any environmental damage.

25.4 The Principal Contractor will ensure all chemical containers on site to be labelled and identified.

25.5 The Principal Contractor will as far as reasonably possible ensure when chemicals are being transferred from on container to another a drip tray must be made available to ensure that spillage is controlled and does not seep into any soil.

25.6 The Principal Contractor will ensure that Hazardous chemicals stores are equipped with information signage on the chemicals being stored, identification of the hazardous linked to the stored chemicals, PPE required to handle such chemicals, sufficient firefighting equipment, solid foundation to ensure no seeping of chemicals into soil and a lock out procedure to ensure control of such stored chemicals.

25.7 The Principal Contractor will ensure chemical store will not be allowed to be used as a storage area for clothing, food or any other personal belongings.

25.8 The Principal Contractor will as far as reasonably possible ensure that no chemical store will be used for an eating or changing facility.

25.9 Where a Principal Contractor or his appointed Contractor intents to store any bulk hazardous chemical on site, an application for a permit/temporary registration must be sent to the local Emergency Services department in the prescribed form of an Annexure 1 along with the required plans as per applicable by-laws and approved prior to such activity taking place on site, proof of such registration/permit must be kept on site and made available upon request.

25.10 Such installation for the above-mentioned tank / installation as per 24.9 must comply with SANS 10131 and ensure that the temporary tank must be located on firm level ground and the ground, must be of adequate strength to support the mass of the tank and contents, provision is made for the run-off of any possible rainwater from the retaining walls or retaining embankments, the storage tank is not erected within 5 m of any erf or lot boundary, building, excavation, road and/or driveway, no source of ignition or potential ignition is brought within 5 m of the storage tank, symbolic signs prohibiting smoking and open flames, at least 300 mm x 300 mm in size, are affixed to all sides of the temporary installation, and a minimum of two 9 kg dry chemical fire extinguishers are installed within 10m of the temporary installation. The approved permit should be signposted at the storage area.

25.11 Such storage tank must be surrounded by a liquid-proof bund wall, volumetrically capable of containing the maximum proposed quantity of liquid, plus 10% of the volume of the tank.

25.12 Must ensure that the rated capacity temporary tank must provide sufficient ullage and spare capacity to permit expansion of the product contained therein by reason of the rise in temperature during storage.

26. Housekeeping and General Safeguarding

26.1 The Principal Contractor must install hoarding as deemed required by the building / construction activity (to isolate members of public from construction activity). The detail of which the hoarding will be constructed will be agreed as the Construction activities require from time to time but must be of solid material used to separate construction activities and should be of a minimum height of 1.8 metres.

26.2 The Principal Contractor must keep all construction activities / material / equipment within the barricaded/hoarded area. The hoarding must be maintained throughout the Project. The required No Entry signage and construction signage must also be displayed on the hoarding, and especially at the entrance gates. And all visitors to site must be required to sign in at the entrance gates, before entering the site.

26.3 The Principal Contractor must do site establishment as indicated by principal agent. These areas must be controlled at all times, no members of public allowed within laydown areas.

26.4 The Principal Contractor must not allow any informal traders in the construction area, no food stalls or similar operation may be allowed within the hoarded area of the construction site.

26.5 The Principal Contractor must appoint a Housekeeping Supervisor and ensure that all Contractors appoint their own Housekeeping Supervisors, to ensure that the Housekeeping on site is maintained on a daily basis.

26.6 The Principal Contractor along with his Sub-Contractors will ensure will conduct a weekly housekeeping inspection which will be recorded and kept on site.

26.7 The Principal Contractor and all the Contractors are not allowed to burn or deposit any waste on site it is to be discarded to an approved dump site or a recycling facility.

26.8 The principal contractor should ensure that all persons entering the site has undergone the site-specific induction and have received the required training and information regarding the site. There should be a classification done for each person entering the site to indicate visitor, permanent or short-term staff this should be done to address the hazards associated with the scope of each person entering and to proactively mitigate the site risk.

26.9 Contractors will furnish, erect, maintain and dismantle safety barricades required for their work, and co-ordinate all barricading belonging to any subcontractors.

26.10 It is required that rigid barricading is used on site and not only danger tape as danger tape is not sustainable.

26.11 Where rigid barricading is required, it must be capable to withstand a lateral force of 90.7kg or greater. It must be erected to have handrail, knee rail and where an access route is used below the area or where employees work below the area a toe board should also be fitted.

26.12 Asite logistics plan is required from the principal contractor and must be displayed on site as well as communicated to each contractor working on site.

26.13 As per the Government Gazette - 6 March 2025: notice regarding amendment to General Safety Regulations, the appointed Principal Contractor must ensure that they take Regulation 13H. Housekeeping into consideration during the construction period.

26.14 The Principal Contractor must designate and clearly demarcate any plant and machinery that does not have a fixed location as a noise zone, where the noise level generated is at or above the noise-rating limit or the noise action level, and there is concurrent exposure to:
(i) ototoxic chemical agents; and/or
(ii) whole-body vibration that exceeds the action level specified in the Physical Agents Regulations.

26.15 The Principal Contractor must ensure that any workplace / construction site, or part of such a workplace / construction site, is designated and clearly marked as a noise zone where the noise level is at or above the noise-rating limit or the noise action level, and there is concurrent exposure to:
(i) ototoxic chemical agents; and/or
(ii) whole-body vibration that exceeds the action level specified in the Physical Agents Regulations.

27. Stacking and Storage on Construction Sites

27.1 The Principal Contractor and their appointed Sub-Contractors must appoint a Stacking & Storage Supervisor in writing.

27.2 The Principal Contractor and their appointed Sub-Contractor will conduct a weekly stacking & storage inspection which will be recorded and kept on file this must be completed by the appointed person.

27.3 Stacking and storage areas should be kept up to standard and all materials stacked and stored must be done in accordance with the legal requirements.

28. Construction Employees' Facilities

28.1 The Principal Contractor must have, as a first activity, chemical toilets in the site establishment to ensure that all construction employees have the facility from the outset.

28.2 The Principal Contractor must have an Employee Facilities Inspector appointed in writing, and this person must be required to complete a weekly facilities Checklist which will be kept in the health and safety file and made available upon request.

28.3 Sheltered eating facilities shall be provided to employees in line with the Construction Employee Facilities Regulations - Construction Regulations 30.

28.4 Drinking water areas to be clearly indicated and sign posted on site and must be available from site start up.

28.5 The drinking water utilised on site should be tested on a regular basis if independent water tanks or systems will be utilised to ensure that the water is safe for human consumption.

28.6 Water taps not fit for human consumption must be clearly signposted to indicate unfit for use.

29. Health & Safety Committee and Representative

29.1 The Principal Contractor must ensure that at least 1 representative from each appointed Contractor attend at least one safety meeting per month chaired by the Principal Contractor. The Health and Safety Chairman from the Principal Contractor must be nominated and appointed in writing.

29.2 The Principal Contractor and their appointed Contractors must in writing appoint a Health & Safety representative, irrespective of whether the Contractor employ twenty or less employees for this Project.

29.3 Following any recordable injury or serious incident, the principal contractor shall hold a site-wide stand down on the same day - to communicate what happened ad reinforce the need for constant safety vigilance.

29.4 The principal contractors site manager / construction manager shall hold weekly supervisory safety meetings to show leadership for the health & safety program, and to discuss safety incidents, rule changes, educational material, and continuous improvements.

30. Ladders

30.1 The Principal Contractor and all appointed Contractors must appoint a Ladder Inspector, and this person must be required to complete a Ladder Checklist at least once a month.

30.2 All ladder on site must be numbered and identified as per General Safety Regulation 13.

30.3 The ladders must be inspected before each use and a copy of the inspection register must be kept in the health & safety file of the applicable contractor.

30.4 When planning work activities, the contractor is urged to plan the activities in such a manner to limit the use of ladders on site where able conduct the work from a safer alternative working platform.

30.5 All straight and extension ladders must be fitted with non-slip feet and when used be tied and secured at the top and bottom of the ladder or should be held when in use.

30.6 Aframe ladders must be provided with non-slip feet and must be held and secured when in use.

30.7 Only one person can work from a single ladder at any given time.

30.8 Under no circumstances may any conductive ladders be used on site where work is done near electrical installations.

30.9 All ladders must be free from slippery substances and must be affect free, any ladders that does not comply must be removed from the premises immediately.

30.10 Where ladder work exposes a person to a fall of more than 1.8metres where the employee cannot be safeguarded from the fall risk, a safety harness must be worn and must be secured to a suitable anchorage point.

30.11 Where no secured anchorage is possible an alternative access method should be used such as scaffolding or mobile elevated working platform. This does not apply to the use of a straight or fixed ladder used for access to a different level. Unless there are other conditions that increase a fall exposure.

30.12 Step ladders must be fully extended and must be locked when in use, the ladder that serves a platform for transition must be extended at least 1metre past the landing/platform for safe access.

30.13 Workers are not allowed to carry tools, materials and or equipment in their hands while climbing a ladder. Tools should be secured to a tool belt or similar means of securing the tools.

31. Hand tools

31.1 All hand tools on site to be identified, numbered, and placed on register.

31.2 The principal contractor along with his Sub-Contractors will appoint in writing a competent person to conduct monthly inspections to ensure that hand tools are not damaged or altered in anyway e.g. mushroom heads, loose handles, appropriate grip handles, etc. which will be recorded on the above-mentioned register and kept on site.

31.3 Only qualified and trained workers are allowed to install, adjust and/or operate laser equipment.

31.4 Areas in which lasers are used shall be provided with the required warning signage to indicate the usage of the laser in the area and the required PPE must be provided to the employees working in the affected area.

31.5 The laser beam may not be directed at any employees.

32. Portable Electrical Equipment

32.1 All Portable electrical tools on site to be identified, numbered, and placed on register.

32.2 The Principal Contractor along with his Sub-Contractors will appoint in writing a competent person to conduct monthly inspections to ensure that Potable electrical tools are not damaged or altered in anyway e.g., loose electrical connections, exposed wiring, earth wire not connected, crack or damage to equipment, safeguard not removed or damaged, etc.

32.3 All cables, cords, leads, and hoses in a building shall be strung by nonconductive means at least 2.1metres overhead, kept to the perimeter of the building, or otherwise protected to prevent tripping hazards.

32.4 Where electrical work is required near wet surfaces or weather conditions, then the equipment used should be IP65 rated.

33. First Aid, Emergency Equipment and Procedures

33.1 The Principal Contractor must ensure that the appointed Contractors with 5 and more employees have a first aid box and that Contractors with 10 and more employees have a first aid box with at least one person on site with a first aid certificate.

33.2 Sufficient firefighting equipment must be available inside each of the construction vehicle and mobile plant being used on site.

33.3 Sufficient amount of firefighting equipment must also be positioned on site in case of an emergency and the employees on site must be trained in the procedure on how to use the equipment if needed.

33.4 Site Emergency Evacuation Procedures must be compiled by the Principal Contractor all employees and Contractors on site must be trained on the Emergency Procedures. This Procedure must be updated as and when needed.

33.5 There must also be an up-to-date emergency contact register displayed on a notice board / site office / access gate area and this list must be kept updated.

33.6 An emergency evacuation diagram of the site must also be complied clearly indicating the assembly points and areas of evacuation.

33.7 The Principal Contractor must also appoint in writing a competent Emergency Evacuation Coordinator.

33.8 Where applicable the existing facilities emergency evacuation procedure must also be incorporated into the site procedure to ensure that the existing facility is not negatively affected in case of an evacuation process obstructing their areas.

34. Incident Reporting and Investigations

34.1 In the event of a fatal incident, it will be required that the Principal Contractor and all the appointed Contractors who can have an influence on the incident, that they hand in their Health & Safety files with immediate effect to Cairnmead.

34.2 Site incidents are to be reported to Cairnmead timeously within the time of them having occurred on site, but not exceeding 30minutes after the incident has occurred.

34.3 Site incident reporting procedures must be compiled and communicated with all employees on site.

34.4 An incident flash report must be submitted to all applicable parties on the same day the incident occurred.

34.5 Full incident investigation reports for each incident must be completed within three days after the incident occurred on site and must be submitted to the client.

34.6 The incident report must clearly indicate the corrective actions that has been taken to prevent a reoccurrence of the incident. Such corrective actions are to be taken without any delay and must be implemented within no more than three days after the incident occurred.

34.7 History of the Incident - This will give a description of the project in general, the time and date, the injured persons' name, designation, ID number, description of the area, activities, and the extent of the injuries the person incurred.

34.8 The Principal Contractor must ensure that any incident that occurs on site that falls under a Section 24 incident must be reported to the provincial director in the form of WCL1 or WCL2 within 7days, and in consequence of such an incident a person dies, becomes unconscious, suffers the loss of a limb or part of a limb, or is injured or becomes ill to such an degree they the person is likely to die or suffer a permanent physical defect, such incident shall forthwith be reported to the provincial director by telephone and followed up with an email regarding the incident information.

34.9 The Principal Contractor must ensure that any Incident Investigation is reflected in a Report, and this Report should deal with the detail of the Incident under at least the four headings listed below:
34.8.1. History of the Incident - This will give a description of the project in general, the time and date, the injured persons' name, designation, ID number, description of the area, activities, and the extent of the injuries the person incurred.
34.8.2. Applicable legislation - The investigator must list here in his/her opinion which specific Sections of the Act and Regulations as well as incorporated safety standards are applicable/relevant to the incident.
34.8.3. Evidence - The investigator must list here all the evidence which was taken to consider in the investigation. For example: photos, statements, documentation out of the Health and Safety File and drawings/sketches. This is an example of the types of evidence, but there may be more.
34.8.4. Conclusions - The investigator should compare the evidence with the applicable legislation and highlight where there was no compliance.

35. Welding, Flame Cutting, Soldering and Similar Operations

35.1 The Principal Contractor will as far as reasonably possible ensure that all hot works are contained to one area.

35.2 Ensure that all equipment is inspected and recorded on a register placed in the Health and Safety file and available upon request.

35.3 Ensure that no Hot Works will be permitted to take place in any confined space unless deemed safe in them of the Regulations to do so.

35.4 That all Combustibles / Flammables liquids are removed from the area where hot works is taking place.

35.5 That the necessary firefighting equipment is available in the area where hot works is taking place along with an appointed competent person to use such equipment correctly.

35.6 Ensure that all sparks are contained by use of welding screens or similar.

35.7 If and where applicable hot work permits are to be obtained.

35.8 Compressed gas cylinders shall always be properly secured and brought into the building only as needed and removed as soon as wok is completed daily or as tanks are emptied.

35.9 Flame cutting and gas welding equipment must be fitted with flash back arrestors between both the torch and hose connection and regulator and hose connection ends.

35.10 Cylinders should have a three -part identification tag attached to all cylinders.

35.11 Oxygen and fuel gas cylinders, when not in use, must be stored 6.1metres apart or separated by a 1.5 metre fire resistant barrier.

35.12 Cylinders must be stored in an upright position and must be chained or secured in a similar manner to a cage or designated storage area.

35.13 Smoking and the use of smokeless tobacco, including the use of e-cigarettes, is not permitted inside and buildings, temporary offices, or near flammable liquid storage areas and is allowed only in designated area.

36. Blasting

Not Applicable

37. Asbestos

Not Applicable

38. Existing Services and Existing Site Conditions

38.1 All services like water, electricity and gas will be pointed to the Principal Contractor by the professional team appointed by the Client as far as reasonably possible. There must be a documented proof that the services for water, storm water, sewer, gas (if applicable) and electricity was terminated successfully. For the gas and electricity there must be a Certificate of Compliance to say it was terminated.

38.2 Where the Principal Contractor or their appointed Contractor intends to work near, under or above ground where Power lines are located, all such activities must be conducted in line with the legal requirements and adherence to the safe work distances must always be monitored by the Principal Contractor.

39. Ergonomics

39.1 The principal contractor must ensure that the required information, instruction, and training are provided to the employees / workforce on site relating to their work activity. The information must be in line with the ergonomic risk assessment requirements which should address the risk of exposures and mitigating or eliminating procedures to follow.

39.2 The required ergonomic risk assessment should address all aspects as stipulated in the Ergonomics Regulations. The risk assessment must be performed by a competent person and should not exceed intervals of two years.

39.3 Risk control measures should be implemented before employees are tasked to commence with their activities on site, all employees are also to be trained on the ergonomic risk assessment. The procedure of reporting, medical surveillance and all factors relating to the ergonomics risk assessment must be made clear to each employee to enable the employees to comply to the requirements.

40. Other Special Conditions

40.1 The Principal Contractor must inform Cairnmead, on the same day, when the Department of Labour issue any written notices for a non-compliance on the site, and a copy of such notice must be forwarded, as soon as possible on the same day, to Cairnmead. The Principal Contractor must not submit any reports to the Department of Labour unless verified by Cairnmead.

40.2 The working hour on site is as per the legislated hours in terms of SANS 10400. No person shall during any building, demolition or excavation work use any machine, machinery, engine, apparatus, which in the opinion of the local authority may unreasonably disturb or interfere with the amenity of the neighbourhood, on a public holiday or Sunday, before 06:00 or after 17:00 on any Saturday and before 06:00 or after 18:00 on any day other than those days contemplated above.

40.3 The prohibition of the above shall not apply in any circumstances in which the use of such machine, machinery, engine, apparatus, tool, or contrivance, is urgently necessary to preserve the life, safety, or health of any person, is urgently necessary to preserve property, has been authorized by the local authority.

The Principal Contractor must take note of the details below for the Local Department of Labour offices:

Contact person: Ms. Fezeka Ngalo

Telephone number: 0214418158

E-mail address: Fezeka.Ngalo@labour.gov.za

Issued by Cairnmead on behalf of Langeberg Municipality



SW Dirker
CHSA/121/2022
For: Cairnmead
Date: 24 October 2025

ANNEXURE 1 – Legal Compliance Audit Guideline

Administrative Requirements / Duties
Induction Training
Medical Fitness Certificates (Annexure 3)
Appointment Letters & Proof of Competency
Contract with Client / Principal Contractor
Copy of The OHS Act & Regulations
Health and Safety Plan
Health & Safety Policy
Letter of Good standing
Mandatary Agreement (Sec 37(2))
Principal Contractors Appointment / Contractors Appointment
Notification of Construction Work / Construction Work Permit
ID Copies and Next of Kin Information
Recording of Incidents (Annexure 1, WCL2 & Incident reporting procedure)
Risk assessments, safe work procedures, method statements and risk review and monitor plan
PPE Issue Register
Safety Meeting Minutes and attendance
Toolbox talks / DSTI's

Registers and Documentation (Where Applicable)
Bulk mixing plant
Construction Employee Facilities
Construction Vehicles & Mobile Plant
Demolition Work
Excavation Work
Explosive Actuated Devices
Explosives
Fall Arrest Equipment
Fall Protection Plan
Material Hoist
Mobile Crane

Rope Access
Scaffolding
Suspended Platforms
Temporary Works
Welding & Flame Cutting / Hotwork
Housekeeping
Stacking & Storage
Temporary Electrical Installations
Fire Precautions
First Aid
Hand tools
Health & Safety Representative
Ladders
Lifting Tackle
Storage of Hazardous Chemicals
Emergency Preparedness / Plan / Procedures
Vessels Under Pressure
Lifts & Escalators
Portable Electric Tools

ANNEXURE 2 – Monthly Projects Statistics Form

CAIRNMEAD Industrial Consultants (Pty) Ltd	**CAIRNMEAD** **MONTHLY PROJECTS STATISTICS FORM**	CICPS **001** REV **03** REV DATE **28/09/2023** PAGE **27.28** REG NO **25386-HS-0001**

PROJECT NAME:	PRINCIPAL CONTRACTOR:
Upgrading of McGregor WTW	Tender

MONTH:	Tick	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	**Oct**	Nov	Dec

STATISTICS SUMMARY

(Statistics is combination of all Contractors working on project – Principal Contractor and subcontractors)

Total hours worked for the month:	Lost Time Incidents for the month:	Medical Treatment Cases for the month:
First Aids cases for the month:	Near Misses reported for the month:	Total hours worked from commencement (THW):
Total LTI from commencement:	Total MTC from commencement:	Total First aid cases from commencement:
Total Near Misses from commencement:	LTIR Rate: (LTI +MTC) / THW) *200,000	

SHORT DESCRIPTION OF MONTHLY INCIDENT REPORTED

(First Aid Cases, Medical Treatment Cases, Lost Time Incidents and Near Misses)

FIRST AID CASES

CAIRNMEAD Industrial Consultants (Pty) Ltd	**CAIRNMEAD** **MONTHLY PROJECTS STATISTICS FORM**	CICPS **001** REV **02** REV DATE **05/10/2022** PAGE **28.28** REG NO **25386-HS-0001**

MEDICAL TREATMENT CASES

LOST TIME INCIDENTS

NEAR MISSES

PRINCIPAL CONTRACTOR CONSTRUCTION MANAGER CR8(1) NAME & SURNAME:	_____	**SIGNATURE:**
PRINCIPAL CONTRACTOR SAFETY OFFICER NAME & SURNAME:	_____	**SIGNATURE:**

Part C7: Drawings

PART C7: DRAWINGS .....

The Works shall be carried out in accordance with the following drawings which are included in Part C7: Drawings and form part of the contract documents:

Table 3.2.1: List of Drawings

DRAWING NUMBER	DRAWING TITLE
CIVIL WORKS	
Locality Plan	**24193-C-000**
Existing Services Key Plan	**24193-C-000-01**
Existing Services Key Plan (Sheet 1)	**24193-C-000-02**
Existing Services Key Plan (Sheet 2)	**24193-C-000-03**
Existing Services Key Plan (Sheet 3)	**24193-C-000-04**
General Arrangement Layout of WTW	**24193-C-004-01**
Pipework Layout (Sheet 1)	**24193-C-004-02**
Pipework Layout (Sheet 2)	**24193-C-004-03**
Detail of Flash Mixing Chamber and Mechanical Flocculators	**24193-C-004-100**
Detail of Rapid Gravity Sand Filters - Lower Level Layout	**24193-C-004-101**
Detail of Rapid Gravity Sand Filters - Upper Level Layout	**24193-C-004-102**
Detail of Rapid Gravity Sand Filters - Sections A to D	**24193-C-004-103**
Detail of Rapid Gravity Sand Filters - Sections E to J	**24193-C-004-104**
Detail of Clear Water Collection Sump	**24193-C-004-105**
Detail of Chlorine Contact Channel - Foundation Layout	**24193-C-004-106**
Detail of Chlorine Contact Channel - Plan Layout	**24193-C-004-107**
Detail of Chlorine Contact Channel - Sections A & B	**24193-C-004-108**
Detail of Chlorine Contact Channel - Sections C & D	**24193-C-004-109**
Detail of Chlorine Contact Channel - Sections E to H	**24193-C-004-110**
Detail of Backwash Recovery Tanks	**24193-C-004-111**
Detail of Sludge Drying Beds	**24193-C-004-112**
Typical Detail of Valve	**24193-C-004-113**

Typical Detail of Service Route Marker	**24193-C-004-114**
Detail of Water Meter Chamber	**24193-C-004-115**
Typical Detail of Stormwater Manhole	**24193-C-005-100**
Detail of WTW Feed Pump Station Building	**24193-C-007-100**
Detail of Transfer Pump Station Structure	**24193-C-007-101**
Detail of Chlorine and Chemical Dosing Building	**24193-C-007-102**
Detail of WTW Building (Sheet 1)	**24193-C-007-103**
Detail of WTW Building (Sheet 2)	**24193-C-007-104**
MECHANICAL WORKS	
Process Flow Diagram	**100028-T-PFD-002-001**
WTW Feed Pumps & Dam Transfer Pumps	**100028-T-PID-004-001**
Flash Mixing, Flocculation & Clarification	**100028-T-PID-004-002**
Filter Feed Pumps, Backwash Recovery & Sludge Dams	**100028-T-PID-004-003**
Filter 1 & 2	**100028-T-PID-004-004**
Filter 3	**100028-T-PID-004-005**
Final Water Pumps, Backwash Pumps & Service Water Pumps	**100028-T-PID-004-006**
Chemical Dosing & Backwash Blowers	**100028-T-PID-004-007**
ELECTRICAL	
New Site Bulk Supply Configuration (1 of 1)	**24193-E-001-01**
Electrical Single Line Diagram (1 of 5)	**24193-E-002-01**
Electrical Single Line Diagram (2 of 5)	**24193-E-002-02**
Electrical Single Line Diagram (3 of 5)	**24193-E-002-03**
Electrical Single Line Diagram (4 of 5)	**24193-E-002-04**
Electrical Single Line Diagram (5 of 5)	**24193-E-002-05**
Network Control Diagram (1 of 1)	**24193-E-003-01**
Lighting and Power Diagram (1 of 2)	**24193-E-004-01**
Lighting and Power Diagram (2 of 2)	**24193-E-004-02**

(The drawings will be made available electronically by Langeberg Municipality to all tenderers present at the compulsory Site Clarification Meeting)



The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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A	ISSUED FOR INFORMATION	'25-10-27	ES	ML

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DRAWN	ES	
CHECKED	ML	

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APPROVED

ENGINEERS: _____

DATE: 2025-10-27

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADING OF MCGREGOR WTW

TITLE

LOCALITY PLAN

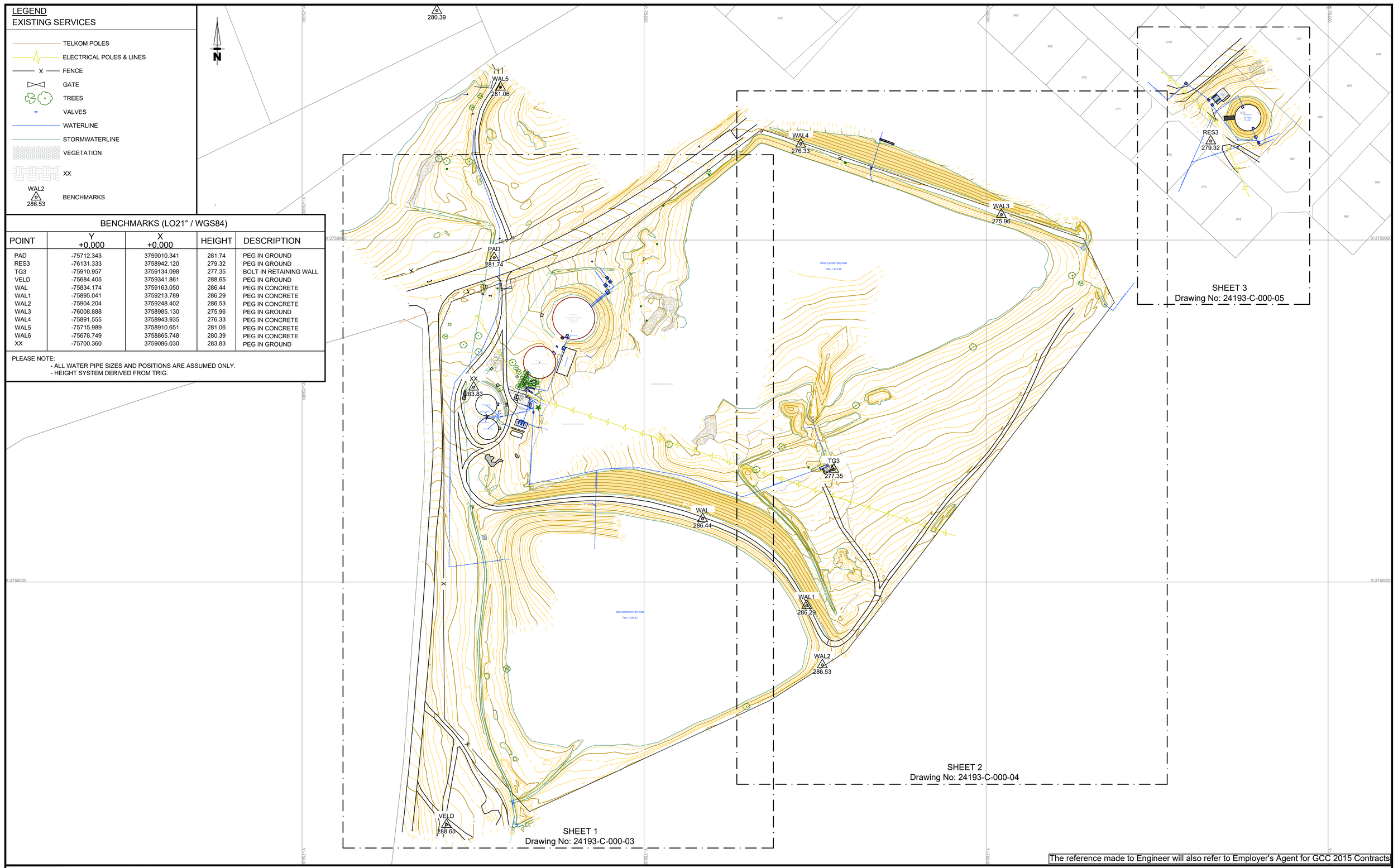
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AS SHOWN	1 OF 1
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-C-000-01 REV A

COORDINATE SYSTEM: WGS84 / Lo19°

LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL POLES & LINES
- FENCE
- GATE
- TREES
- VALVES
- WATERLINE
- STORMWATERLINE
- VEGETATION
- XX
- WAL2 286.53 — BENCHMARKS



BENCHMARKS (LO21° / WGS84)

POINT	Y +0,000	X +0,000	HEIGHT	DESCRIPTION
PAD	-75712.343	3759010.341	281.74	PEG IN GROUND
RES3	-76131.333	3758942.120	279.32	PEG IN GROUND
TG3	-75910.957	3759134.098	277.35	BOLT IN RETAINING WALL
VELD	-75684.405	3759341.861	288.65	PEG IN GROUND
WAL	-75834.174	3759163.050	286.44	PEG IN CONCRETE
WAL1	-75895.041	3759213.789	286.29	PEG IN CONCRETE
WAL2	-75904.204	3759248.402	286.53	PEG IN CONCRETE
WAL3	-76008.888	3758985.130	275.96	PEG IN GROUND
WAL4	-75891.555	3758943.935	276.33	PEG IN CONCRETE
WAL5	-75715.989	3758910.651	281.06	PEG IN CONCRETE
WAL6	-75678.749	3758865.748	280.39	PEG IN CONCRETE
XX	-75700.360	3759086.030	283.83	PEG IN GROUND

PLEASE NOTE:
- ALL WATER PIPE SIZES AND POSITIONS ARE ASSUMED ONLY.
- HEIGHT SYSTEM DERIVED FROM TRIG.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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ENGINEERS: _____
DATE: 2025-10-27

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
EXISTING SERVICES KEY PLAN

SCALE	SHEET
1:1000 on A1	1 OF 1
CONTRACT No.	PROJECT No. 24193C

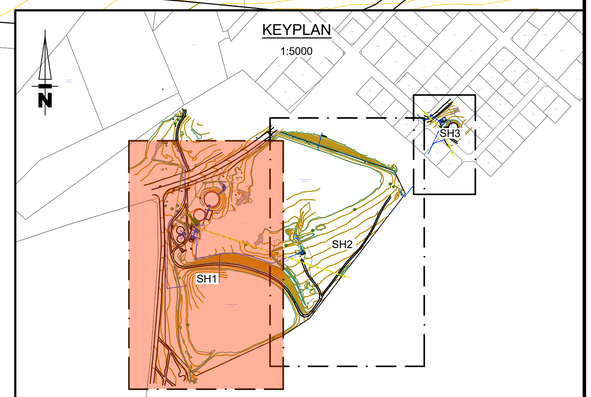
DRAWING No. 24193-C-000-02 REV A
COORDINATE SYSTEM: WGS84 / Lo19°

LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL POLES & LINES
- FENCE
- GATE
- TREES
- VALVES
- WATERLINE
- STORMWATERLINE
- VEGETATION
- XX

NEW DRINKWATER DAM
TWL = 285.42

KEYPLAN
1:5000



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DATE: _____

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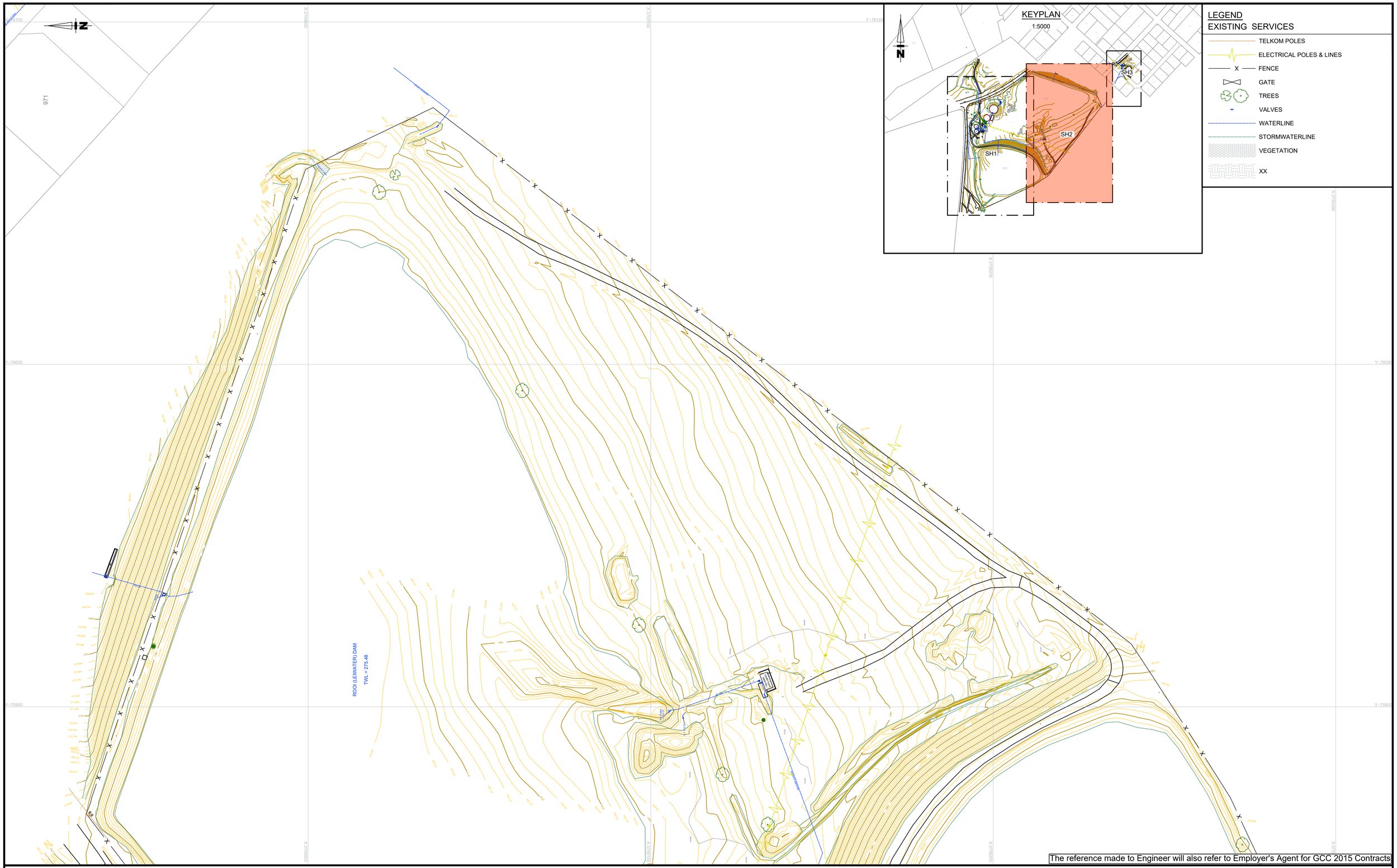
PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
EXISTING SERVICES KEY PLAN
SHEET 1

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CONTRACT No.		PROJECT No. 24193C

DRAWING No. 24193-C-000-03 REV A

COORDINATE SYSTEM: WGS84 / Lo19°



KEYPLAN
1:5000

LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL POLES & LINES
- FENCE
- GATE
- TREES
- VALVES
- WATERLINE
- STORMWATERLINE
- VEGETATION
- XX

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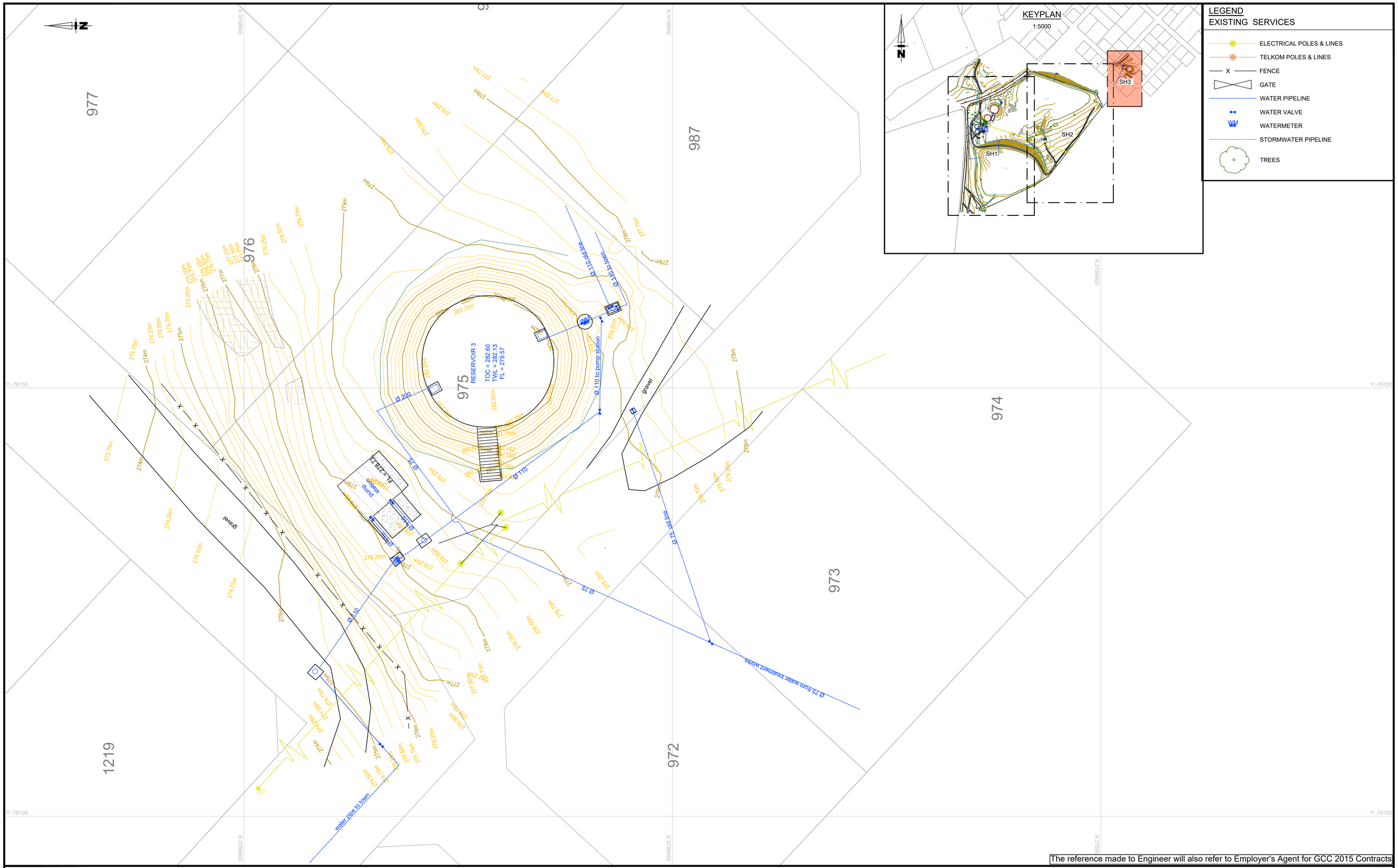
PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
EXISTING SERVICES KEY PLAN
SHEET 2

SCALE	SHEET
on A1 1:500	2 OF 3
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-C-000-04 REV A

COORDINATE SYSTEM: WGS84 / Lo19°



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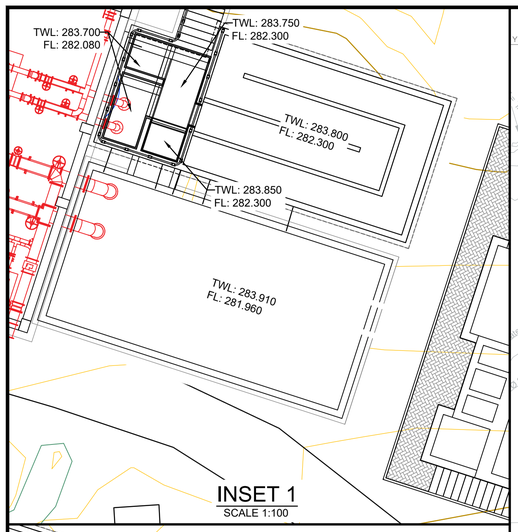
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PROJECT
UPGRADING OF MCGREGOR WTW

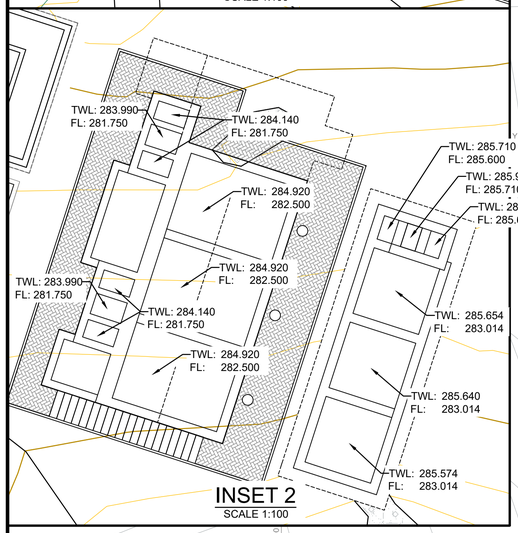
TITLE
EXISTING SERVICES KEY PLAN
SHEET 3

SCALE	SHEET
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CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-C-000-05 REV A
COORDINATE SYSTEM: WGS84 / Lo19°



INSET 1
SCALE 1:100



INSET 2
SCALE 1:100

LAYOUT
SCALE 1:250

LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL POLES & LINES
- FENCE
- GATE
- TREES
- VALVES
- WATERLINE
- STORMWATERLINE

NOTES:

1. Contractor must verify location and extent of all the existing services prior to commencement of work. Any discrepencies must be liased with the Engineer immediately.
2. Contractor must verify in writing, to the Engineer, the TOP WATER LEVEL and INVERT LEVEL of the existing reservoir prior to the commencement of work.
3. Refer to dwg no. 24193-C-001-05 for the relocation of existing services.
4. The contractor must ensure the existing WTW remains operational during construction.
5. Refer to mechanical drawings for detail of proposed mechanical equipment.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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email: bellville@lyners.co.za

APPROVED
ENGINEERS: _____
DATE: 2025-10-27

APPROVED
CLIENT: _____
DATE: _____

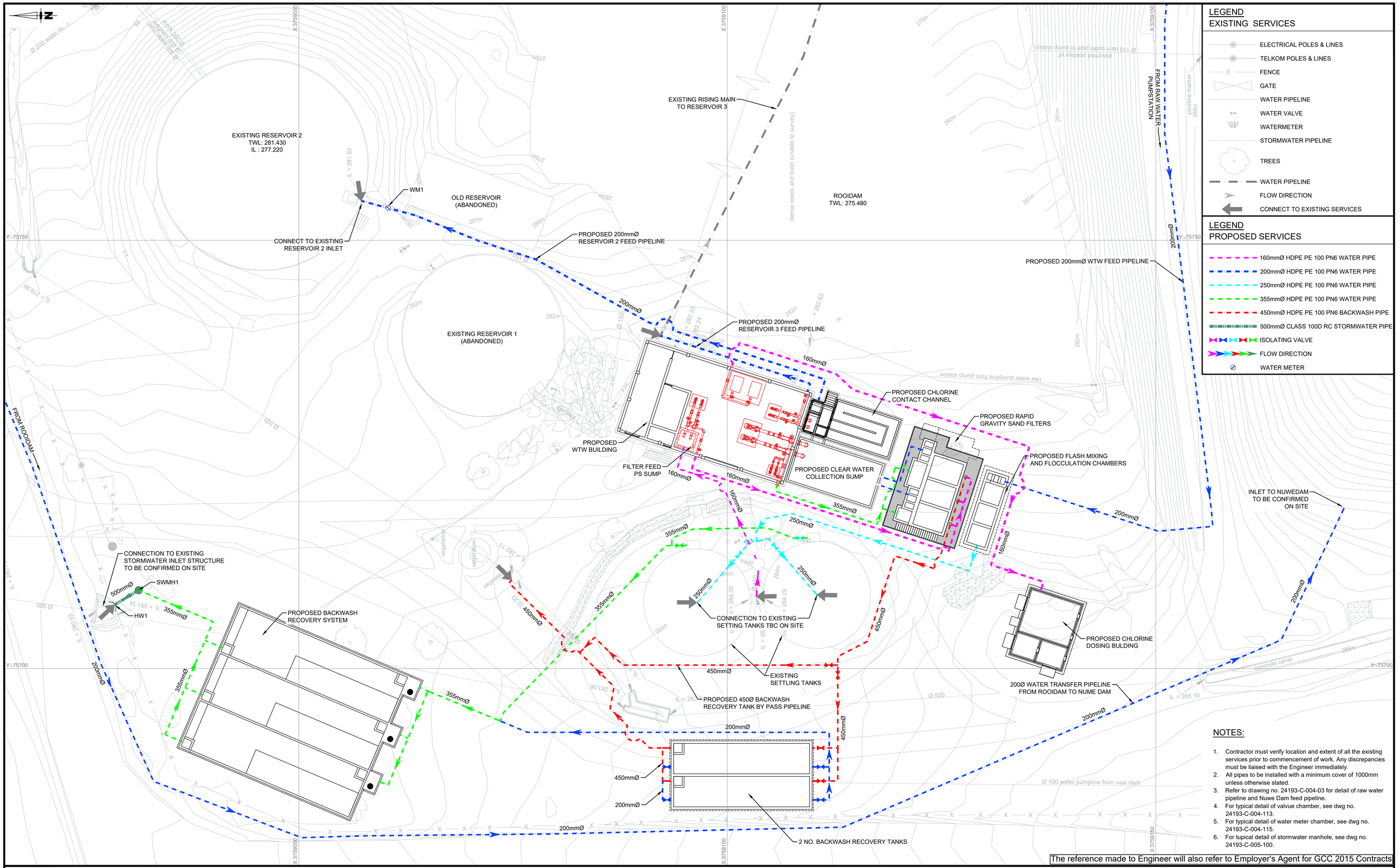
CLIENT
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
GENERAL ARRANGEMENT LAYOUT

SCALE	on A1	SHEET
1:250		1 OF 1
CONTRACT No.		PROJECT No. 24193C

DRAWING No. 24193-C-004-01 REV A
COORDINATE SYSTEM: WGS84 / Lo19°



LEGEND
EXISTING SERVICES

- ELECTRICAL POLES & LINES
- TELKOM POLES & LINES
- FENCE
- GATE
- WATER PIPELINE
- WATER VALVE
- WATERMETER
- STORMWATER PIPELINE
- TREES
- WATER PIPELINE
- FLOW DIRECTION
- CONNECT TO EXISTING SERVICES

LEGEND
PROPOSED SERVICES

- 160mmØ HDPE PE 100 PN6 WATER PIPE
- 200mmØ HDPE PE 100 PN6 WATER PIPE
- 250mmØ HDPE PE 100 PN6 WATER PIPE
- 355mmØ HDPE PE 100 PN6 WATER PIPE
- 450mmØ HDPE PE 100 PN6 BACKWASH PIPE
- 500mmØ CLASS 100D RC STORMWATER PIPE
- ISOLATING VALVE
- FLOW DIRECTION
- WATER METER

NOTES:

1. Contractor must verify location and extent of all the existing services prior to commencement of work. Any discrepancies must be liaised with the Engineer immediately.
2. All pipes to be installed with a minimum cover of 1000mm unless otherwise stated.
3. Refer to drawing no. 24193-C-004-03 for detail of raw water pipeline and Nuwe Dam feed pipeline.
4. For typical detail of valvue chamber, see dwg no. 24193-C-004-113.
5. For typical detail of water meter chamber, see dwg no. 24193-C-004-115.
6. For tupical detail of stormwater manhole, see dwg no. 24193-C-005-100.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 6 12
Meters 1:200

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'25-10-27	ES	ML

REVISIONS

DESIGNED	HB	
DRAWN	ES	
CHECKED	ML	

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APPROVED
ENGINEERS: _____
DATE: 2025-10-27

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CLIENT: _____
DATE: _____

CLIENT
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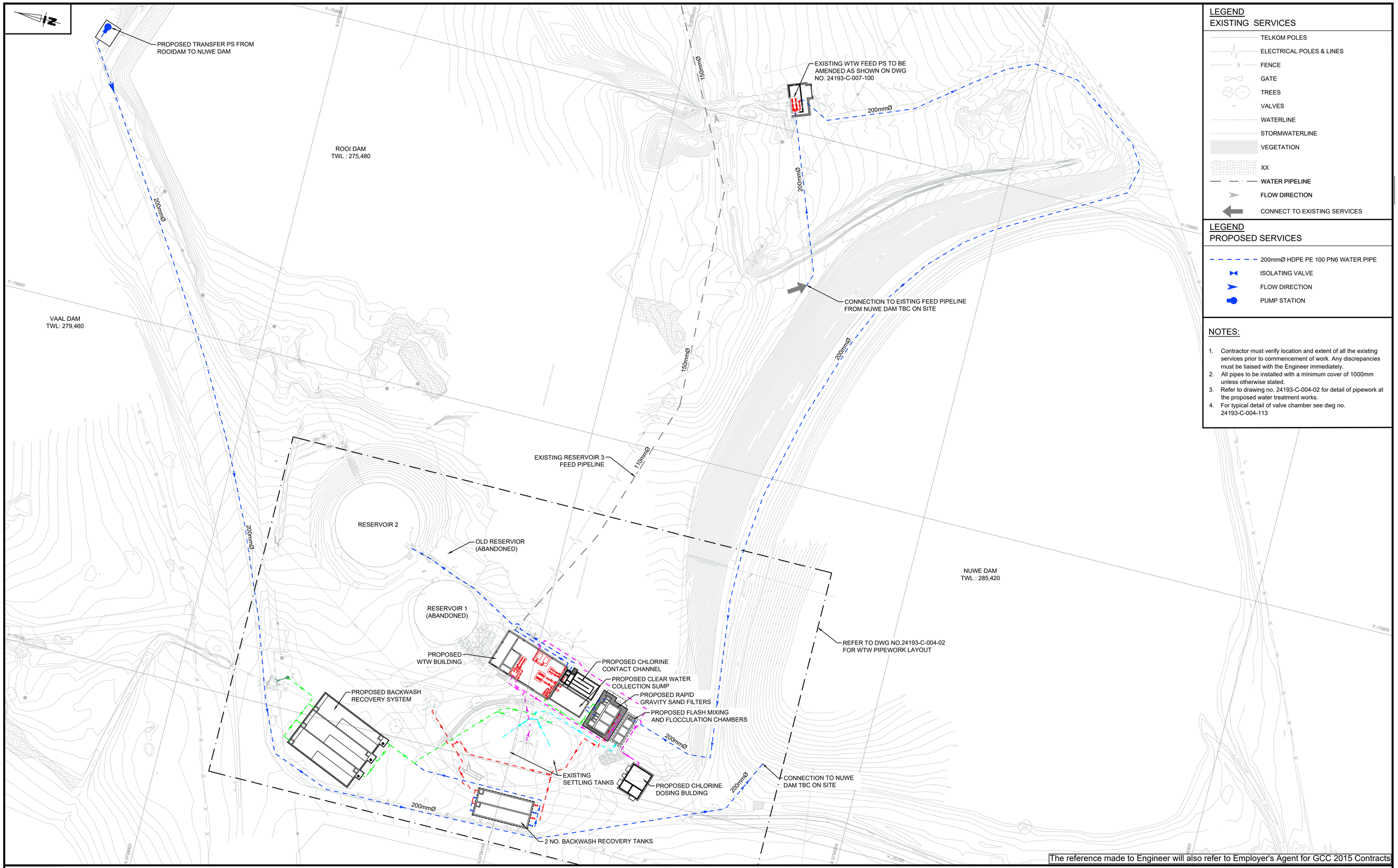
PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
PIPEWORK LAYOUT
SHEET 1

SCALE	SHEET
on A1 1:200	1 OF 1
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-C-004-02 REV A

COORDINATE SYSTEM: WGS84 / Lo19°



LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL POLES & LINES
- FENCE
- GATE
- TREES
- VALVES
- WATERLINE
- STORMWATERLINE
- VEGETATION
- XX
- WATER PIPELINE
- FLOW DIRECTION
- CONNECT TO EXISTING SERVICES

LEGEND
PROPOSED SERVICES

- 200mmØ HDPE PE 100 PN6 WATER PIPE
- ISOLATING VALVE
- FLOW DIRECTION
- PUMP STATION

NOTES:

1. Contractor must verify location and extent of all the existing services prior to commencement of work. Any discrepancies must be liaised with the Engineer immediately.
2. All pipes to be installed with a minimum cover of 1000mm unless otherwise stated.
3. Refer to drawing no. 24193-C-004-02 for detail of pipework at the proposed water treatment works.
4. For typical detail of valve chamber see dwg no. 24193-C-004-113

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 15 30
Meters 1:500

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REVISIONS

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DRAWN	ES	
CHECKED	ML	

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ENGINEERS: _____
DATE: 2025-10-27

APPROVED
CLIENT: _____
DATE: _____

CLIENT
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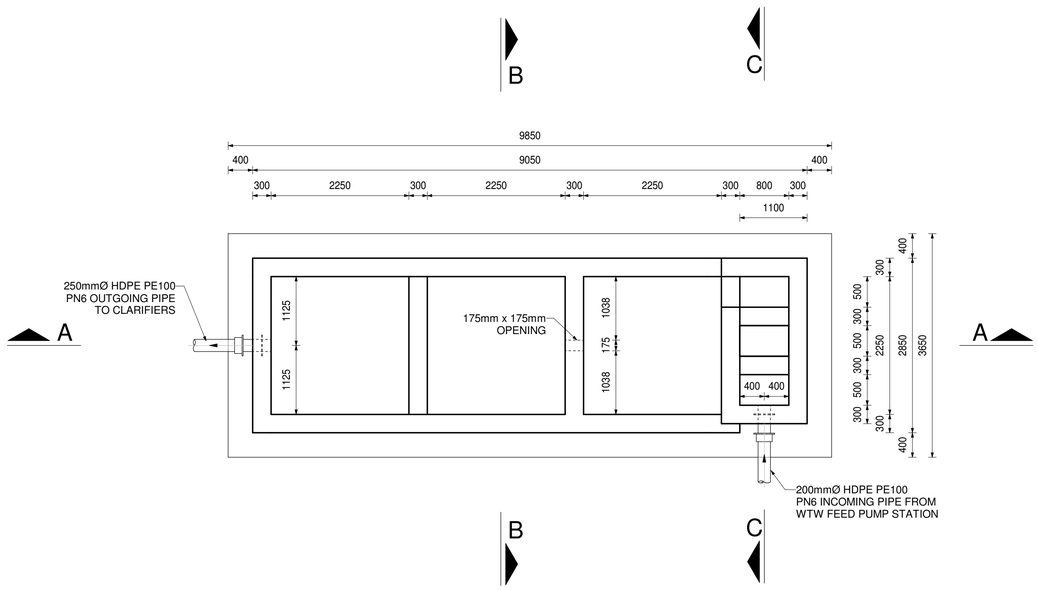
PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
PIPEWORK LAYOUT
SHEET 2

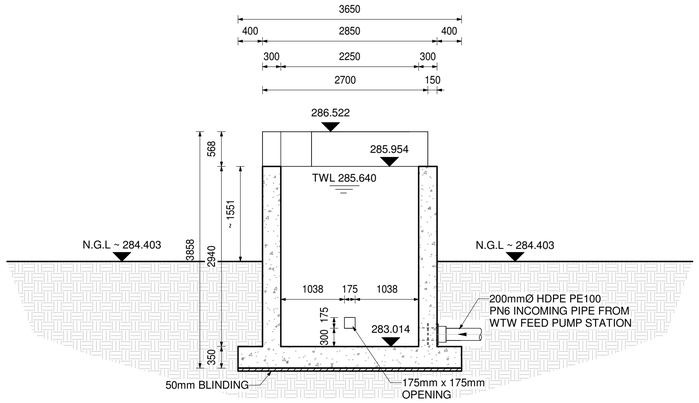
SCALE	SHEET
1:500 on A1	2 OF 2
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-C-004-03 REV A

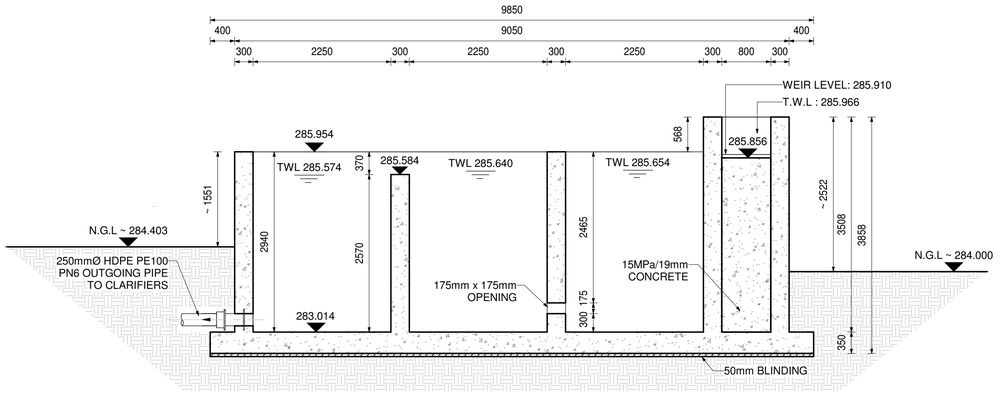
COORDINATE SYSTEM: WGS84 / Lo19°



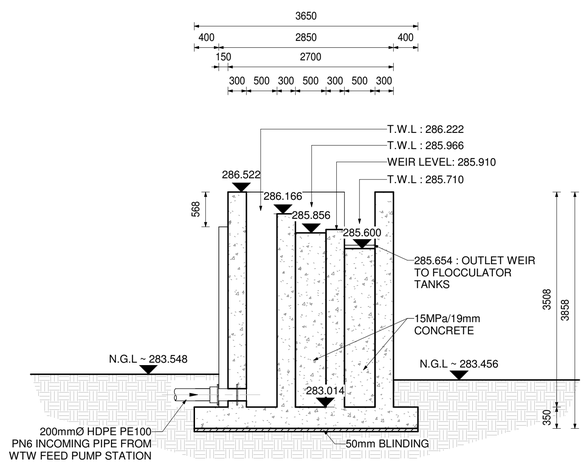
PLAN
SCALE 1 : 50



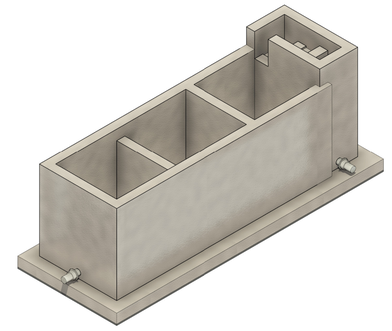
SECTION B-B
SCALE 1 : 50



SECTION A-A
SCALE 1 : 50



SECTION C-C
SCALE 1 : 50



3D VIEW OF FLASH MIXING CHAMBER AND
MECHANICAL FLOCCULATOR

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

   b) Mild steel pipes up to 150mmØ shall be seamless, medium class steel pipes manufactured in accordance with SANS 62.

   c) Flange drilling shall be in accordance with SANS 1123:Table 1000/3.

2.Dimensions of all pipes, fittings, valves, etc must be submitted for approval on a shopdrawing before any material is ordered

3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape, so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for each cast indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR

AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-24	RW	ML

REVISIONS

DESIGNED	ML	
DRAWN	RW	
CHECKED	CD	

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ENGINEERS:
DATE: 2025-10-24

APPROVED:
CLIENT:
DATE:

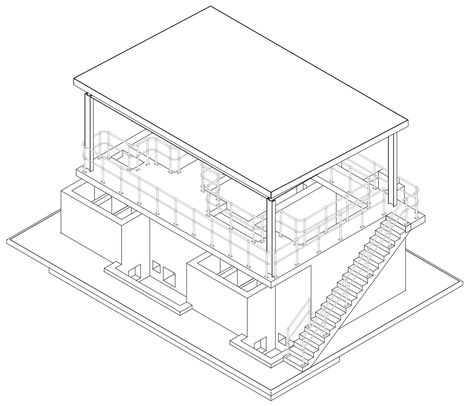
CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF FLASH MIXING CHAMBER AND MECHANICAL FLOCCULATOR

SCALE ON A1	SHEET
1:50	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-004-100 REV A
COORDINATE SYSTEM: N/A

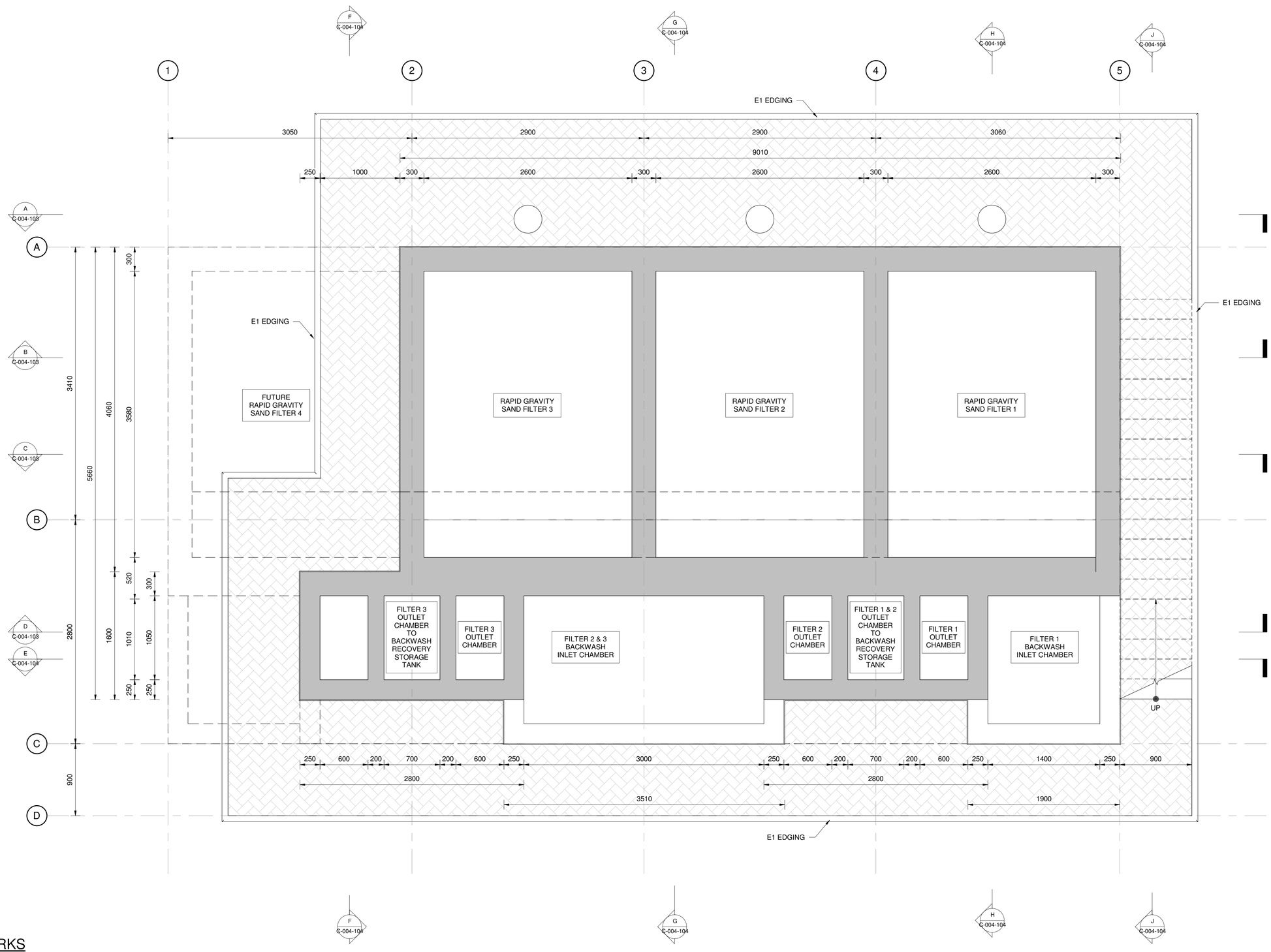


ISOMETRIC VIEW

SCALE

DETAIL 1 - TRAFFICABLE PAVING LAYERWORKS

SCALE 1 : 10



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REVISIONS

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DRAWN	SN	
CHECKED	ML	

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DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

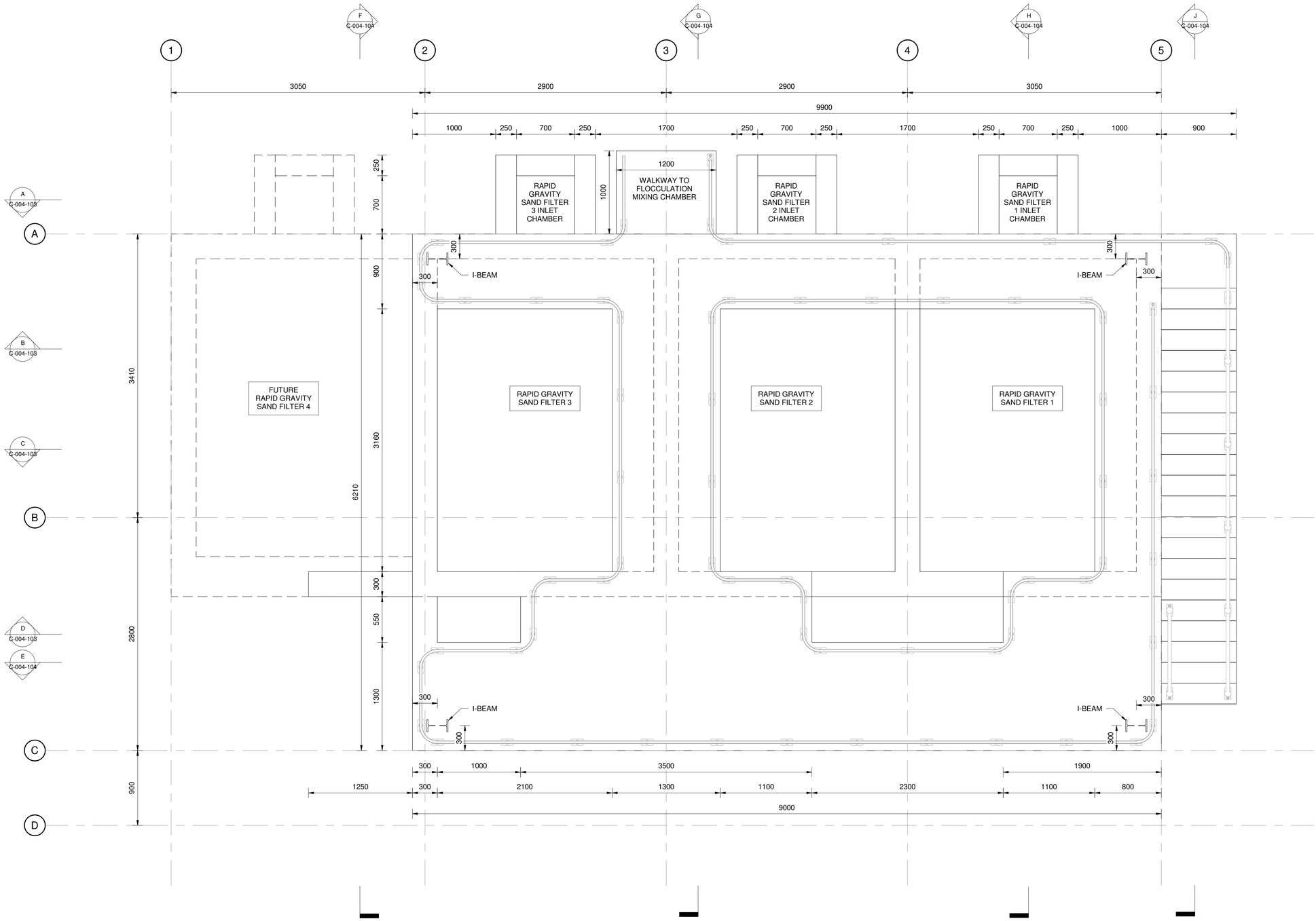
TITLE

DETAIL OF RAPID GRAVITY SAND FILTERS - LOWER LEVEL LAYOUT

SCALE ON A1	SHEET
As indicated	1 OF 4
CONTRACT NO	PROJECT NO
	24193

DRAWING NO: 24193-C-004-101 REV NO: A

COORDINATE SYSTEM:



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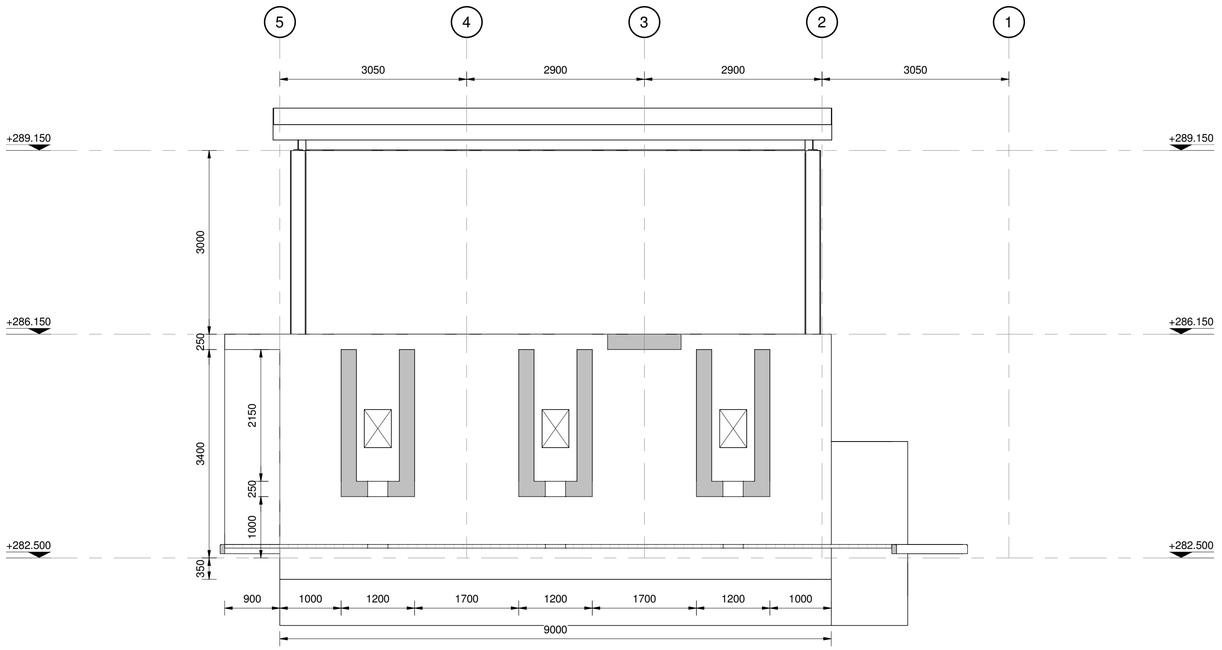
APPROVED:
CLIENT:
DATE:

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PROJECT NAME
UPGRADING OF MCGREGOR WTW

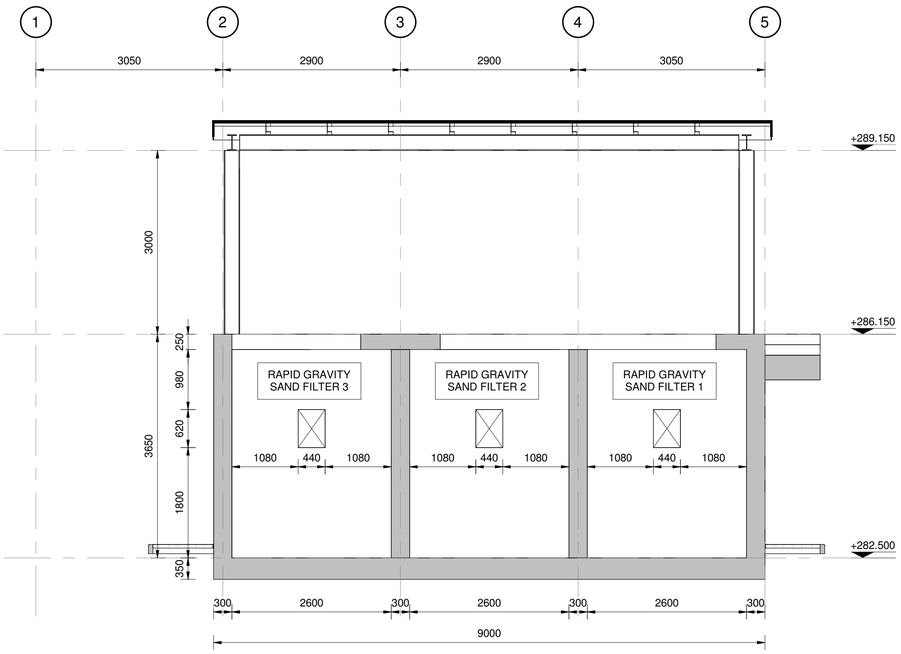
TITLE
DETAIL OF RAPID GRAVITY SAND FILTERS - UPPER LEVEL LAYOUT

SCALE ON A1: 1 : 25	SHEET: 2 OF 4
CONTRACT NO:	PROJECT NO: 24193
DRAWING NO: 24193-C-004-102	REV NO: A
COORDINATE SYSTEM:	



SECTION A-A

SCALE 1 : 50



SECTION B-B

SCALE 1 : 50

SECTION C-C

SCALE 1 : 50

SECTION D-D

SCALE 1 : 50

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REVISIONS

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-27	SN	ML

DESIGNED	HB	
DRAWN	SN	
CHECKED	ML	

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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

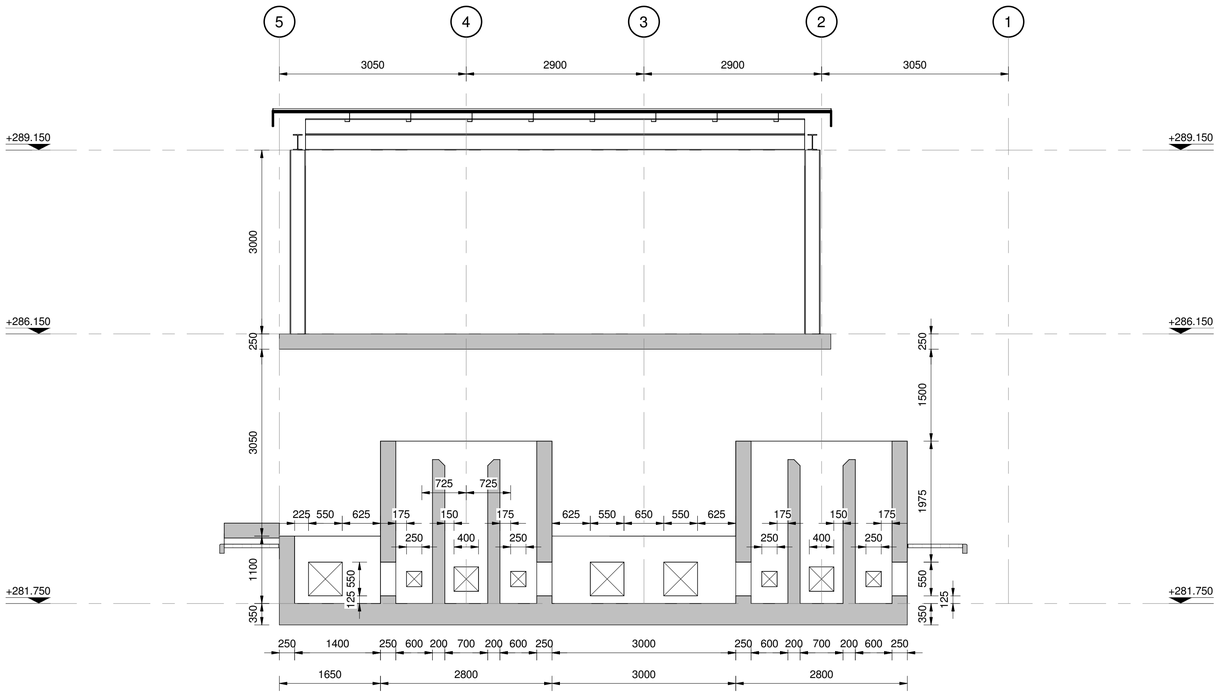
TITLE

DETAIL OF RAPID GRAVITY SAND FILTERS - SECTIONS A-A TO D-D

SCALE ON A1	SHEET
1 : 50	3 OF 4
CONTRACT NO	PROJECT NO
	24193

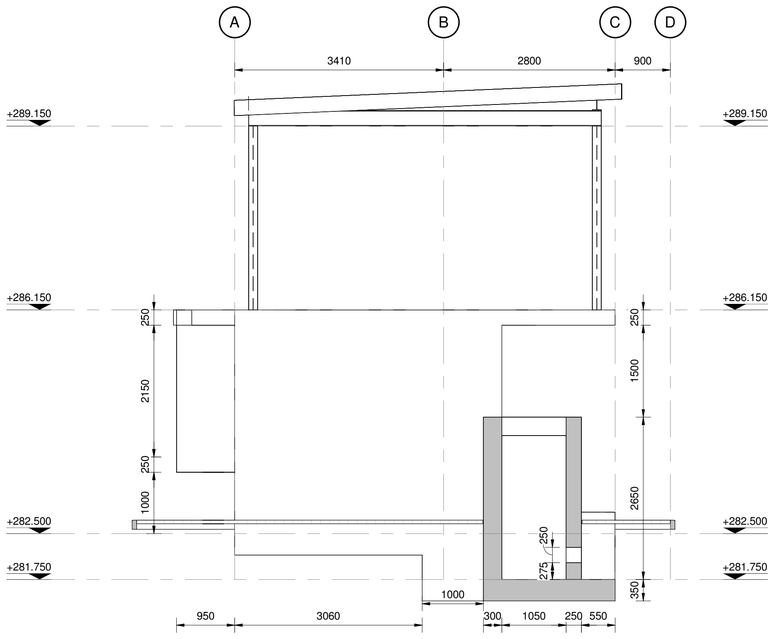
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COORDINATE SYSTEM:



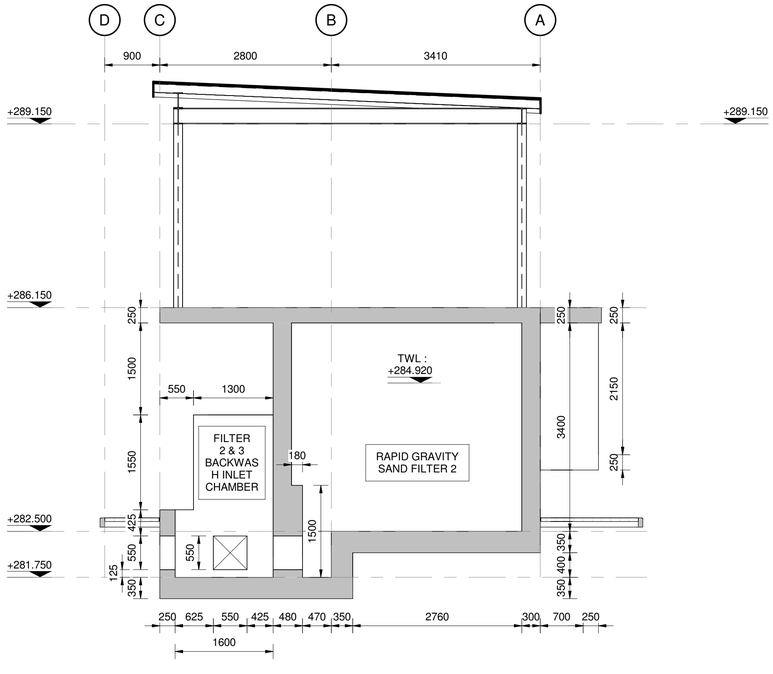
SECTION E-E

SCALE 1 : 50



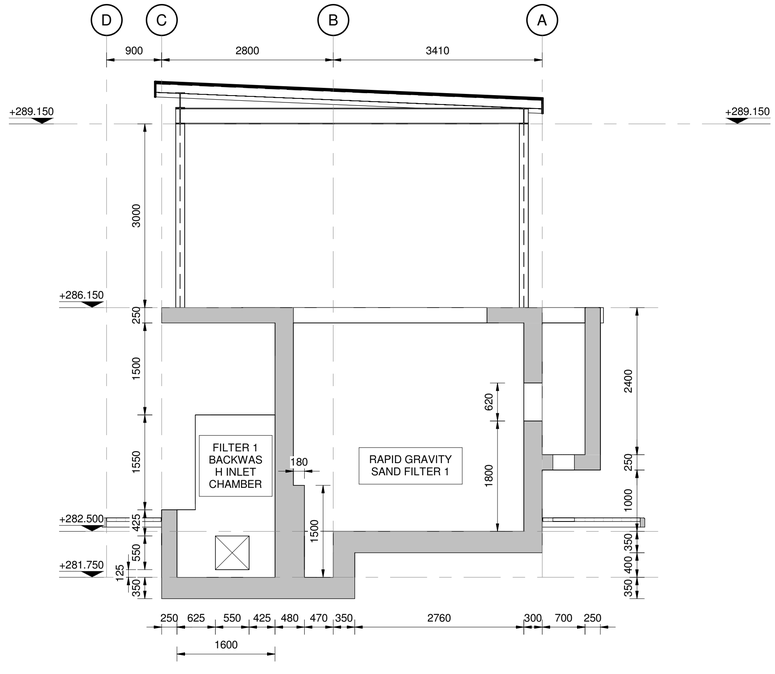
SECTION F-F

SCALE 1 : 50



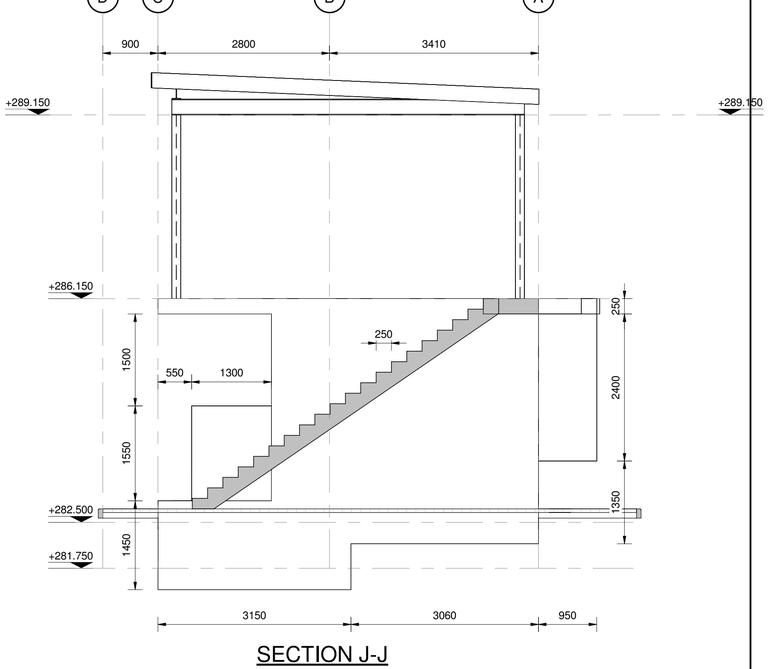
SECTION G-G

SCALE 1 : 50



SECTION H-H

SCALE 1 : 50



SECTION J-J

SCALE 1 : 50

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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

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MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

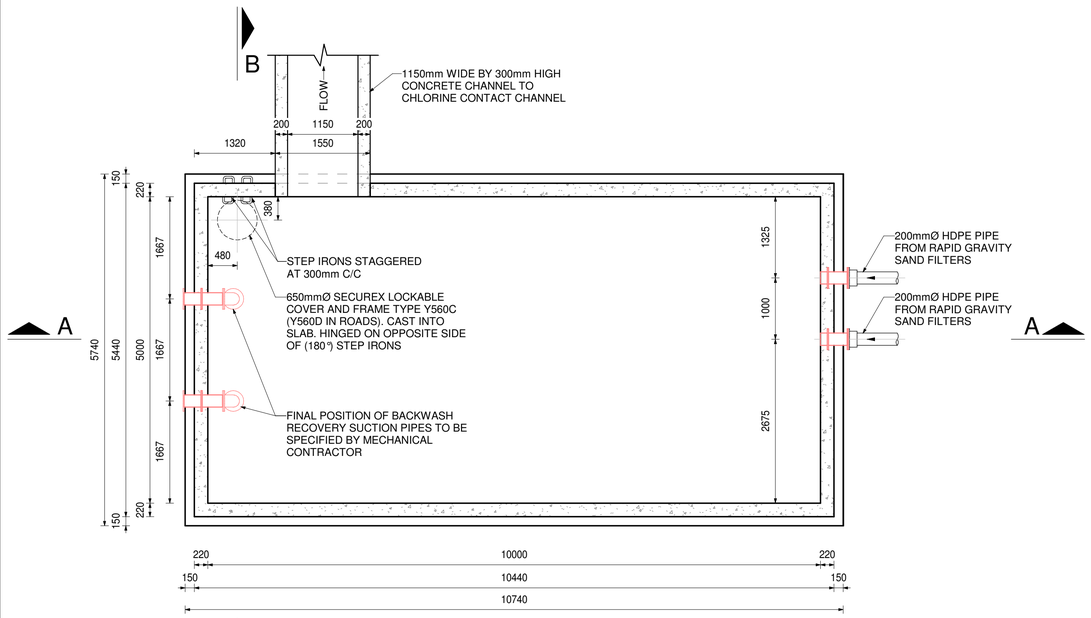
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DETAIL OF RAPID GRAVITY SAND FILTERS - SECTIONS E-E TO J-J

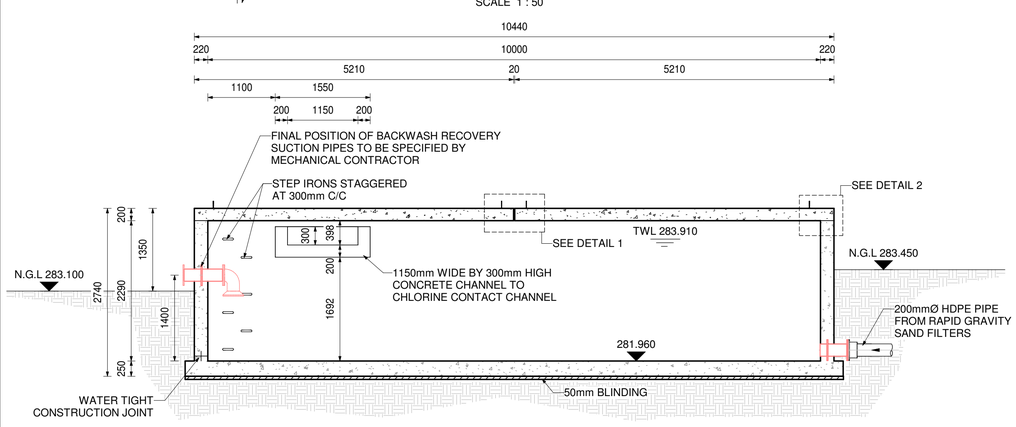
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1 : 50	4 OF 4
CONTRACT NO	PROJECT NO
	24193

DRAWING NO: 24193-C-004-104 REV NO: A

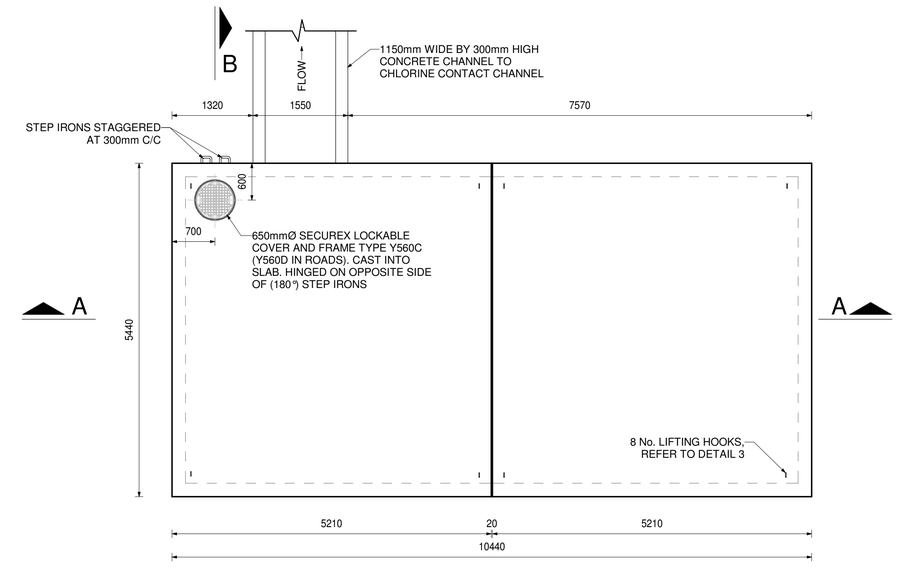
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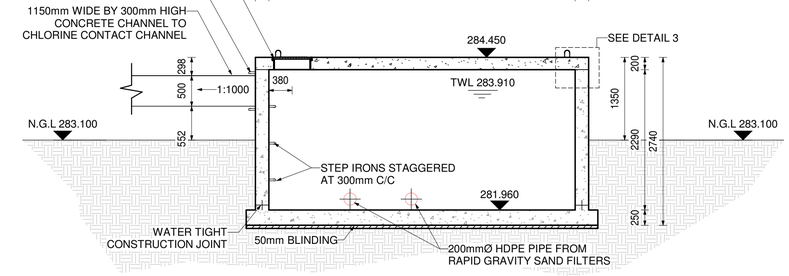
PLAN
SCALE 1 : 50



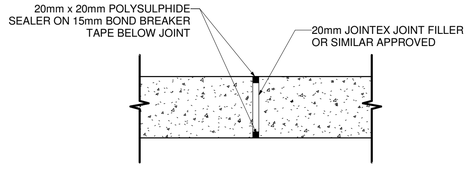
SECTION A-A
SCALE 1 : 50



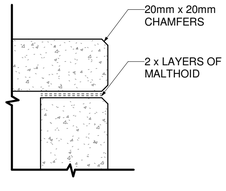
TOP PLAN
SCALE 1 : 50



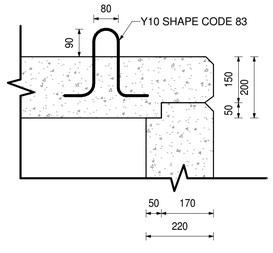
SECTION B-B
SCALE 1 : 50



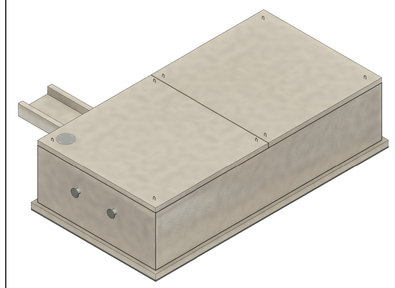
DETAIL 1 - JOINT DETAIL
SCALE 1 : 10



DETAIL 2 - SLAB LAYER DETAIL
SCALE 1 : 10



DETAIL 3- SLAB LIFTING HOOKS
SCALE 1 : 10



DETAIL OF CLEAR WATER
COLLECTION SUMP

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

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3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape, so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for the base, walls and top slab indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR

AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-27	RW	CD

REVISIONS

DESIGNED	ML	
DRAWN	RW	
CHECKED	CD	

CONSULTING ENGINEERS

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APPROVED:

ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

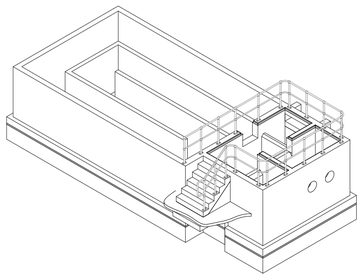
TITLE

DETAIL OF CLEAR WATER
COLLECTION SUMP

SCALE ON A1	SHEET
AS SHOWN	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

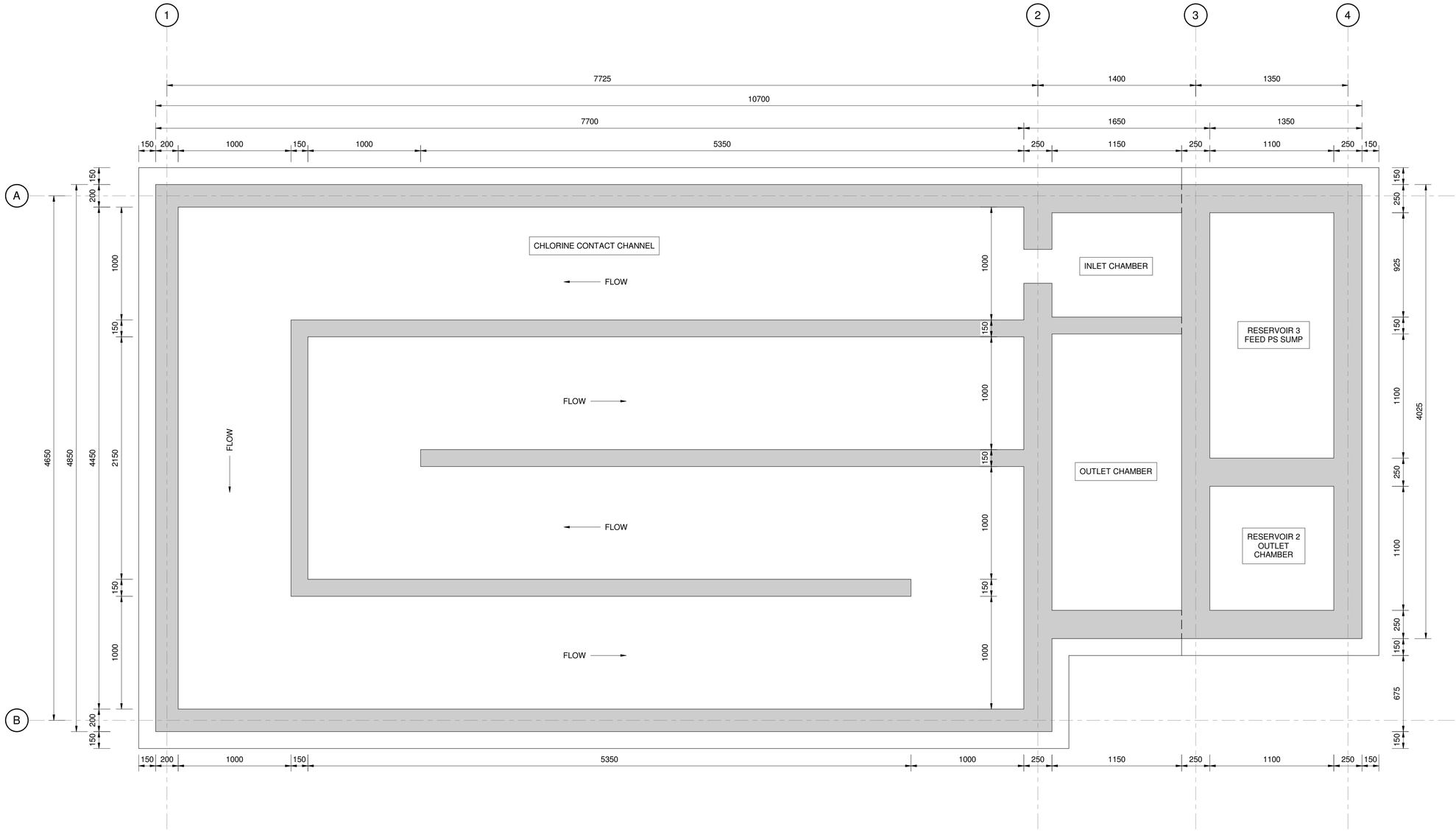
DRAWING NO: 24193-C-004-105 REV A

COORDINATE SYSTEM: N/A



ISOMETRIC VIEW

SCALE



FOUNDATION LAYOUT OF CHLORINE CONTACT CHANNEL

SCALE 1 : 20

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A	ISSUED FOR TENDER	2025-10-27	SN	ML

REVISIONS

DESIGNED	HB	
DRAWN	SN	
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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

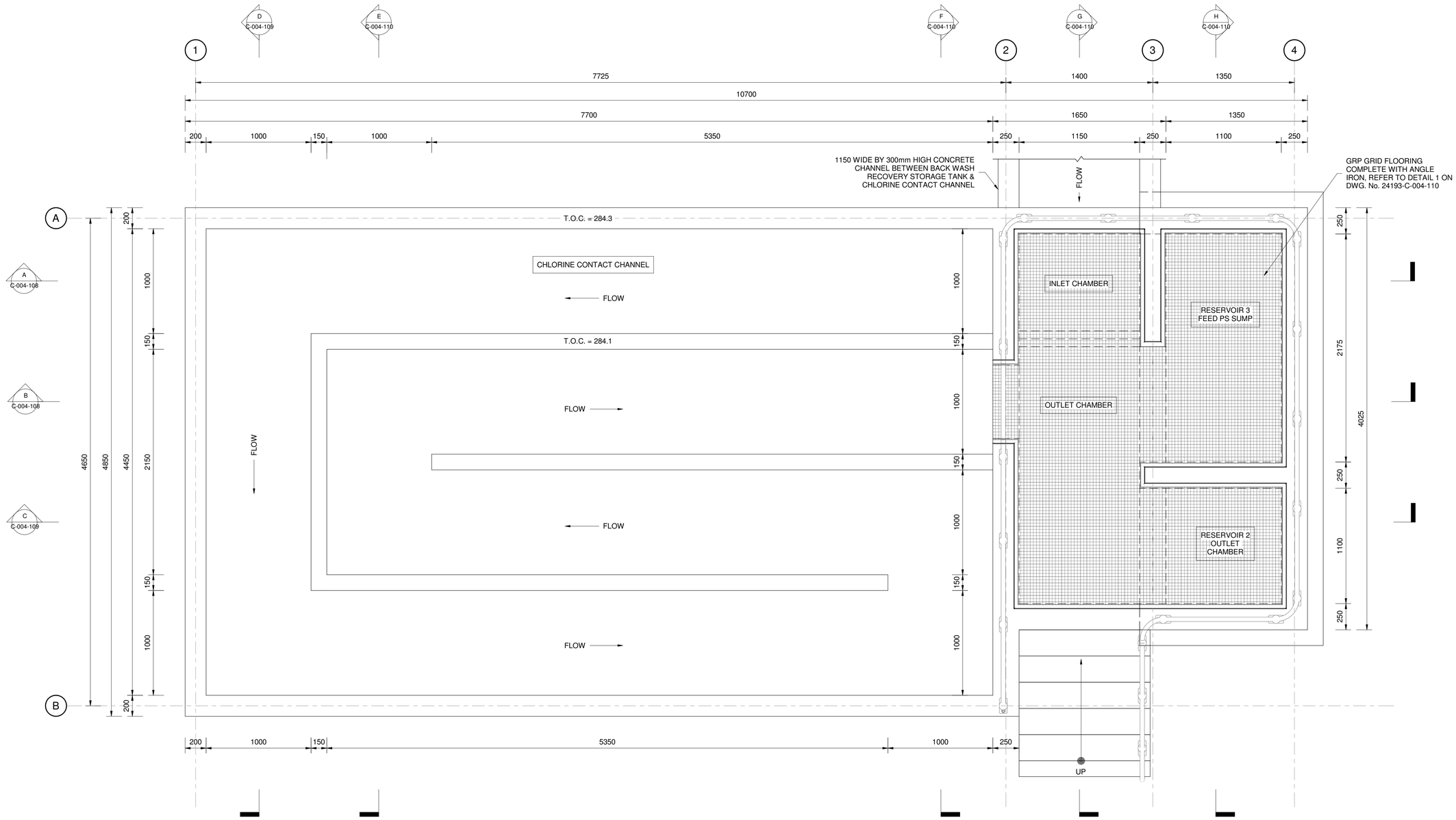
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DETAILOF CHLORINE CONTACT CHANNEL - FOUNDATION LAYOUT

SCALE ON A1	SHEET
1 : 20	2 OF 6
CONTRACT NO	PROJECT NO
	24193

DRAWING NO: 24193-C-004-106 REV NO: A

COORDINATE SYSTEM:



PLAN VIEW OF CHLORINE CONTACT CHANNEL

SCALE 1 : 20

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REVISIONS

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DRAWN	SN	
CHECKED	ML	

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APPROVED:
ENGINEERS:
DATE: 2025-10-27

APPROVED:
CLIENT:
DATE:

CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

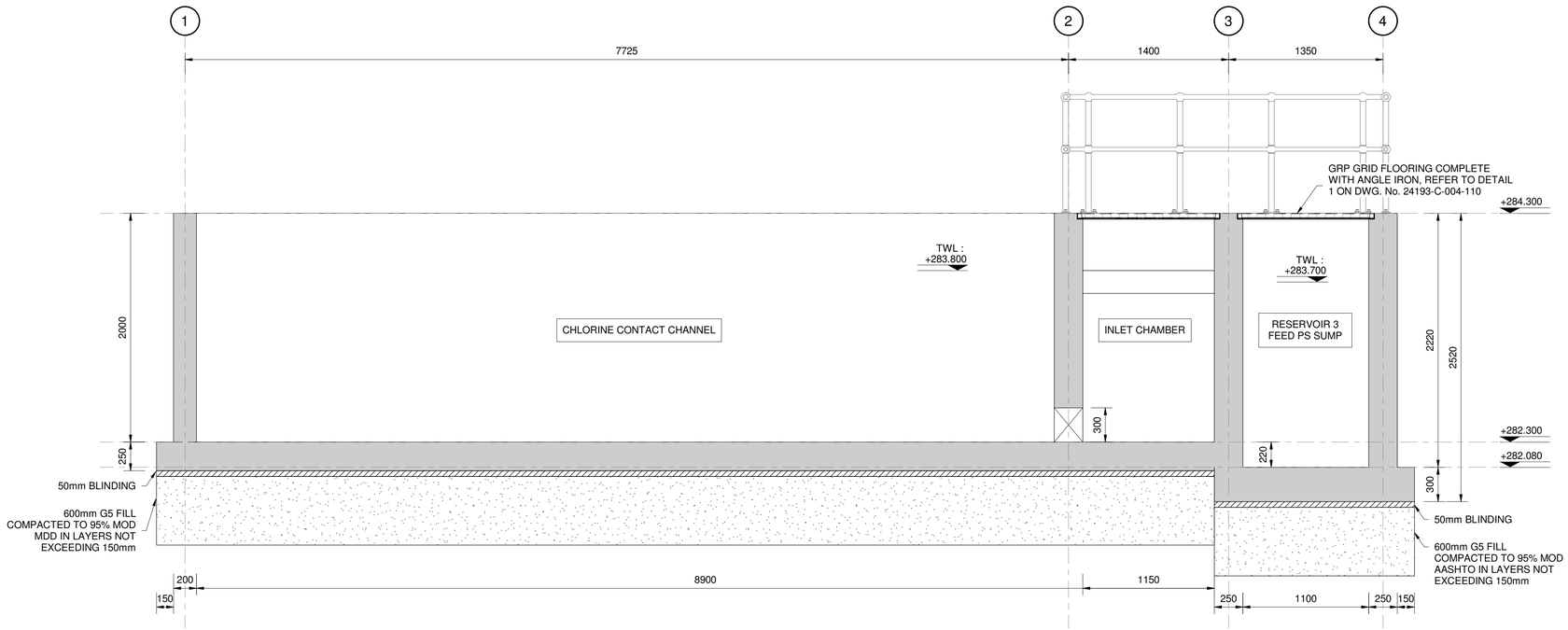
PROJECT NAME
UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF CHLORINE CONTACT CHANNEL - PLAN LAYOUT

SCALE ON A1	SHEET
1 : 20	3 OF 6
CONTRACT NO	PROJECT NO
	24193

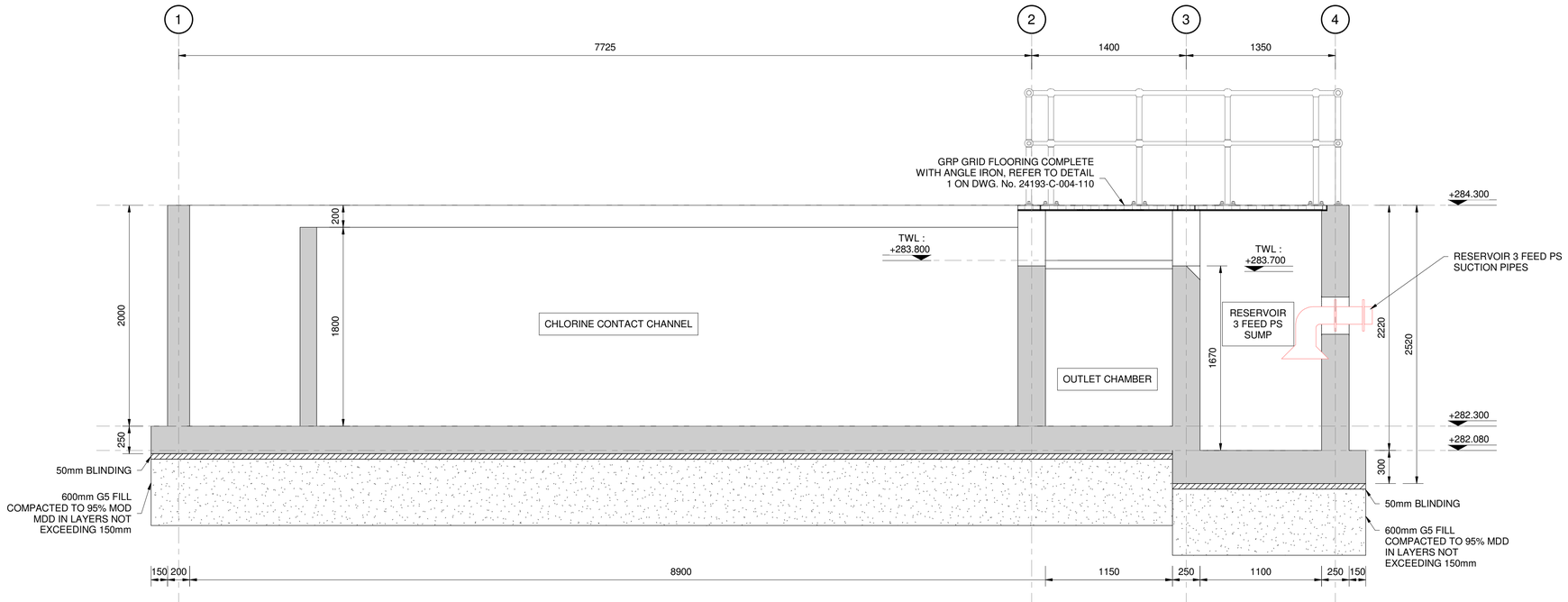
DRAWING NO: 24193-C-004-107 REV NO: A

COORDINATE SYSTEM:



SECTION A-A

SCALE 1 : 25



SECTION B-B

SCALE 1 : 25

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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REVISIONS				
REV	DESCRIPTION	DATE	REV BY	CHKD
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DESIGNED	??	
DRAWN	SN	
CHECKED	NAP	

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ENGINEERS:
DATE: 2025-10-27

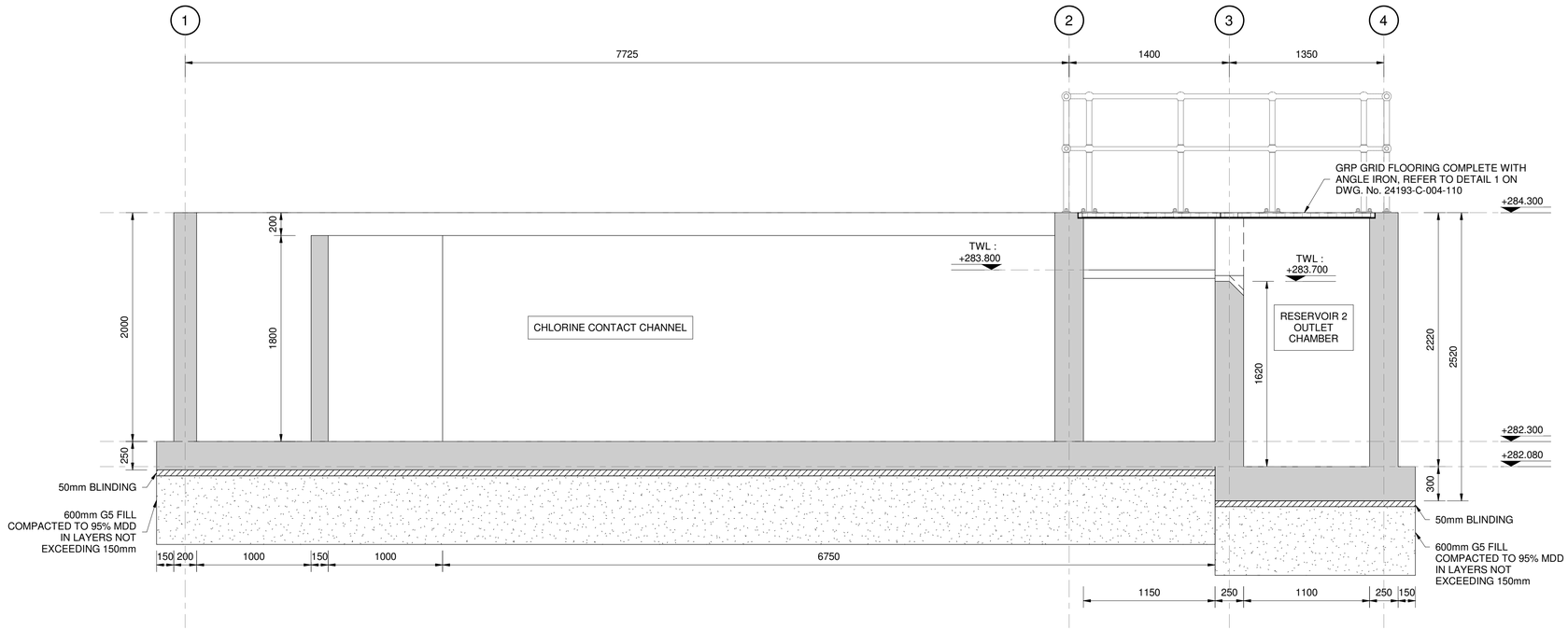
APPROVED:
CLIENT:
DATE:

CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF CHLORINE CONTACT CHANNEL - SECTIONS A-A & B-B

SCALE ON A1: 1 : 25	SHEET: 4 OF 6
CONTRACT NO:	PROJECT NO: 24193
DRAWING NO: 24193-C-004-108	REV NO: A
COORDINATE SYSTEM:	



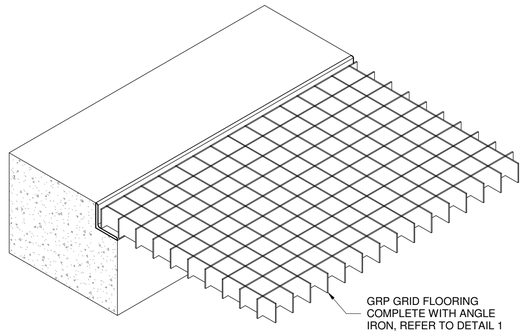
SECTION C-C

SCALE 1 : 25

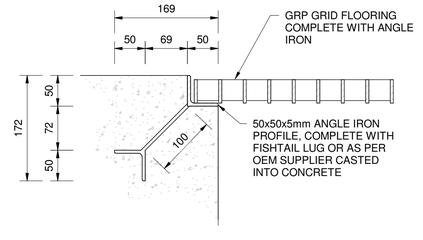


SECTION D-D

SCALE 1 : 25



GRP GRID FLOORING ISOMETRIC VIEW



DETAIL 1

SCALE 1 : 5

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DESIGNED	HB	
DRAWN	SN	
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ENGINEERS:
DATE: 2025-10-27

APPROVED:
CLIENT:
DATE:

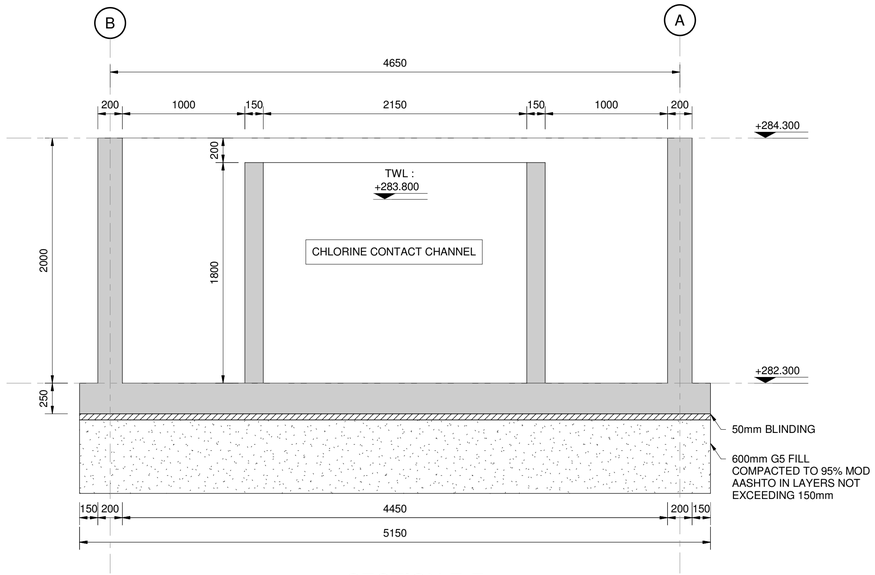
CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF CHLORINE CONTACT CHANNEL - SECTIONS C-C & D-D

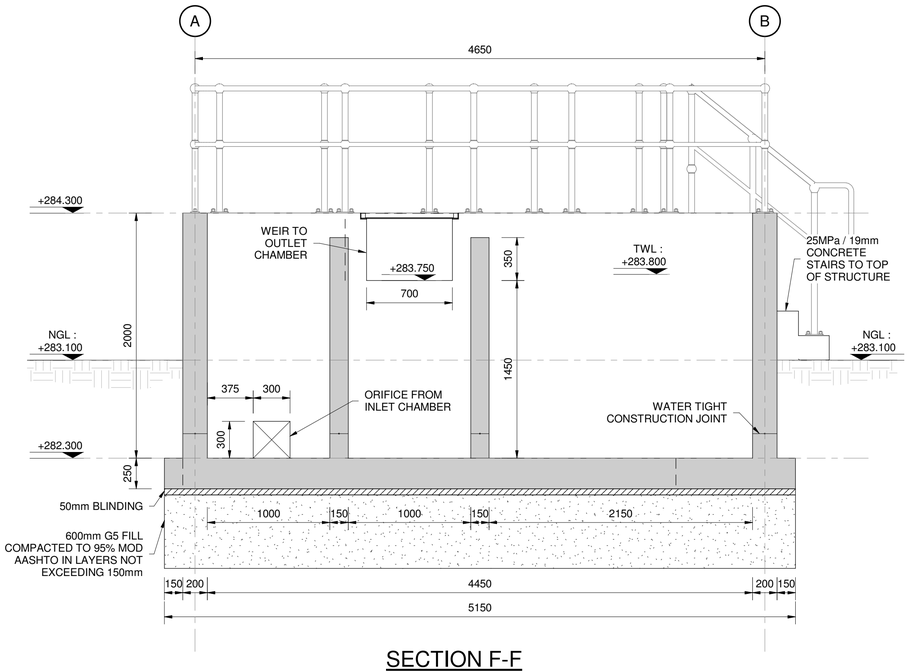
SCALE ON A1	SHEET
As indicated	5 OF 6
CONTRACT NO	PROJECT NO
	24193

DRAWING NO: 24193-C-004-109 REV NO: A
COORDINATE SYSTEM:



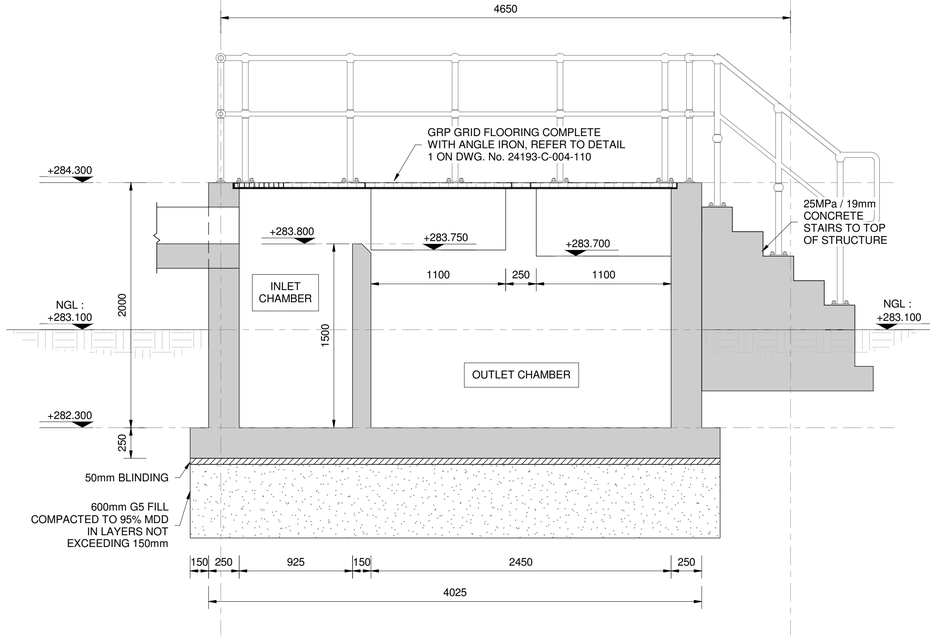
SECTION E-E

SCALE 1 : 25



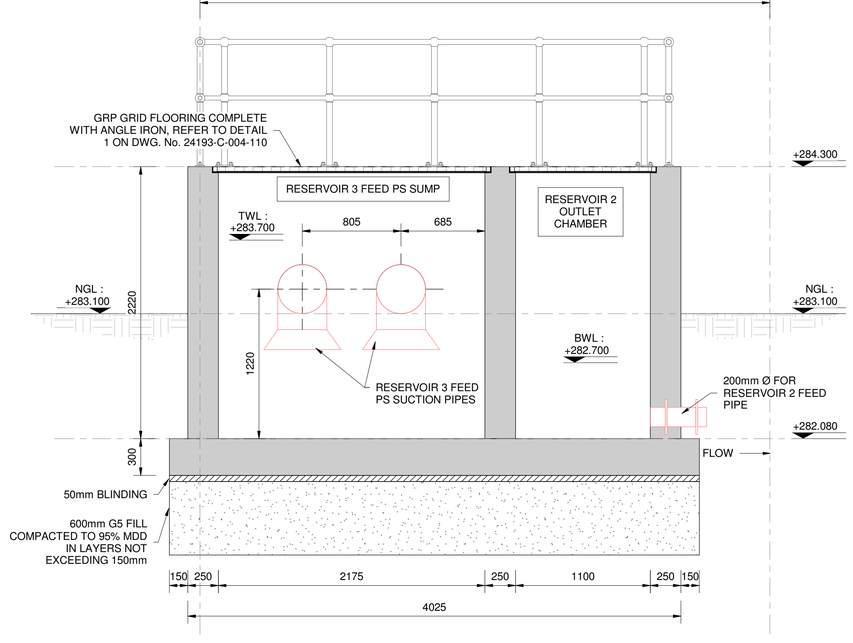
SECTION F-F

SCALE 1 : 25



SECTION G-G

SCALE 1 : 25



SECTION H-H

SCALE 1 : 25

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A	ISSUED FOR TENDER	2025-10-27	SN	ML

DESIGNED	HB	
DRAWN	SN	
CHECKED	ML	

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ENGINEERS: _____

DATE: 2025-10-27

APPROVED:

CLIENT: _____

DATE: _____

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

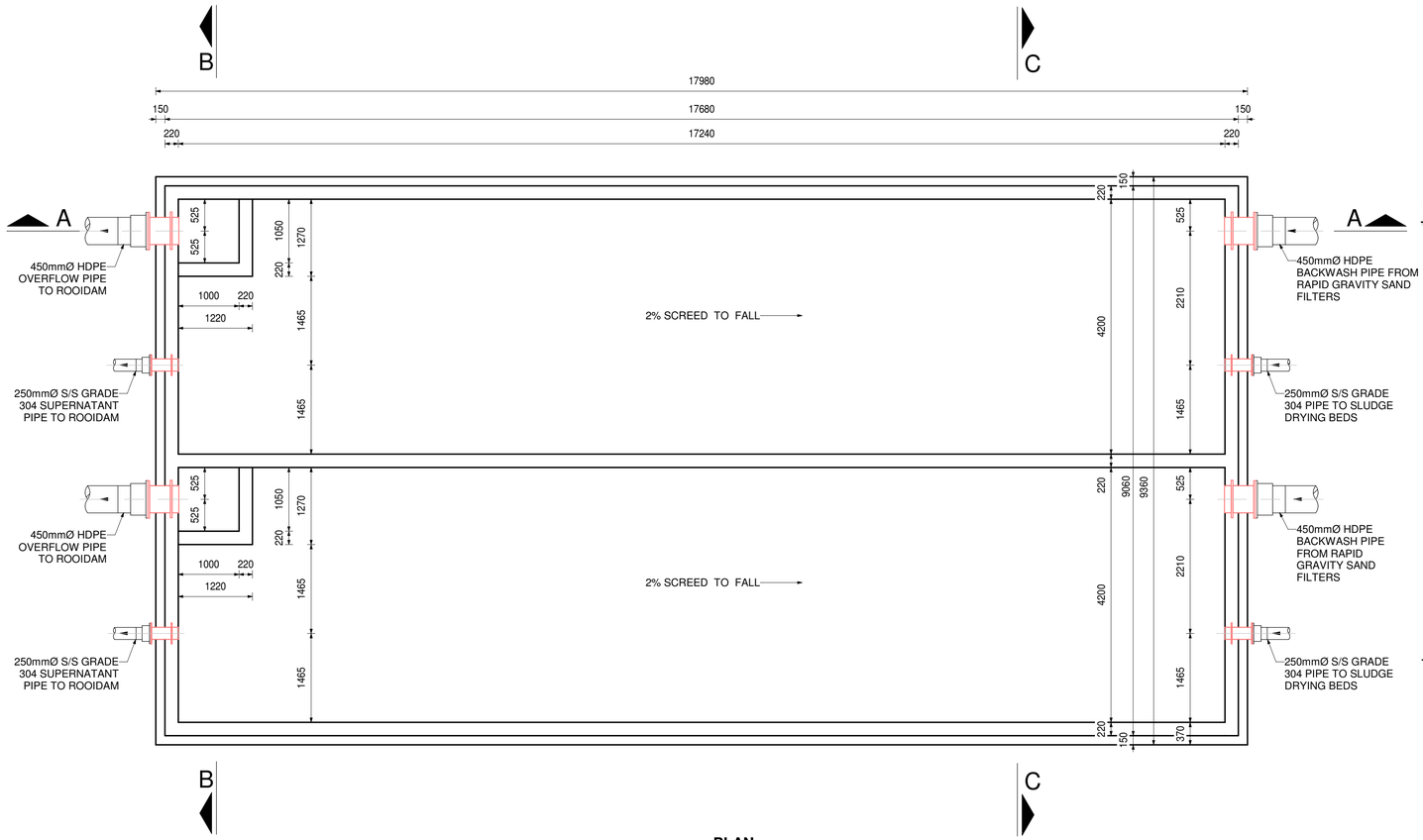
TITLE

DETAIL OF CHLORINE CONTACT CHANNEL - SECTIONS E-E TO H-H

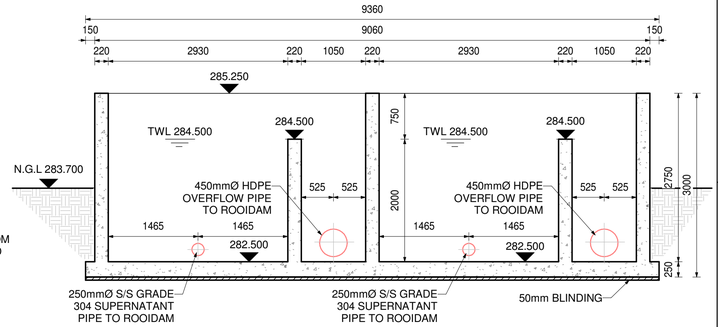
SCALE ON A1	SHEET
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CONTRACT NO	PROJECT NO
	24193

DRAWING NO: 24193-C-004-110 REV NO: A

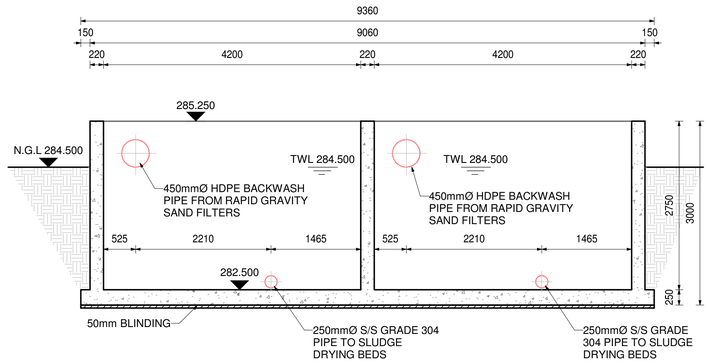
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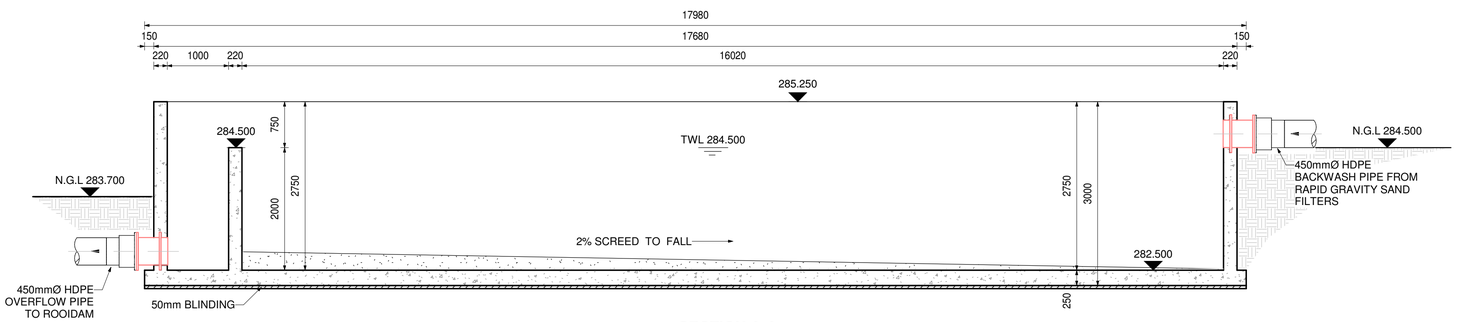
PLAN
SCALE 1 : 50



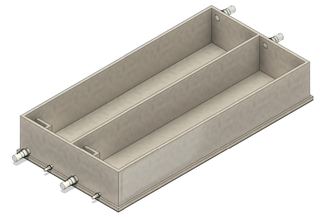
SECTION B-B
SCALE 1 : 50



SECTION C-C
SCALE 1 : 50



SECTION A-A
SCALE 1 : 50



3D VIEW OF DETAIL OF
BACKWASH RECOVERY TANK

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

   b) Mild steel pipes up to 150mmØ shall be seamless, medium class steel pipes manufactured in accordance with SANS 62.

   c) Flange drilling shall be in accordance with SANS 1123:Table 1000/3.

2.Dimensions of all pipes, fittings, valves, etc must be submitted for approval on a shopdrawing before any material is ordered

3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape,
   so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for each cost indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-27	RW	CD

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	CD	

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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

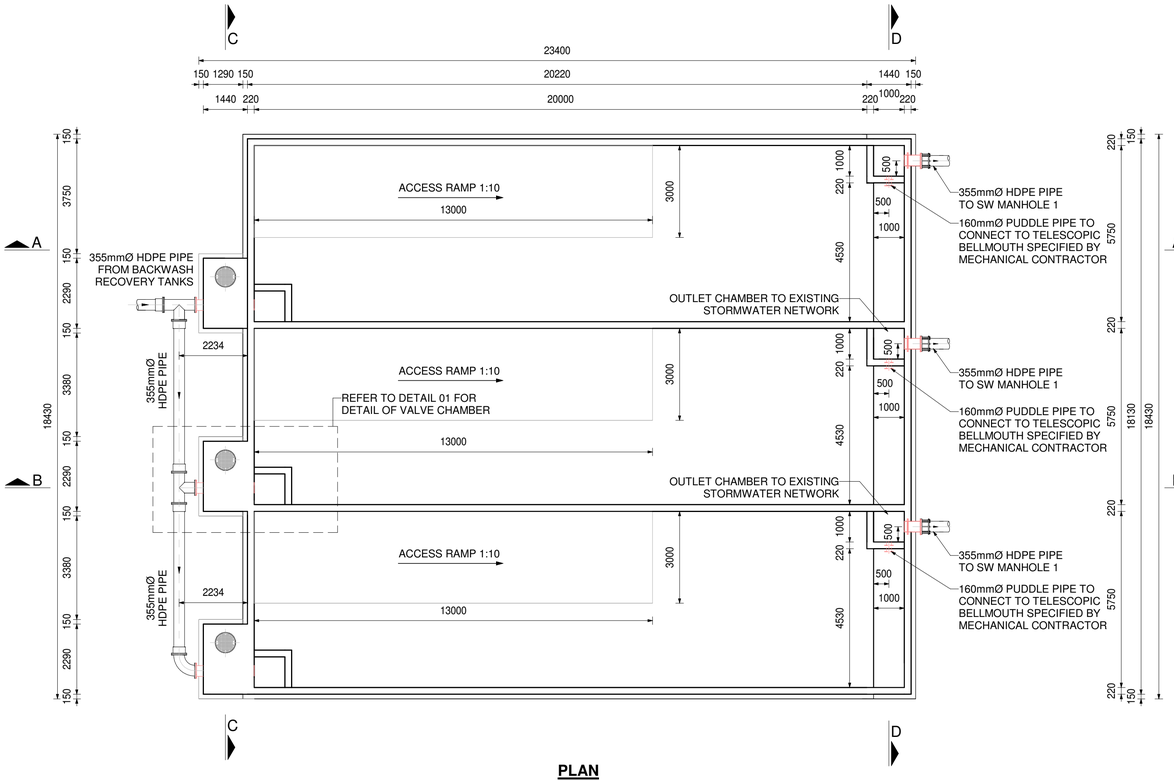
TITLE

DETAIL OF BACKWASH RECOVERY TANK

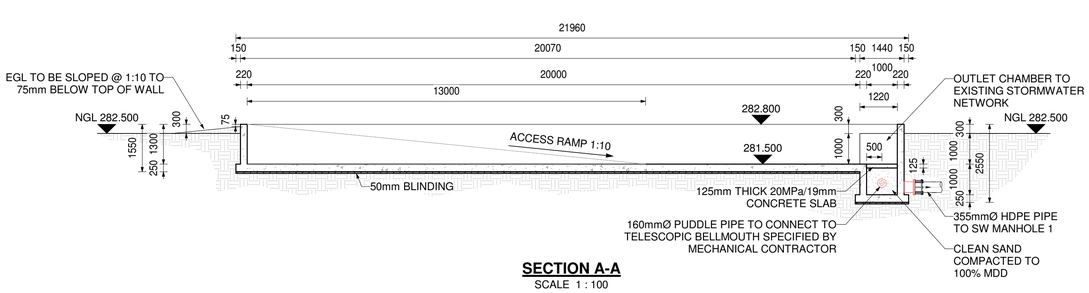
SCALE ON A1	SHEET
1:50	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-004-111 REV A

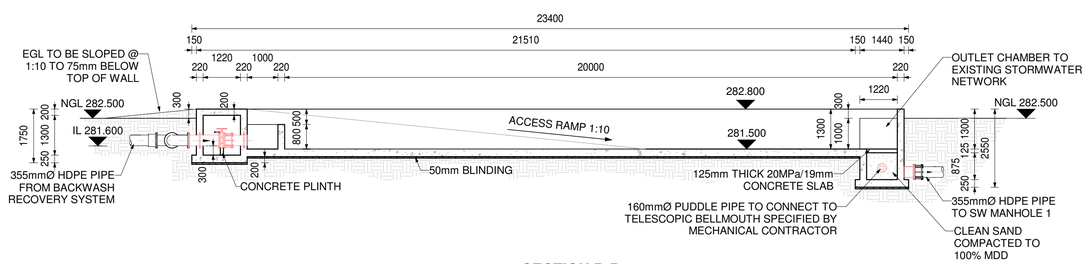
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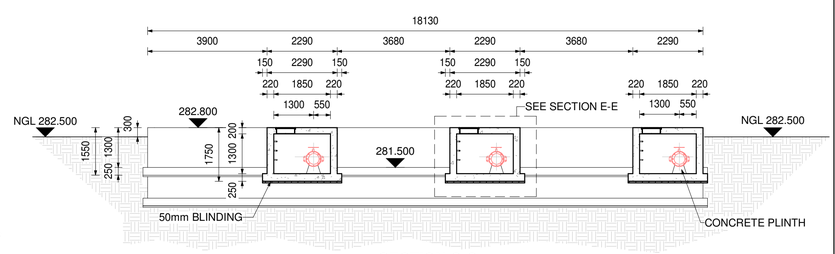
PLAN
SCALE 1 : 100



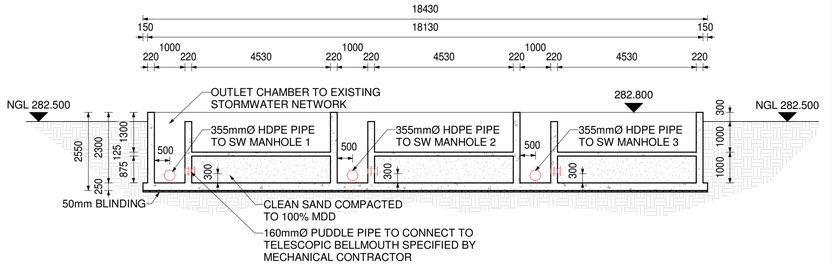
SECTION A-A
SCALE 1 : 100



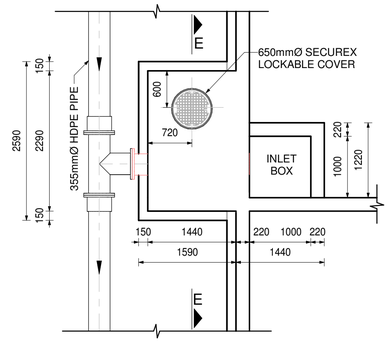
SECTION B-B
SCALE 1 : 100



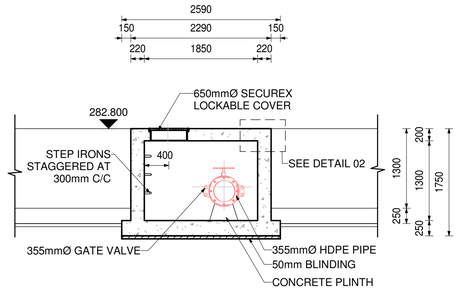
SECTION C-C
SCALE 1 : 100



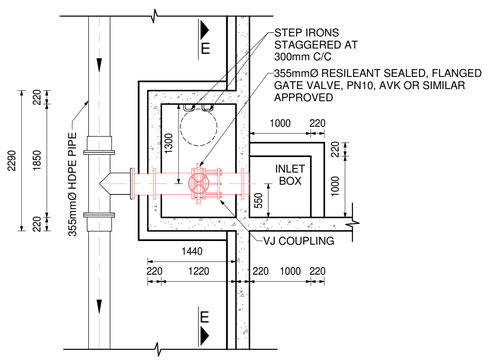
SECTION D-D
SCALE 1 : 100



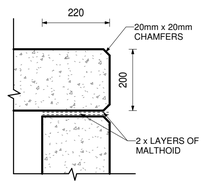
DETAIL 01 - TOP SLAB OF VALVE CHAMBER
SCALE 1 : 50



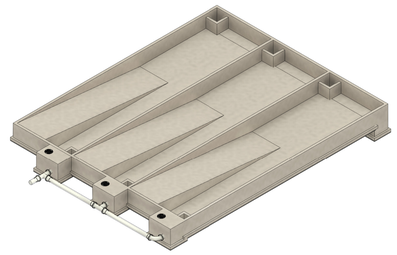
SECTION E-E (DETAIL 01)
SCALE 1 : 50



PLAN VIEW OF VALVE CHAMBER
SCALE 1 : 50



DETAIL 02
SCALE 1 : 10



3D VIEW OF SLUDGE DAMS

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

   b) Mild steel pipes up to 150mmØ shall be seamless, medium class steel pipes manufactured in accordance with SANS 62.

   c) Flange drilling shall be in accordance with SANS 1123:Table 1000/3.

2.Dimensions of all pipes, fittings, valves, etc must be submitted for approval on a shopdrawing before any material is ordered

3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape,
   so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for each cast indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR

AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-27	RW	ML

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	ML	

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email: bellville@lyners.co.za

APPROVED:
ENGINEERS:
DATE: 2025-10-27

APPROVED:
CLIENT:
DATE:

CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

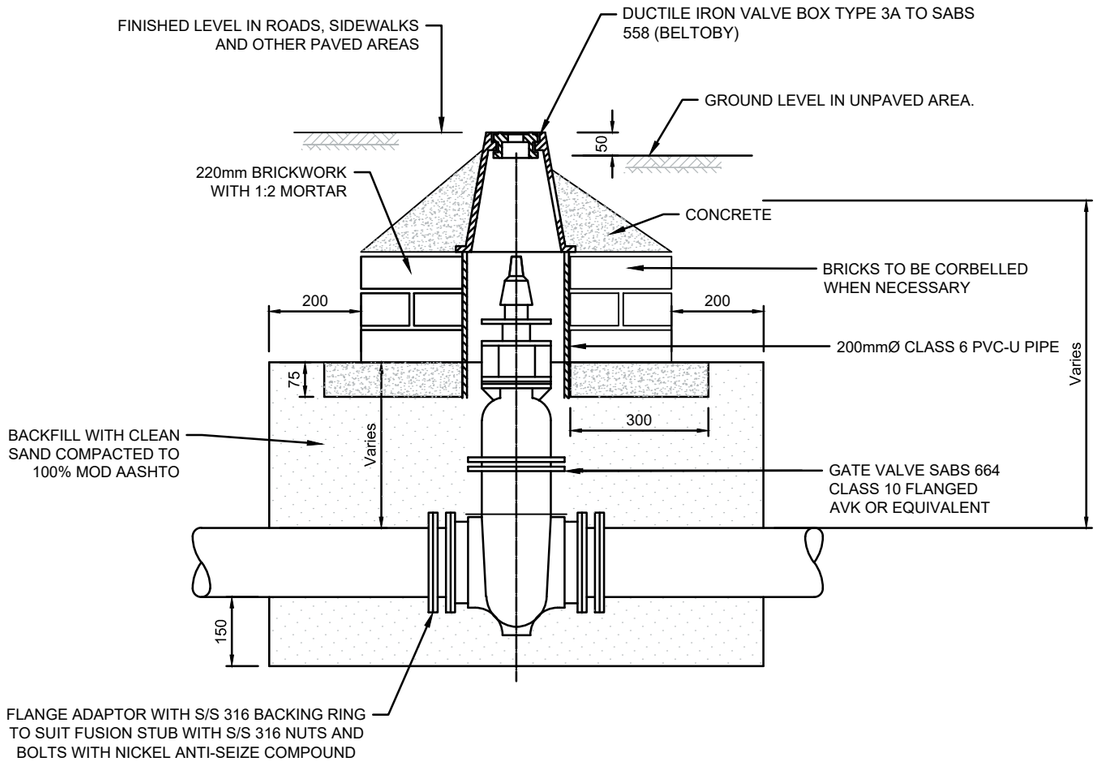
PROJECT NAME
UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF SLUDGE DAMS

SCALE ON A1	SHEET
AS SHOWN	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-004-112 REV A

COORDINATE SYSTEM: N/A



DETAIL OF VALVE CHAMBER
(PIPES UP TO 200mmØ)

NOTES:

1. ALL VALVES MUST HAVE A SQUARE SPINDLE CAP WITH S/S 316 NUTS AND BOLTS AND MUST BE ANTI-CLOCKWISE CLOSING.
2. ALL CONCRETE TO BE CLASS 20/19
3. INSTALL S/S EXTENSION ROD ON VALVE SPINDEL IF THE TOP OF THE VALVE IS MORE THAN 400mm BELOW FINISHED SURFACE LEVEL
4. USE TWO COATS OIL PAINT FOR COVERS
5. ALL CONCRETE TO BE 25MPa/19mm

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REVISIONS

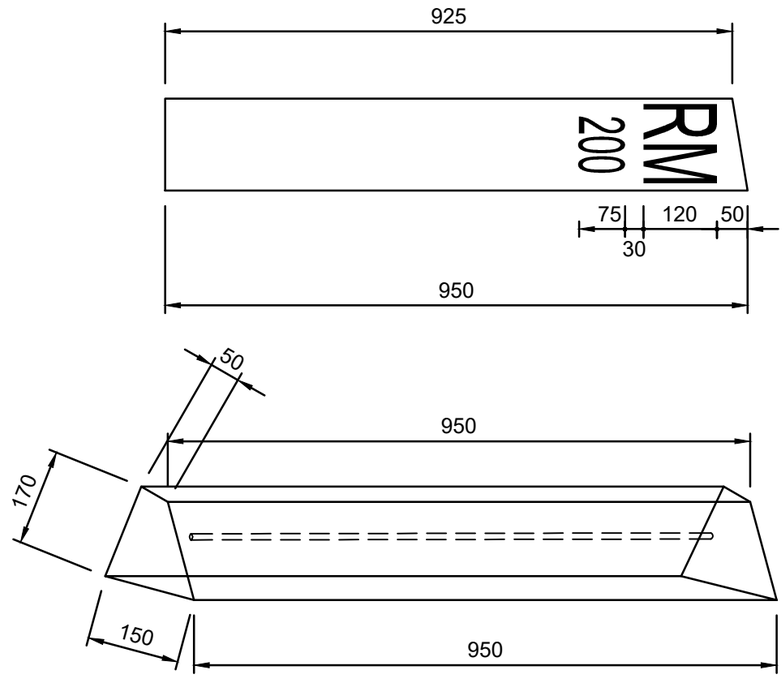
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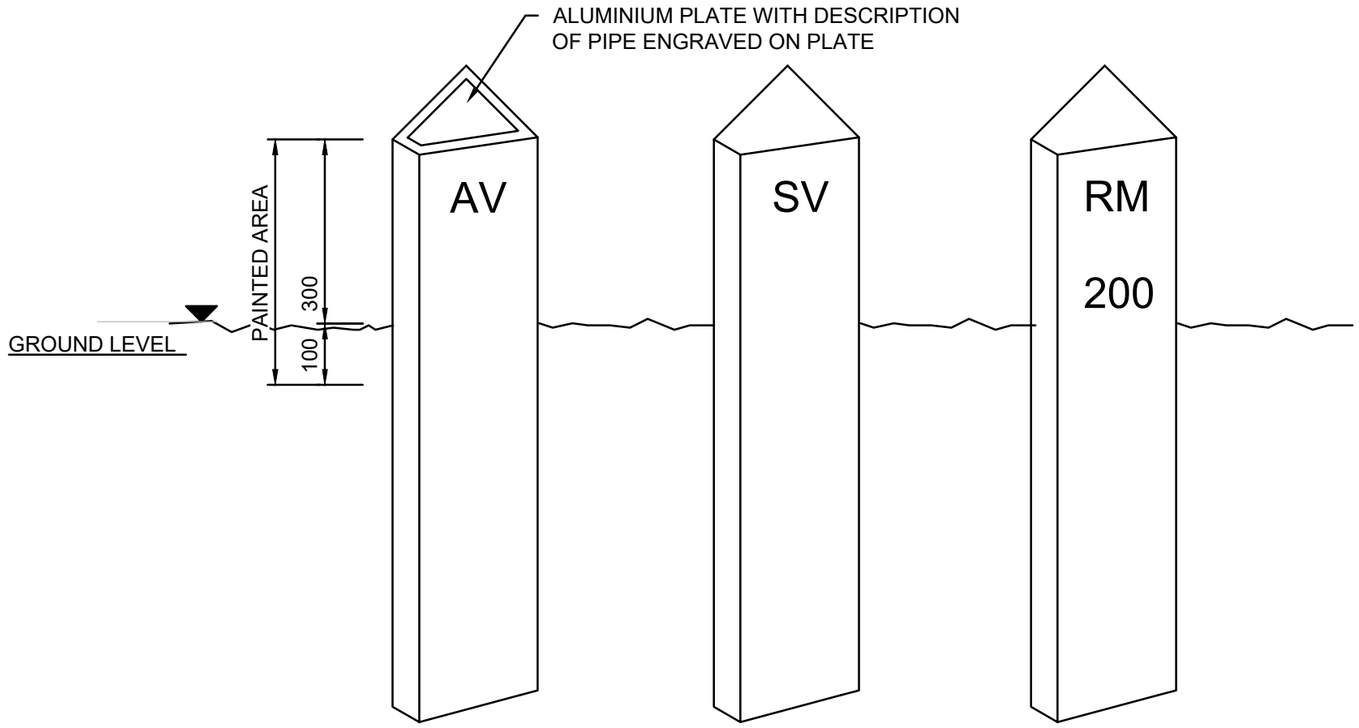
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email: bellville@lyners.co.za

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
TYPICAL DETAIL OF VALVE

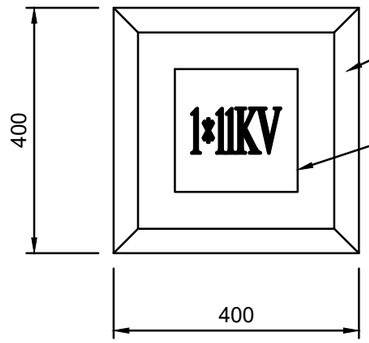
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CONTRACT No.	PROJECT No.: 24193C
DRAWING No.: 24193-C-004-113	REV: A
COORDINATE SYSTEM: N/A	

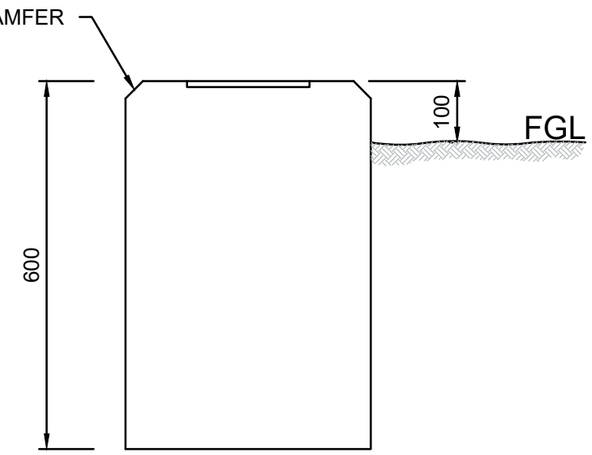




NOTES :

1 SECTION ABOVE GROUND MUST BE 300mm
2 REINFORCE MARKER WITH 1xY10 BAR IN CENTER (875mm LONG)
3 NON REFLECTORIZED PAINT SHALL BE USED ACCORDING TO SABS 731
COLOUR SPECIFICATIONS :
MARKER - WHITE (TO BE PAINTED UP TO 100mm
BELOW NATURAL GROUNDLEVEL)
LETTERING - GOLDEN YELLOW
4 PIPE ROUTE MARKERS EVERY 100m AND CHANGE IN DIRECTION
5 PIPE ROUTE MARKERS SHALL INDICATE DIAMETER OF PIPES
6 V = VALVE AND SIZE
W = WATERMAIN AND DIAMETER SIZE
AV = AIR VALVE
SV = SCOUR VALVE
RM = RISING MAIN





The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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REVISIONS

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DRAWN	ES	
CHECKED	ML	

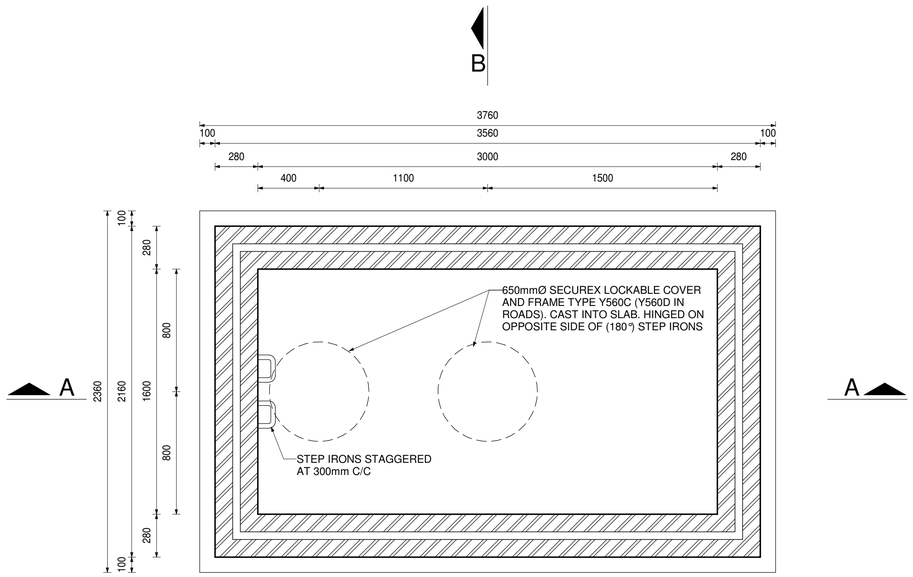
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PROJECT
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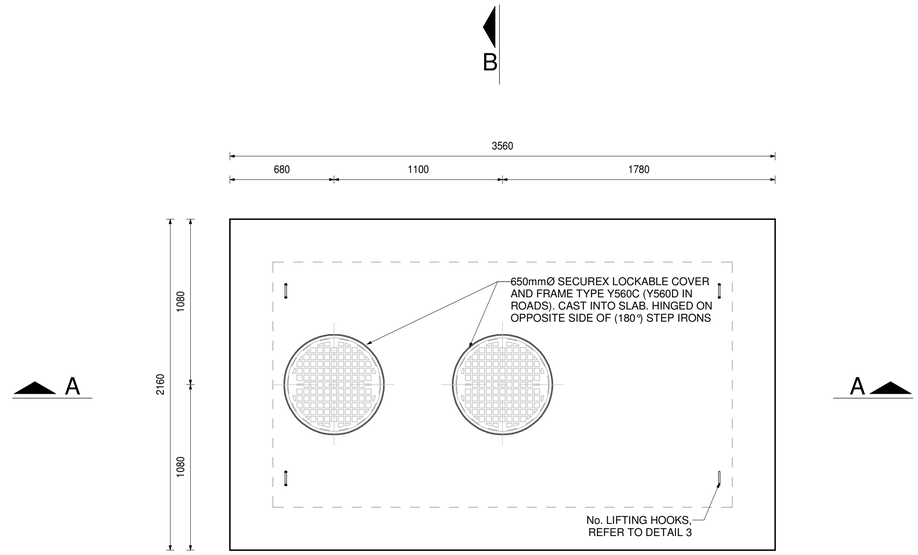
TITLE
TYPICAL DETAIL OF SERVICES ROUTE MARKER

SCALE 1:10 on A3	SHEET 1 OF 1
CONTRACT No.	PROJECT No. 24193C

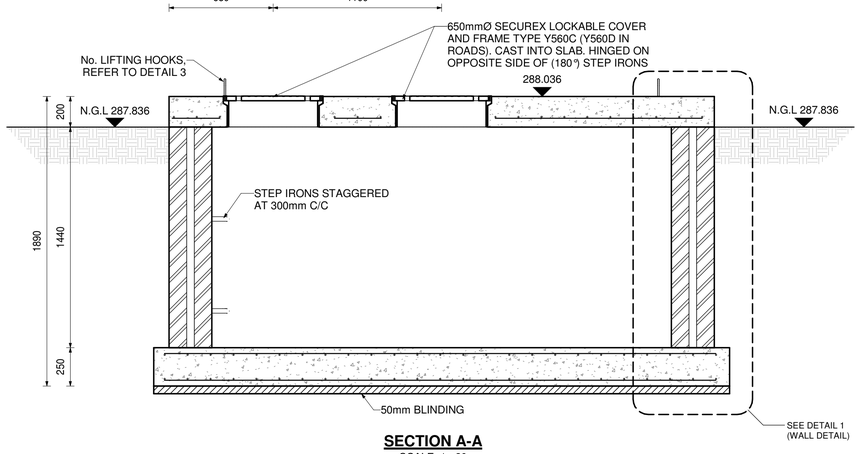
DRAWING No. 24193-C-004-114 REV A
COORDINATE SYSTEM: N/A



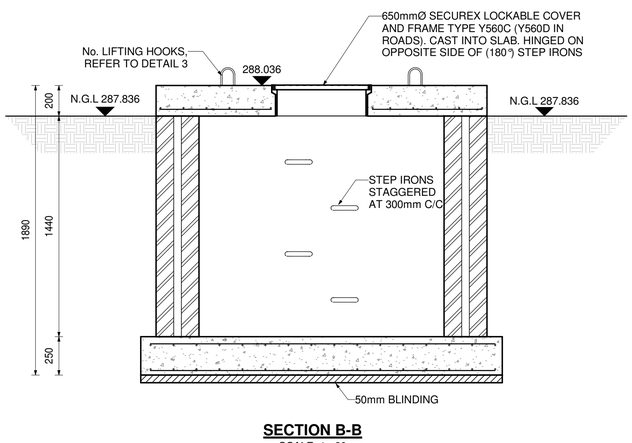
PLAN
SCALE 1 : 20



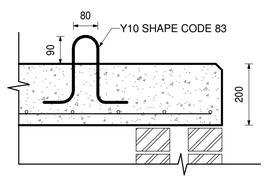
TOP SLAB
SCALE 1 : 20



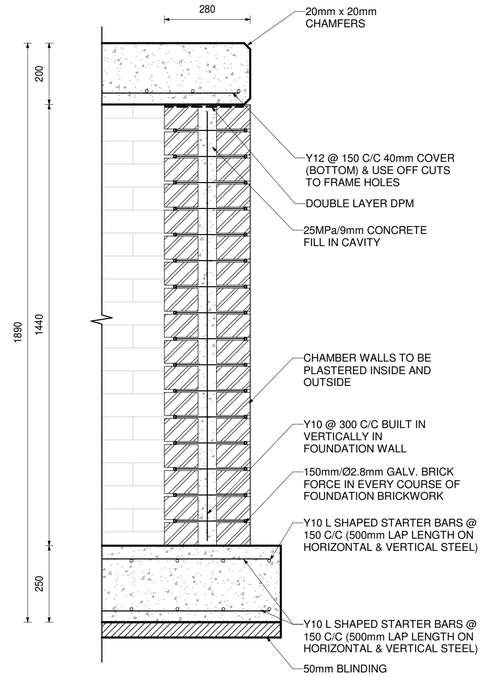
SECTION A-A
SCALE 1 : 20



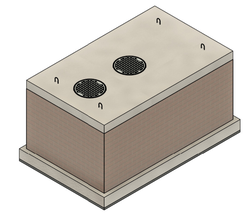
SECTION B-B
SCALE 1 : 20



DETAIL 2 - SLAB LIFING HOOKS
SCALE 1 : 10



DETAIL 1- WALL DETAIL
SCALE 1 : 10



3D VIEW OF WATER METER CHAMBER

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

   b) Mild steel pipes up to 150mmØ shall be seamless, medium class steel pipes manufactured in accordance with SANS 62.

   c) Flange drilling shall be in accordance with SANS 1123:Table 1000/3.

2.Dimensions of all pipes, fittings, valves, etc must be submitted for approval on a shopdrawing before any material is ordered

3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape, so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for the base slab and top slab indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

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SCALE BAR

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A	ISSUED FOR TENDER	2025-10-27	RW	ML

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	ML	

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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

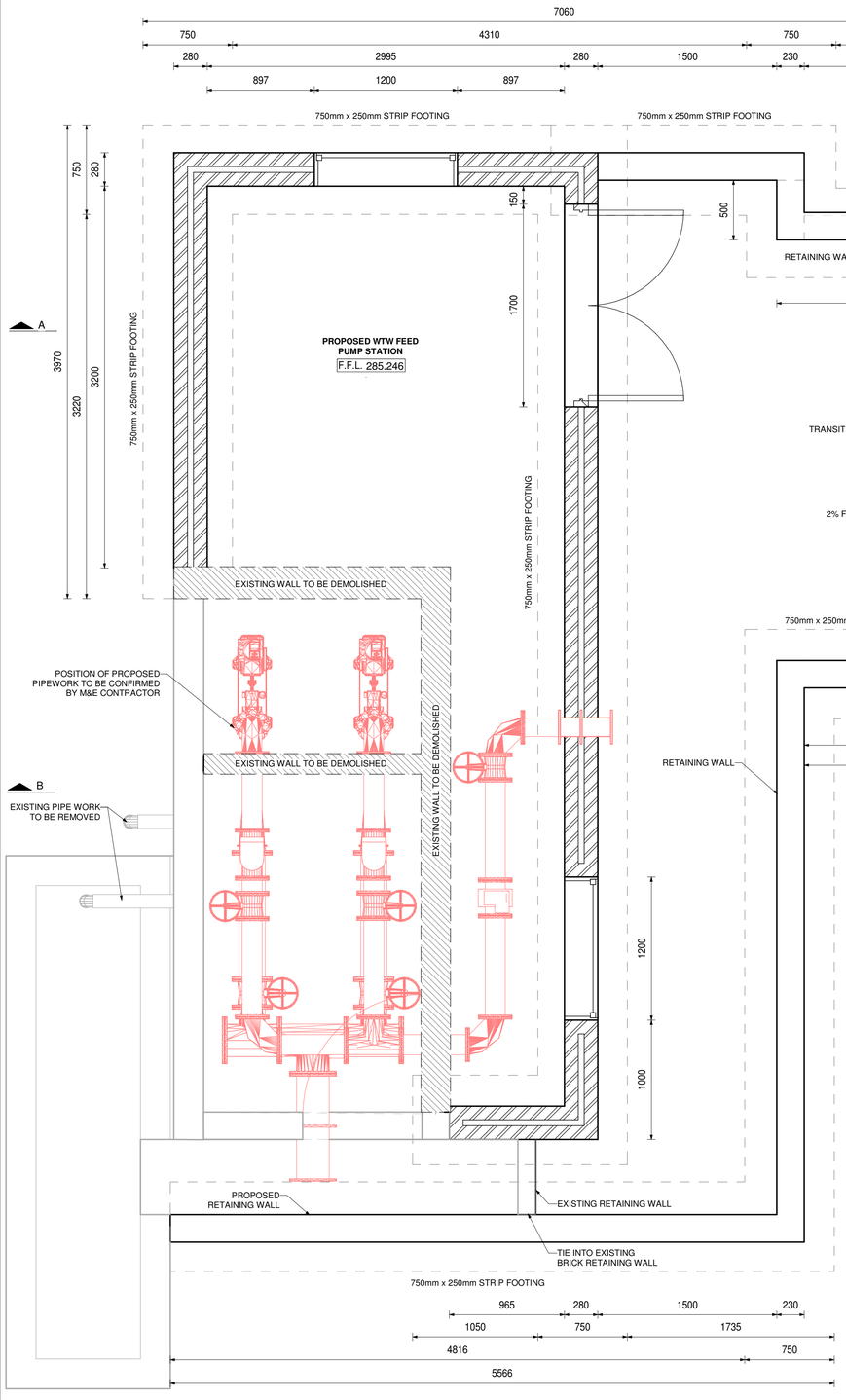
TITLE

DETAIL OF WATER METER CHAMBER

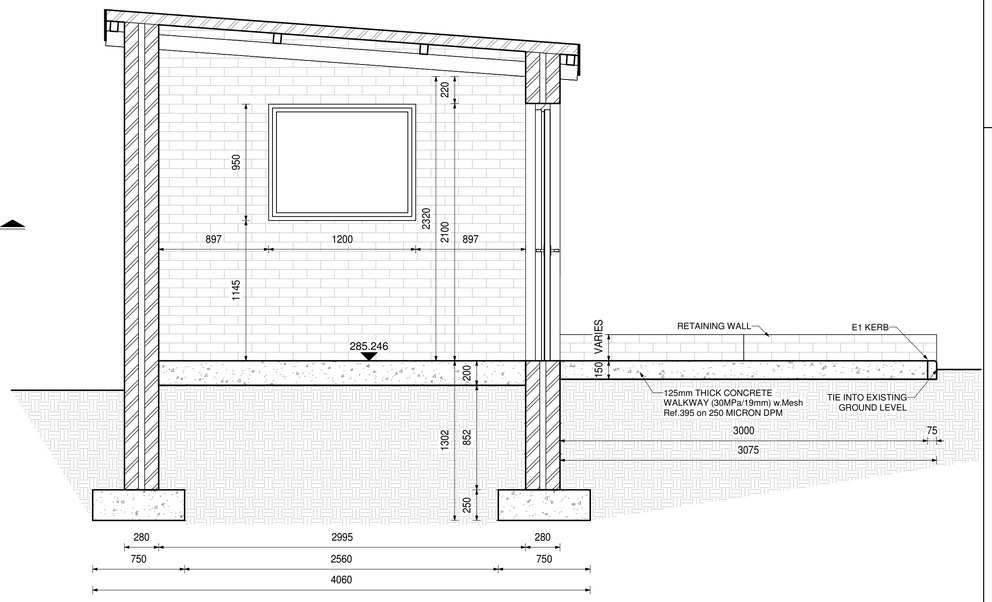
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CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-004-115 REV A

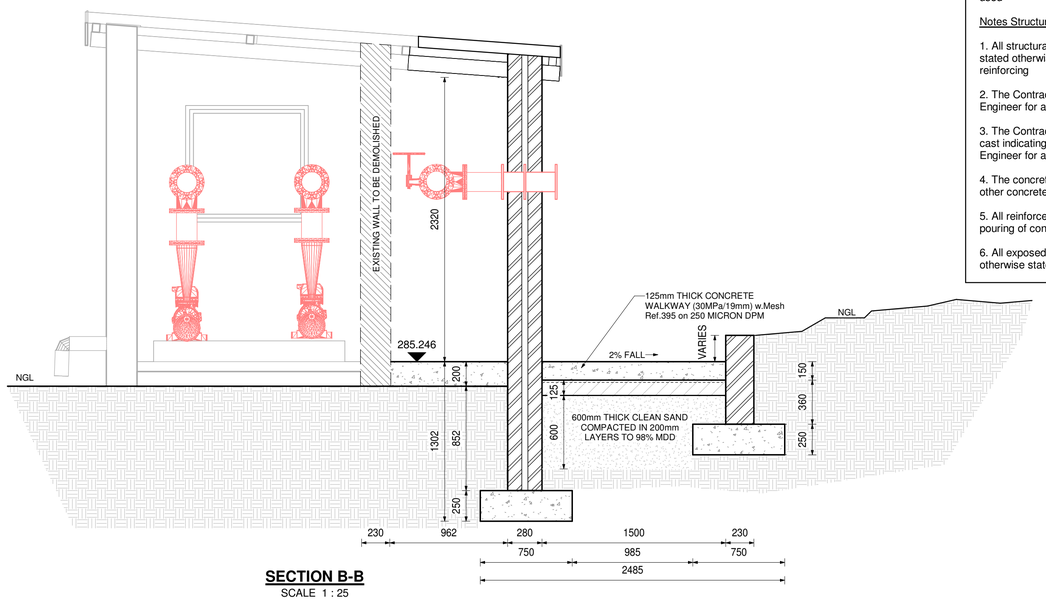
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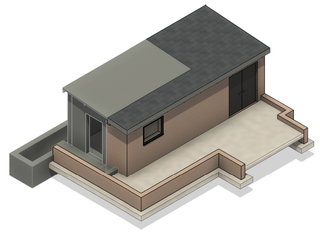
PLAN
SCALE 1 : 25



SECTION A-A
SCALE 1 : 25



SECTION B-B
SCALE 1 : 25



3D VIEW OF FEED PUMP STATION

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

   a) Stainless steel pipes shall be Grade 304 and shall comply with ANSI B36.19m Schedule 10S.

   b) Mild steel pipes up to 150mmØ shall be seamless, medium class steel pipes manufactured in accordance with SANS 62.

   c) Flange drilling shall be in accordance with SANS 1123:Table 1000/3.

2.Dimensions of all pipes, fittings, valves, etc must be submitted for approval on a shopdrawing before any material is ordered

3.Step irons to be Calcamite-type or approved equivalent

4.All steel pipe work or fittings buried in the ground shall be externally protected by a wrapping system the specification for the wrapping system is as follows:

   a) Clean surface to required standard (minimum preparation ST2 according to SI6 055900-1967)

   b) Brush or spray denso priming solution or denso S105 paste denso mastic to create profile for denso tape, so as to ensure that there are no air voids forming beneath the denso tape

   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

7.Backfilled material compacted to 93% MOD AASHTO (100% for sand) unless otherwise specified

8.Only S/S 316L nuts and bolts with anti seize compound may be used

Notes Structure:

1. All structural concrete shall be 35MPa/19mm concrete, unless stated otherwise on drawing with minimum 40mm cover for reinforcing

2. The Contractor must submit a concrete mix design report to the Engineer for approval, prior to construction.

3. The Contractor must submit concrete cube test results for each cast indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

4. The concrete base slab shall have a rough surface finish. All other concrete surfaces shall have a smooth surface finish.

5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

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A	ISSUED FOR TENDER	2025-10-27	RW	CD

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	CD	

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APPROVED:
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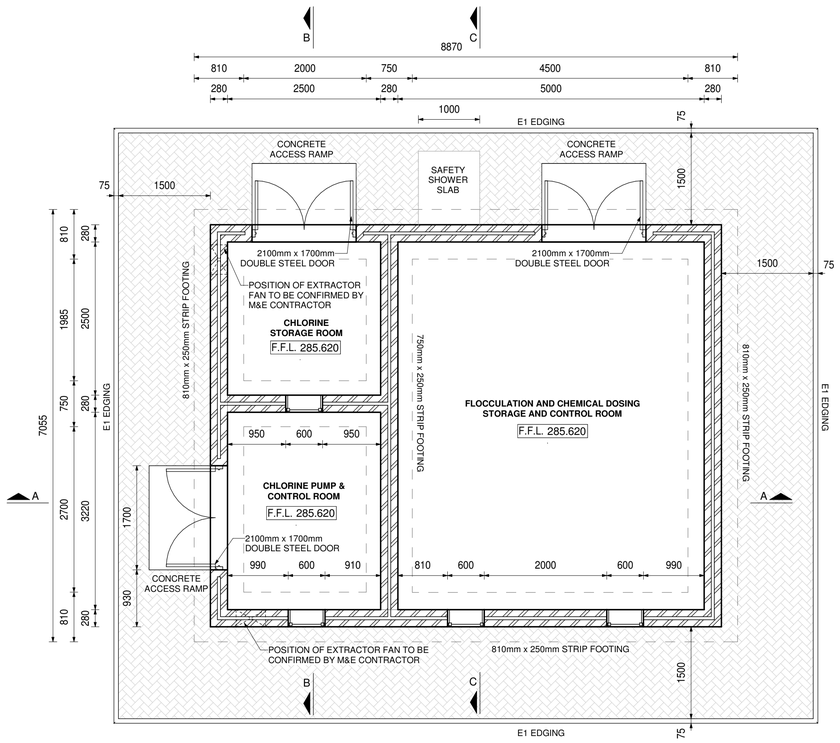
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UPGRADING OF MCGREGOR WTW

TITLE
DETAIL OF FEED PUMP STATION

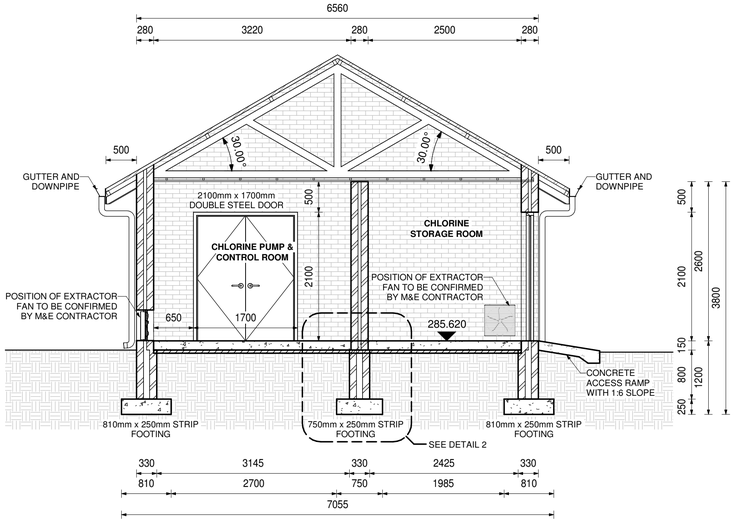
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CONTRACT NO	PROJECT NO
	C21493

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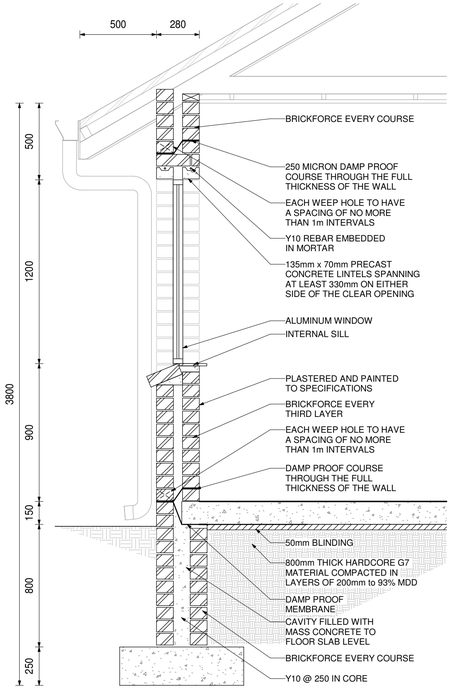
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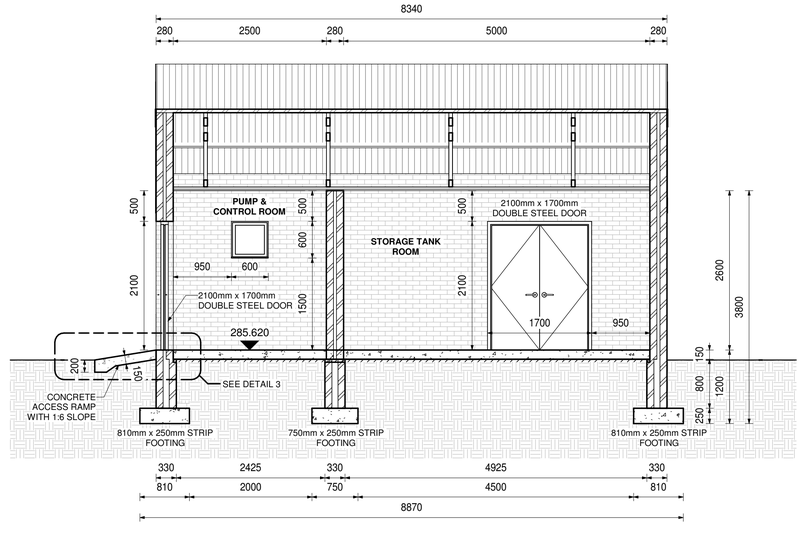
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SCALE 1 : 50



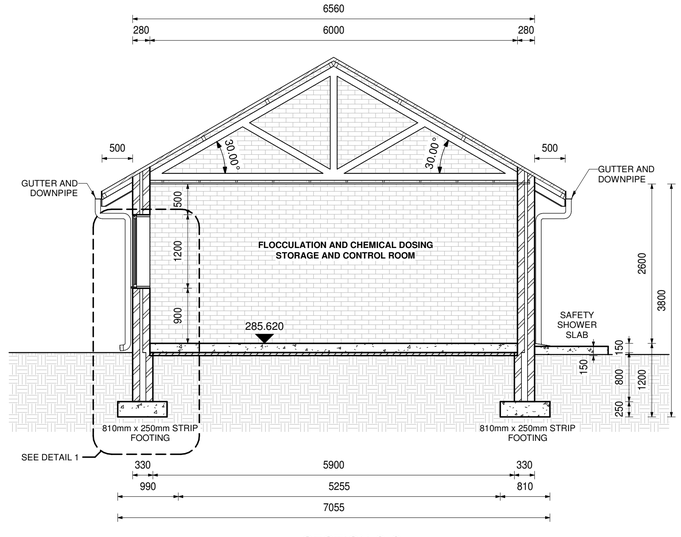
SECTION B-B
SCALE 1 : 50



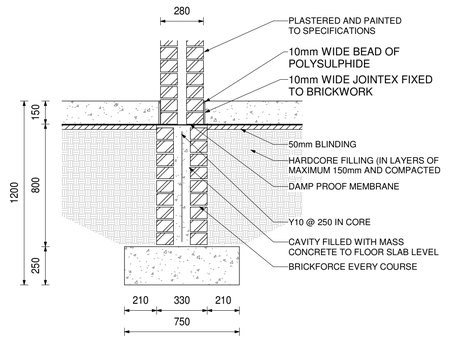
DETAIL 1 - LOAD BEARING WALL & WINDOW DETAIL
SCALE 1 : 20



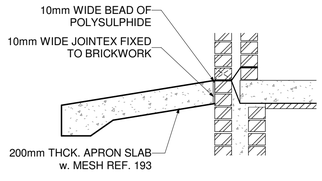
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SCALE 1 : 50



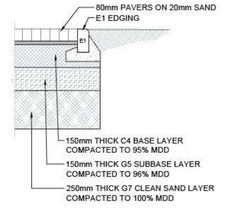
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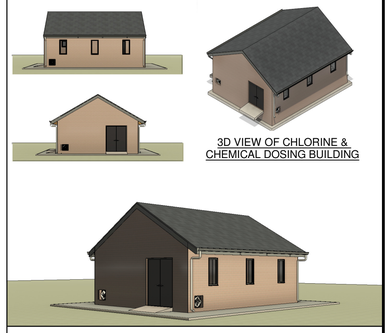
DETAIL 2 - NON-LAODBEARING WALL FOUNDATION
SCALE 1 : 20



DETAIL 3 - SLAB THICKENING
SCALE 1 : 20



DETAIL 4 - PAVIING DETAIL
SCALE 1 : 20



3D VIEW OF CHLORINE & CHEMICAL DOSING BUILDING

Notes General:

1.All dimensions shown to be verified by Contractor on site prior to construction.

Notes Pipes:

1. Steel and stainless steel pipes shall comply with the following.

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   c) Denso tape (petrolatum tape) wrapped spirally around prepared area

   d) Double wrap polyethelene tape (minimum 300 Micron thick)

5.SANS approval certificates of all coatings to be delivered to the engineer for approval

6.Mild steel pipes shall be coated with three layers of Carboguard 891, 125 Micron dry film thickness (dft) per layer

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3. The Contractor must submit concrete cube test results for each cast indicating the 7 day, 14 day and 28 day strength to the Engineer for approval.

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5. All reinforcement must be inspected by the Engineer prior to the pouring of concrete.

6. All exposed edges shall have a chamfer of 25x25mm unless otherwise stated

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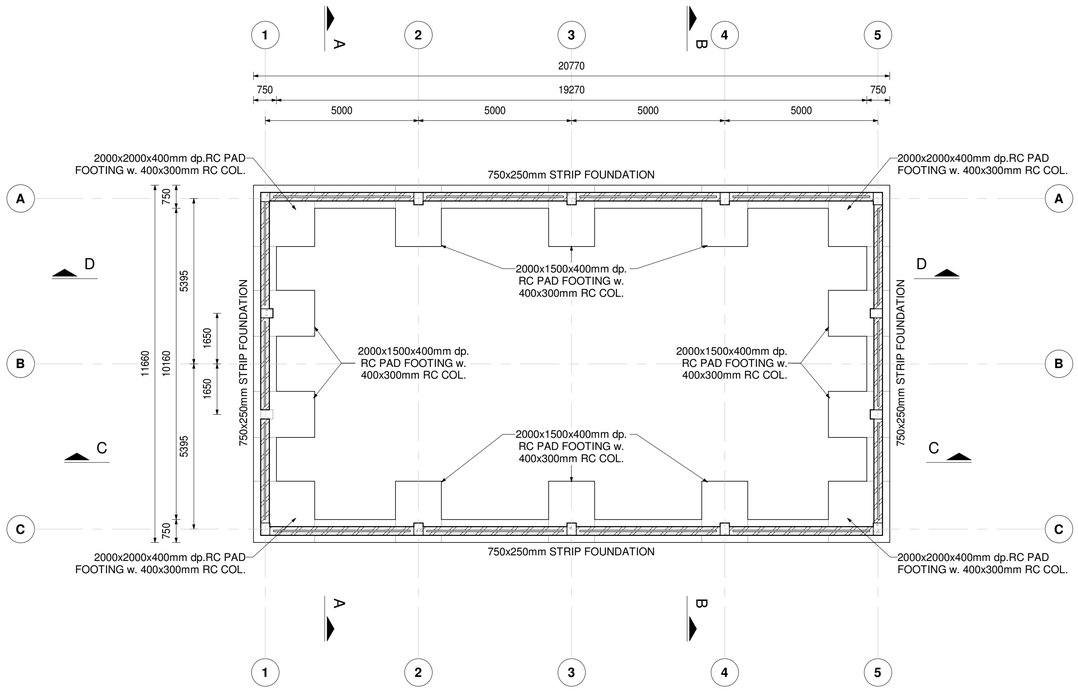
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF MCGREGOR WTW

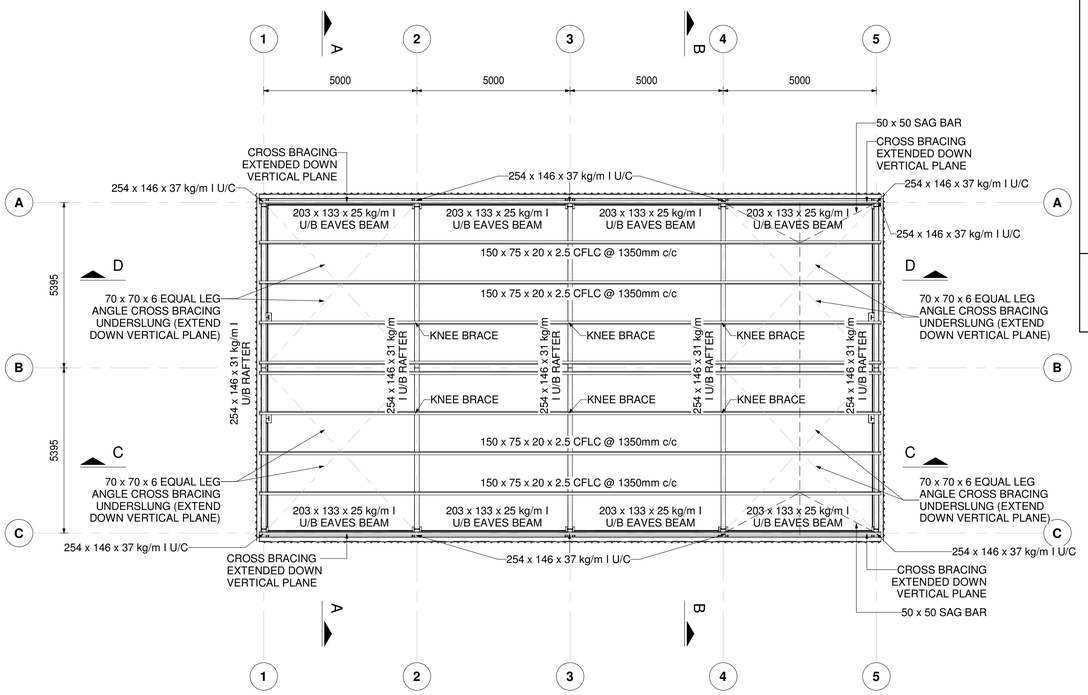
TITLE
Detail of Chlorine & Chemical Dosing Building

SCALE ON A1	SHEET
1:50	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

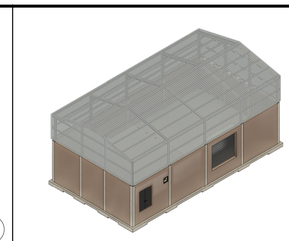
DRAWING NO: 24193-C-007-102 REV A
COORDINATE SYSTEM: N/A



FOUNDATION PLAN
SCALE 1 : 100



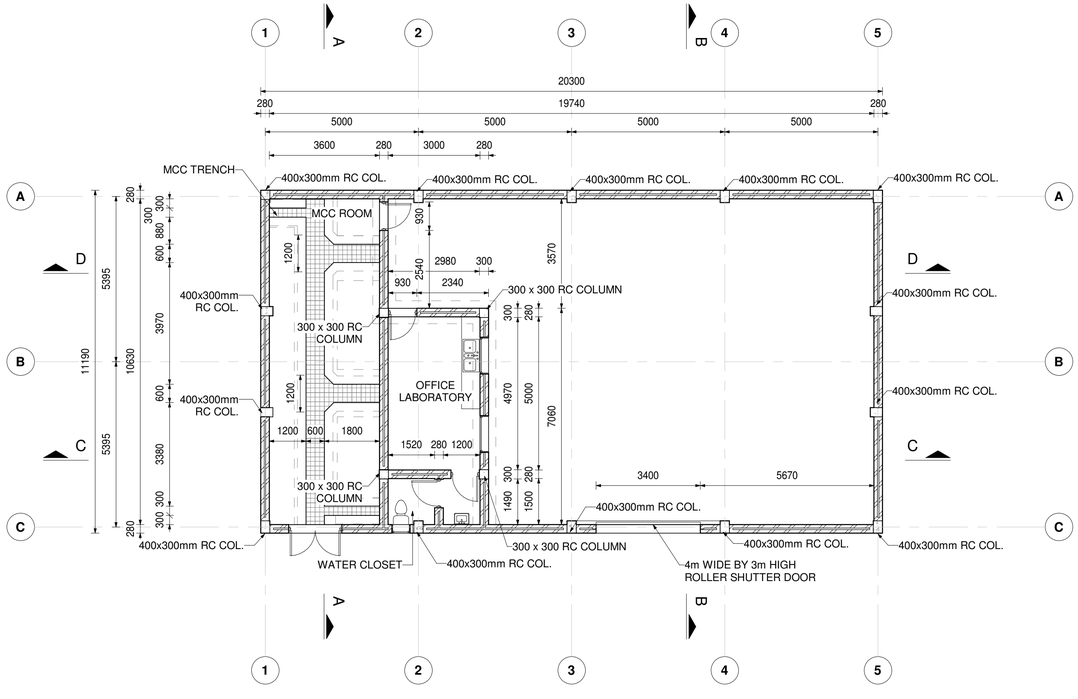
ROOF PLAN
SCALE 1 : 100



3D VIEW OF WAREHOUSE

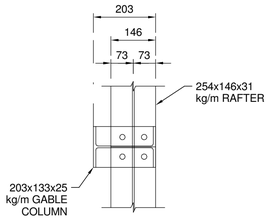
NOTE:

REFER TO GENEERAL NOTES DRAWING NUMBER 24193-C-008-100

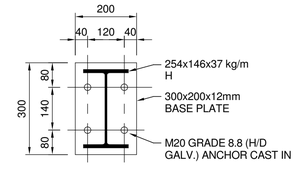


SURFACE BED PLAN
SCALE 1 : 100

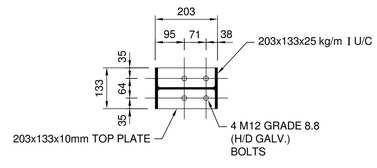
STEEL ROOF DETAILS



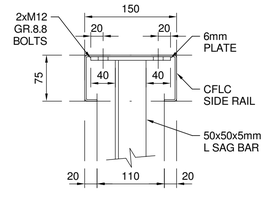
DETAIL 1 - GABLE COLUMN DETAIL
SCALE 1:10



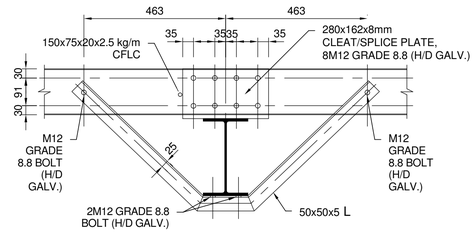
DETAIL 2 - BASE PLATE DETAIL
SCALE 1:10



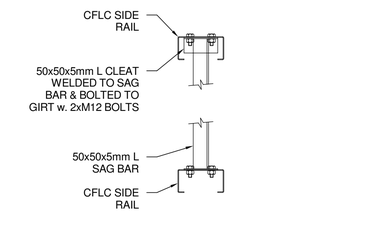
DETAIL 3 - TOP PLATE DETAIL (GABLE COL.)
SCALE 1:10



DETAIL 4 - SAG ANGLE DETAIL
SCALE 1:5



DETAIL 5 - PURLIN KNEE-BRACE DETAIL
SCALE 1:10



DETAIL 6 - TYPICAL ELEVATION : SAG BAR
SCALE 1:10

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	2025-10-27	RW	CD

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	ML	

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APPROVED:

ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

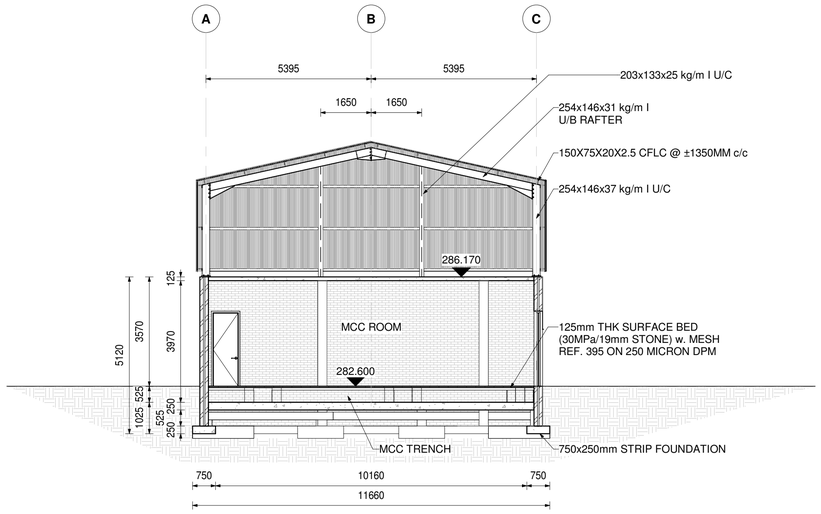
TITLE

DETAIL OF WTW BUILDING - PLANS

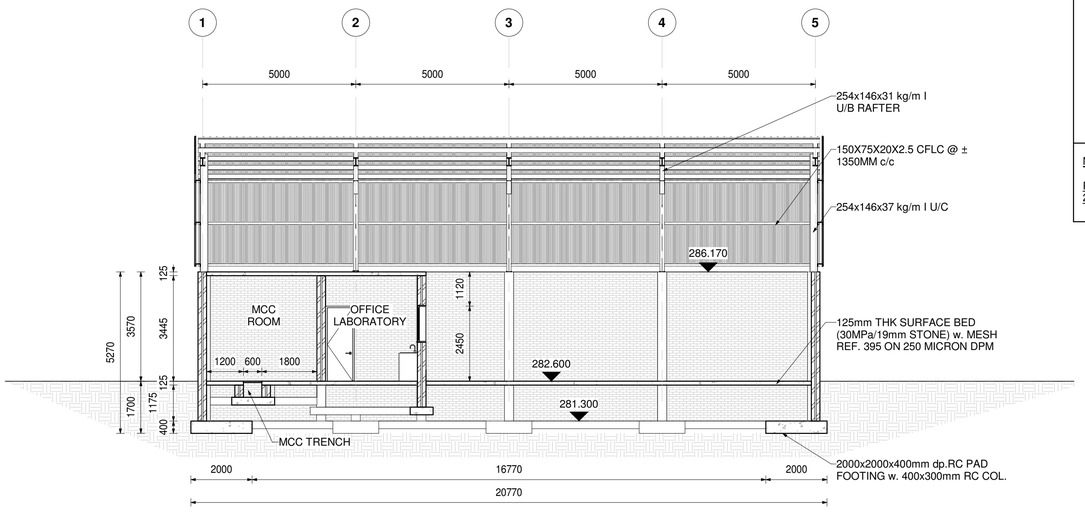
SCALE ON A1	SHEET
AS SHOWN	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-007-104 REV A

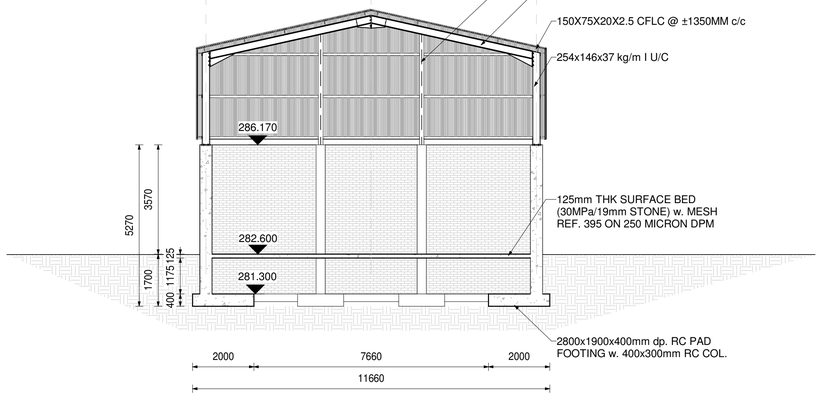
COORDINATE SYSTEM: WGS84/Lo19°



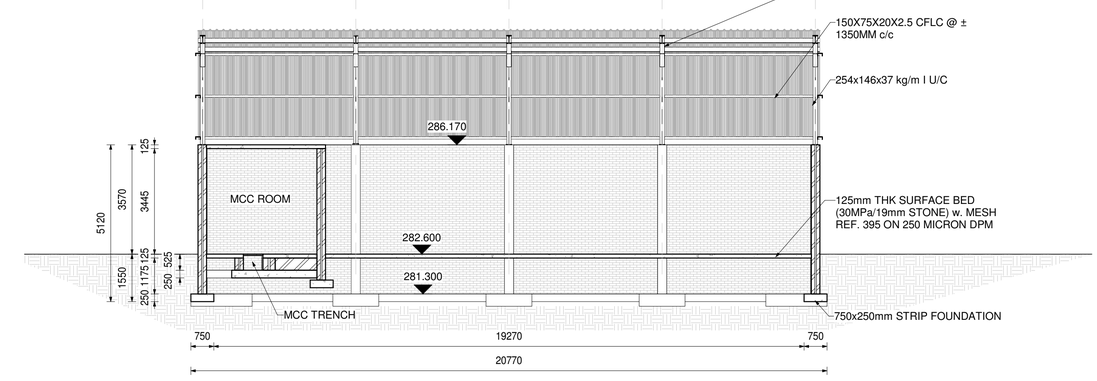
SECTION A-A
SCALE 1 : 100



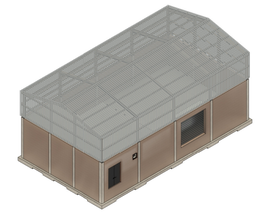
SECTION C-C
SCALE 1 : 100



SECTION B-B
SCALE 1 : 100



SECTION D-D
SCALE 1 : 100



3D VIEW OF WAREHOUSE

NOTE:

REFER TO GENEERAL NOTES DRAWING NUMBER 24193-C-008-100

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SCALE BAR

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REVISIONS

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ENGINEERS:

DATE: 2025-10-27

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF MCGREGOR WTW

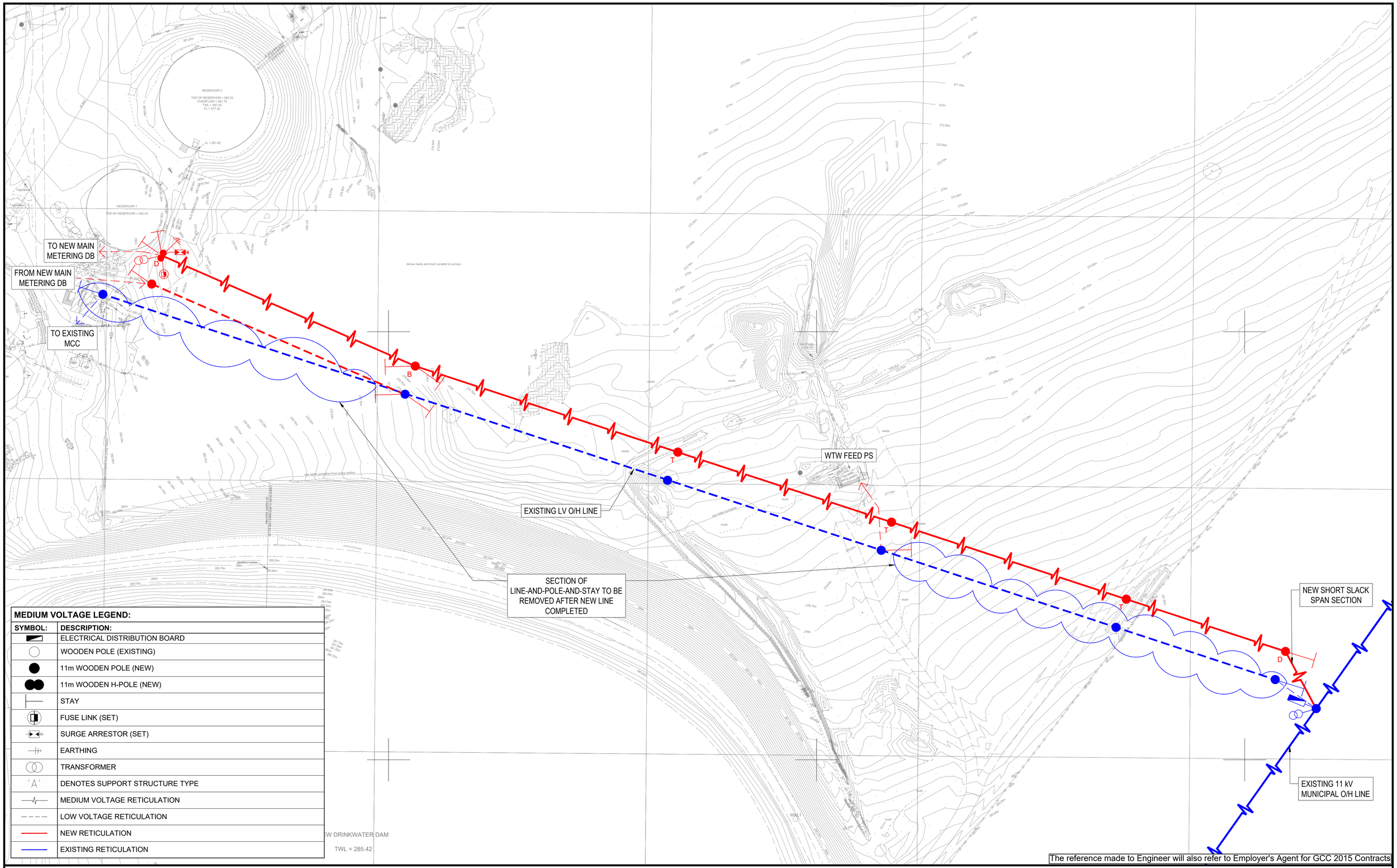
TITLE

DETAIL OF WTW BUILDING - SECTIONS

SCALE ON A1	SHEET
AS SHOWN	1 OF 1
CONTRACT NO	PROJECT NO
	C21493

DRAWING NO: 24193-C-007-104 REV A

COORDINATE SYSTEM: WGS84/Lo19°



MEDIUM VOLTAGE LEGEND:

SYMBOL:	DESCRIPTION:
	ELECTRICAL DISTRIBUTION BOARD
	WOODEN POLE (EXISTING)
	11m WOODEN POLE (NEW)
	11m WOODEN H-POLE (NEW)
	STAY
	FUSE LINK (SET)
	SURGE ARRESTOR (SET)
	EARTHING
	TRANSFORMER
'A'	DENOTES SUPPORT STRUCTURE TYPE
	MEDIUM VOLTAGE RETICULATION
	LOW VOLTAGE RETICULATION
	NEW RETICULATION
	EXISTING RETICULATION

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	FOR TENDER	'25-10-24	ABS	JDC

REVISIONS

DESIGNED	ABS	
DRAWN	DRA	
CHECKED	JDC	

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ENGINEERS: _____
DATE: 2025-10-24

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG
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PROJECT
UPGRADING OF MCGREGOR WTW

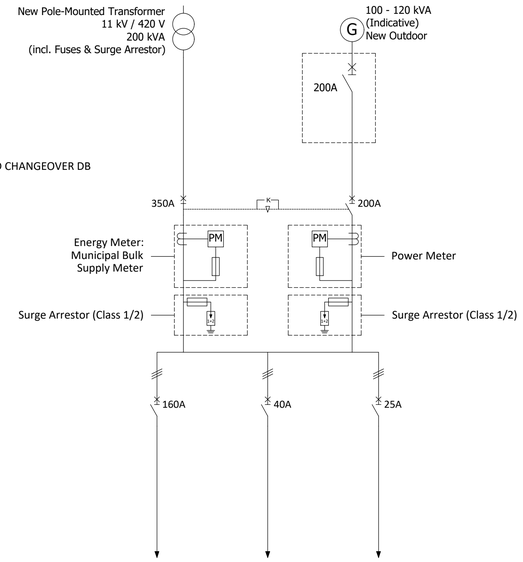
TITLE
NEW SITE BULK SUPPLY CONFIGURATION

SCALE	SHEET
on A1 N.T.S	1 OF 1
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-E-001-01 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2025-10-23
Checked:
Auditing: thinus



DB LABELS:
MCC Name: MAIN METERING AND CHANGEOVER DB
COMPLIANT: SANS 1973-3
Color: Orange
Material: 3CR12
Voltage: 400 VAC / 230VAC
Busbar Rating: 350A
kA-Fault Rating: 10kA 3sec
Safety Instructions:
1. Emergency Procedures
2. Switching on Instructions
3. Isolation Instructions

Adjustable Breaker (Incoming and Distribution) Protection
1. Overload
2. Leakage Protection
3. Earth-fault Protection
4. Short-circuit Protection

Power (PFR) Protection
1. Phase Sequence (Rotation)
2. Phase Loss
3. Phase Imbalance
4. Over Voltage
5. Under Voltage
6. Permissible Harmonics:
   THDu ≤ 5%
   THDi ≤ 10%

400VAC	400VAC	400VAC
FDR	FDR	FDR
Feeder to Main WTW MCC	Feeder to WTW Feed PS MCC	Feeder to Transfer PS MCC

*TO DRAWING 24193-E-002-02

*TO DRAWING 24193-E-002-04

*TO DRAWING 24193-E-002-05

LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
- Local Control Station
- 3P Motor w Heater
- Motorized Mechanically and Electrically Interlocked Changeover Mechanism
- Miniature Substation
- Supply Kiosk
- Emergency Backup Generator
- Cable Joint

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'25-10-24	ABS	JDC

REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	ABS	

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APPROVED
ENGINEERS: _____
DATE: 2025-10-24

APPROVED
CLIENT: _____
DATE: _____

CLIENT
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MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

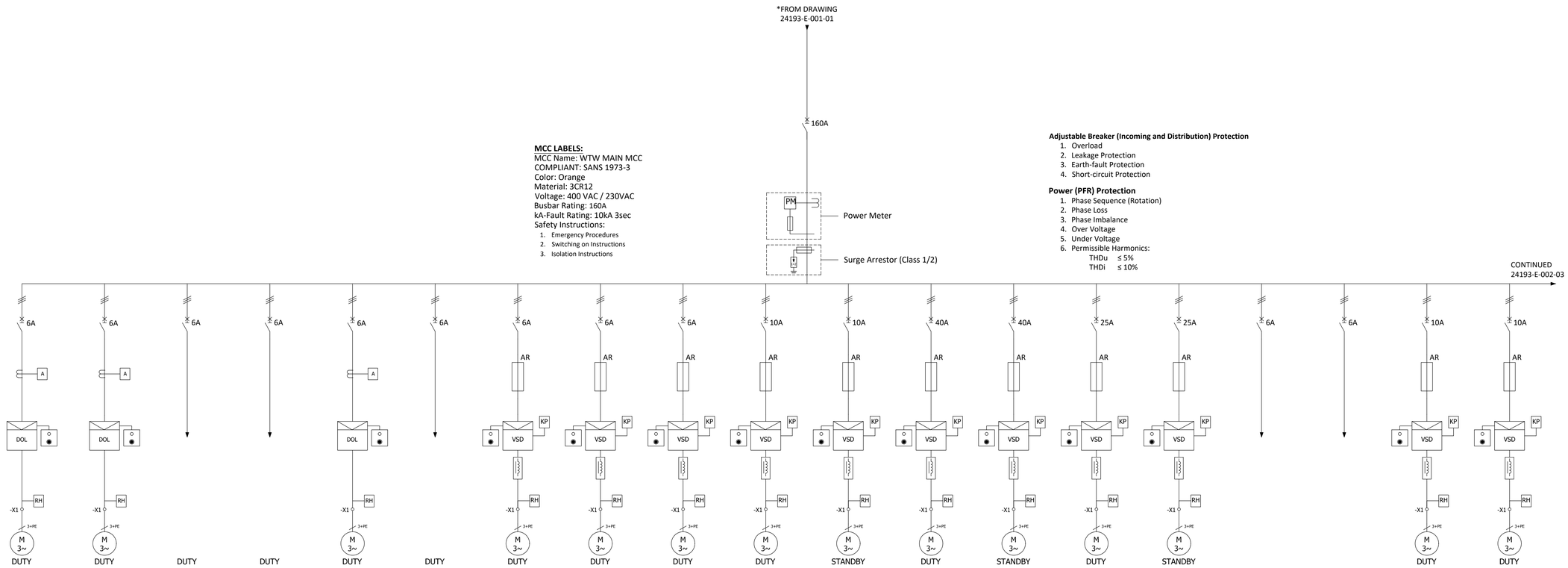
TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

SCALE	on A1	SHEET
N.T.S.		1 OF 5
CONTRACT No.		PROJECT No. 24193C

DRAWING No. 24193-E-002-01 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Auditing: thinus Checked: Date: 2025-10-24



MCC LABELS:
MCC Name: WTW MAIN MCC
COMPLIANT: SANS 1973-3
Color: Orange
Material: 3CR12
Voltage: 400 VAC / 230VAC
Busbar Rating: 160A
kA-Fault Rating: 10kA 3sec
Safety Instructions:

1. Emergency Procedures
2. Switching on Instructions
3. Isolation Instructions

Adjustable Breaker (Incoming and Distribution) Protection

1. Overload
2. Leakage Protection
3. Earth-fault Protection
4. Short-circuit Protection

Power (PFR) Protection

1. Phase Sequence (Rotation)
2. Phase Loss
3. Phase Imbalance
4. Over Voltage
5. Under Voltage
6. Permissible Harmonics:
   THDu ≤ 5%
   THDi ≤ 10%

400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC
0.37 kW	0.37 kW	FDR	FDR	0.37 kW	FDR	1.1 kW	1.1 kW	1.1 kW	3 kW	3 kW	18.5 kW	18.5 kW	11 kW	11 kW	FDR	FDR	3 kW	3 kW
DOL	DOL	Feeder to Soda Ash/Lime	Feeder to Soda Ash/Lime	DOL	Feeder to Coagulant	VSD	VSD	VSD	VSD	VSD	VSD	VSD	VSD	VSD	Feeder to Air Isolation	Feeder to Air Isolation	VSD	VSD
Soda Ash/Lime Mixer 1	Soda Ash/Lime Mixer 2	Dosing Pump 1	Dosing Pump 1	Coagulant Mixer	Dosing Pump 1	Flocculation Tank Mixer 1	Flocculation Tank Mixer 2	Flocculation Tank Mixer 3	Filter Feed Pump 1	Filter Feed Pump 2	Backwash Pump 1	Backwash Pump 2	Backwash Blower 1	Backwash Blower 2	Valve 1	Valve 2	Service Water Pump 1	Service Water Pump 2
20 MX 01	20 MX 02	20 PS 01	20 PS 02	20 MX 11	20 PS 11	21 MX 01	21 MX 02	21 MX 03	100 PS 01	100 PS 02	101 PS 01	101 PS 02	110 BLO 01	110 BLO 02	110 BFV 01	110 BFV 02	102 PS 01	102 PS 02

LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
- Local Control Station
- 3P Motor w Heater
- Motorized Mechanically and Electrically Interlocked Changeover Mechanism
- Miniature Substation
- Supply Kiosk
- Emergency Backup Generator
- Cable Joint

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A	ISSUED FOR TENDER	'25-10-24	ABS	JDC

REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	ABS	

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APPROVED
ENGINEERS: _____
DATE: 2025-10-24

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CLIENT: _____
DATE: _____

CLIENT
LANGEBERG
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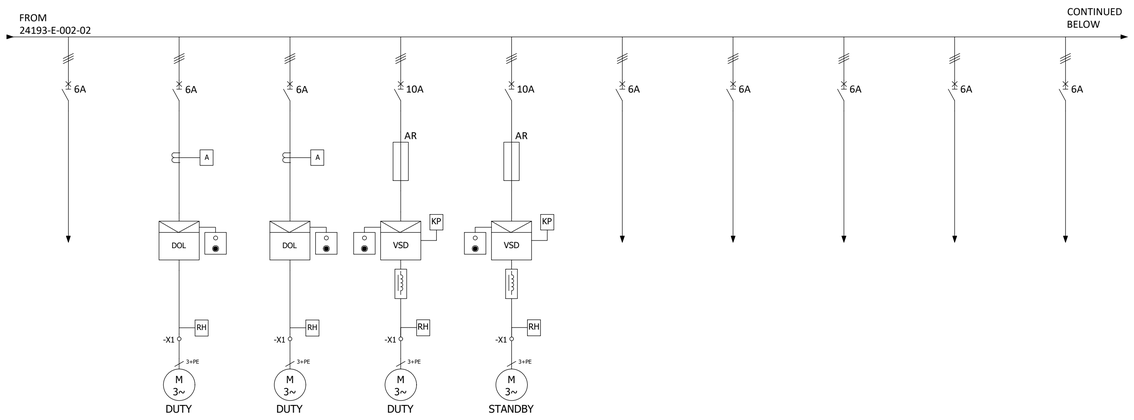
PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

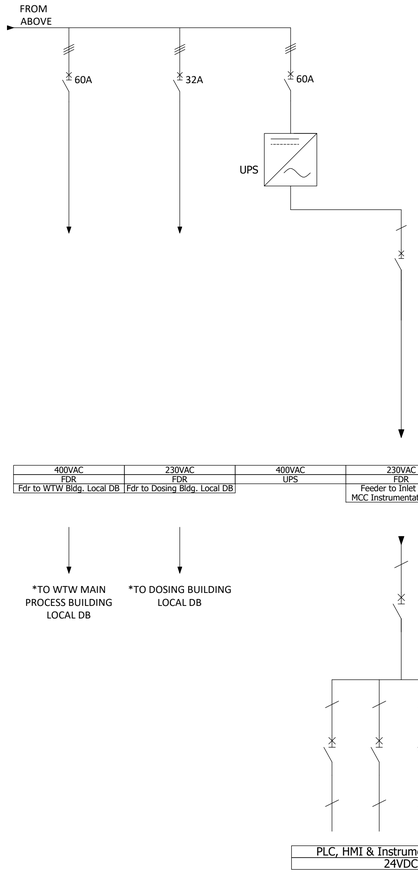
SCALE	on A1	SHEET
N.T.S.		2 OF 5
CONTRACT No.		PROJECT No. 24193C

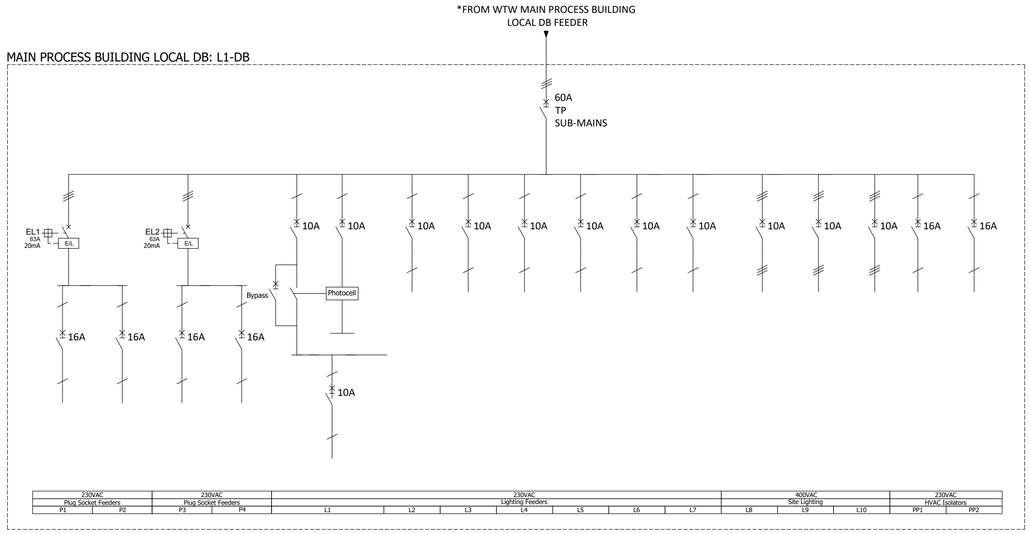
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COORDINATE SYSTEM: WGS84 / Lo?°

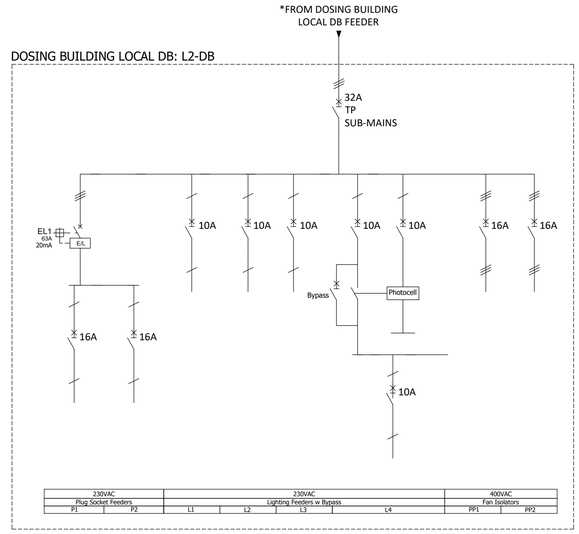
Date: 2025-10-24
Checked:
Auditing: thinus



400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC
FDR	0.37 kW	0.37 kW	4 kW	4 kW	FDR	FDR	FDR	FDR	FDR
Feeder to Chlorination Changeover Valve	DOL	DOL	VSD	VSD	Feeder to Filter Inlet Valves (x3)	Feeder to Filter Outlet Valves (x3)	Feeder to Backwash Inlet Valves (x3)	Feeder to Backwash Outlet Valves (x3)	Feeder to Filter Air Inlet Valves (x3)
-	Chlorination Extraction Fan 1	Chlorination Extraction Fan 2	Reservoir 3 Pump 1	Reservoir 3 Pump 2	50 BFV 01	50 BFV 11	50 BFV 21	50 BFV 31	50 BFV 41
	90 FN 01	90 FN 02	103 PS 01	103 PS 02	50 BFV 02	50 BFV 12	50 BFV 22	50 BFV 32	50 BFV 42
					50 BFV 03	50 BFV 13	50 BFV 23	50 BFV 33	50 BFV 43







LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
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DRAWN	JDC	
CHECKED	ABS	

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ENGINEERS: _____
DATE: 2025-10-24

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CLIENT: _____
DATE: _____

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MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

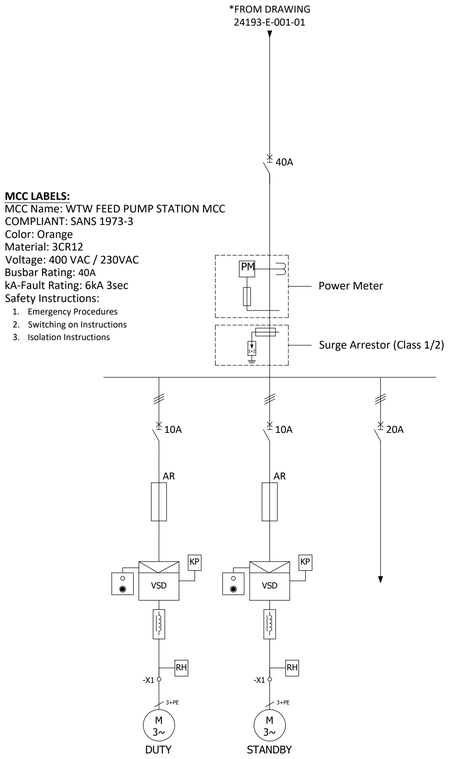
TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

SCALE	on A1	SHEET
N.T.S.		3 OF 5
CONTRACT No.		PROJECT No. 24193C

DRAWING No. 24193-E-002-03 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2025-10-24
Checked:
Authling: Ithuus



MCC LABELS:
MCC Name: WTW FEED PUMP STATION MCC
COMPLIANT: SANS 1973-3
Color: Orange
Material: 3CR12
Voltage: 400 VAC / 230VAC
Busbar Rating: 40A
kA-Fault Rating: 6kA 3sec
Safety Instructions:

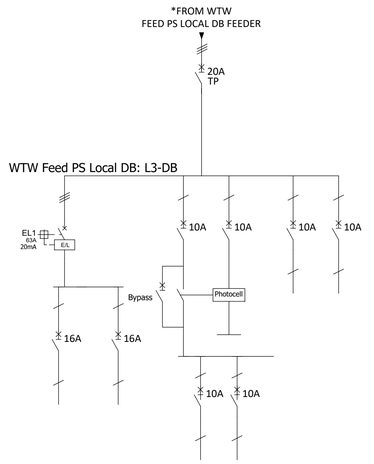
1. Emergency Procedures
2. Switching on Instructions
3. Isolation Instructions

Adjustable Breaker (Incoming and Distribution) Protection

1. Overload
2. Leakage Protection
3. Earth-fault Protection
4. Short-circuit Protection

Power (PFR) Protection

1. Phase Sequence (Rotation)
2. Phase Loss
3. Phase Imbalance
4. Over Voltage
5. Under Voltage
6. Permissible Harmonics:
   THDu ≤ 5%
   THDi ≤ 10%



400VAC	400VAC	230VAC
4 kW	4 kW	FDR
VSD	VSD	Feeder to Local DB
WTW Feed Pump 1	WTW Feed Pump 2	
105 PS 01	105 PS 02	

*TO WTW FEED PS
LOCAL DB

230VAC		230VAC			
Plug Socket Feeders		Lighting Feeders w Bypass			
P1	P2	L1	L2	L3	L4

LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
- Local Control Station
- 3P Motor w Heater
- Motorized Mechanically and Electrically Interlocked Changeover Mechanism
- Miniature Substation
- Supply Kiosk
- Emergency Backup Generator
- Cable Joint

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 30 60
Meters 1:1000

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'25-10-24	ABS	JDC

REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	ABS	

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email: bellville@lyners.co.za

APPROVED
ENGINEERS: _____
DATE: 2025-10-24

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

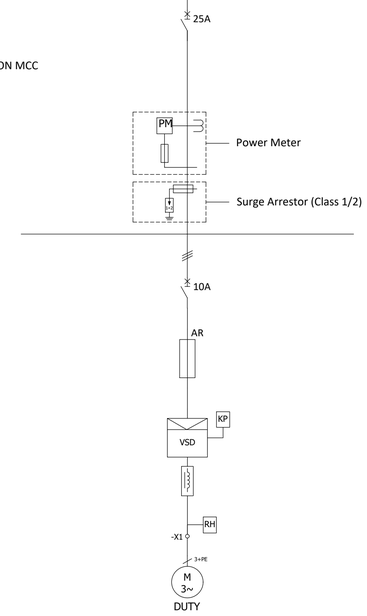
SCALE	SHEET
on A1 N.T.S.	4 OF 5
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-E-002-04 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2025-10-24
Checked:
Auditing: thirus

*FROM DRAWING
24193-E-001-01



DUTY

400VAC
4 kW
VSD
Dam Transfer Pump
104 PS 01

MCC LABELS:
MCC Name: TRANSFER PUMP STATION MCC
COMPLIANT: SANS 1973-3
Color: Orange
Material: 3CR12 (Outdoor)
Voltage: 400 VAC / 230VAC
Busbar Rating: 25A
kA-Fault Rating: 6kA 3sec
Safety Instructions:
1. Emergency Procedures
2. Switching on Instructions
3. Isolation Instructions

Adjustable Breaker (Incoming and Distribution) Protection
1. Overload
2. Leakage Protection
3. Earth-fault Protection
4. Short-circuit Protection

Power (PFR) Protection
1. Phase Sequence (Rotation)
2. Phase Loss
3. Phase Imbalance
4. Over Voltage
5. Under Voltage
6. Permissible Harmonics:
   THDu ≤ 5%
   THDi ≤ 10%

LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
- Local Control Station
- 3P Motor w Heater
- Motorized Mechanically and Electrically Interlocked Changeover Mechanism
- Miniature Substation
- Supply Kiosk
- Emergency Backup Generator
- Cable Joint

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'25-10-24	ABS	JDC

REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	ABS	

CONSULTING ENGINEERS
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APPROVED
ENGINEERS: _____
DATE: 2025-10-24

APPROVED
CLIENT: _____
DATE: _____

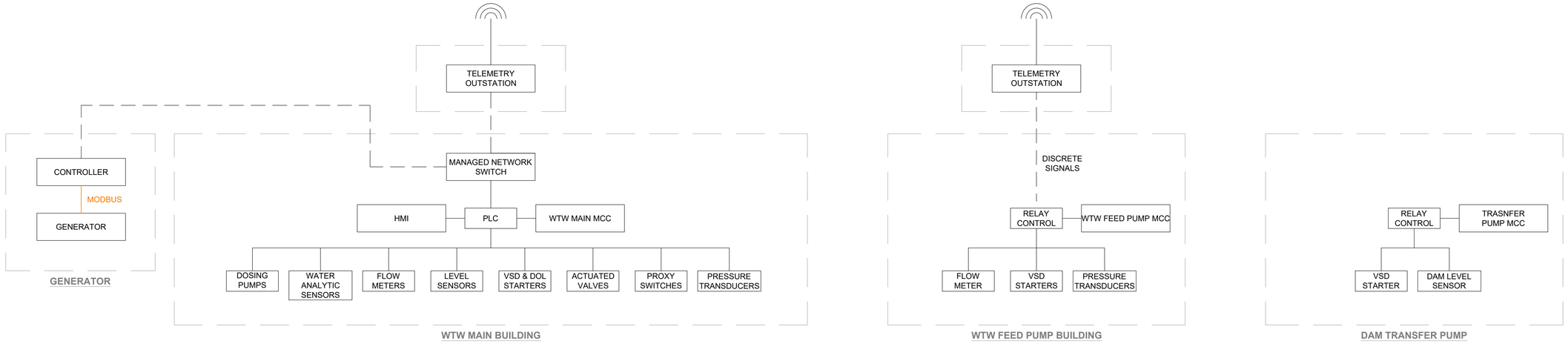
CLIENT
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

SCALE on A1 N.T.S.	SHEET 5 OF 5
CONTRACT No.	PROJECT No. 24193C
DRAWING No. 24193-E-002-05	REV A
COORDINATE SYSTEM: WGS84 / Lo?°	

Date: 2025-10-24
Checked:
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REVISIONS

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'25-10-24	ABS	JDC

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	ABS	

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APPROVED

ENGINEERS: _____

DATE: 2025-10-24

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADING OF MCGREGOR WTW

TITLE

NETWORK CONTROL DIAGRAM

SCALE	SHEET
on A1 N.T.S.	1 OF 1
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-E-003-01 REV A

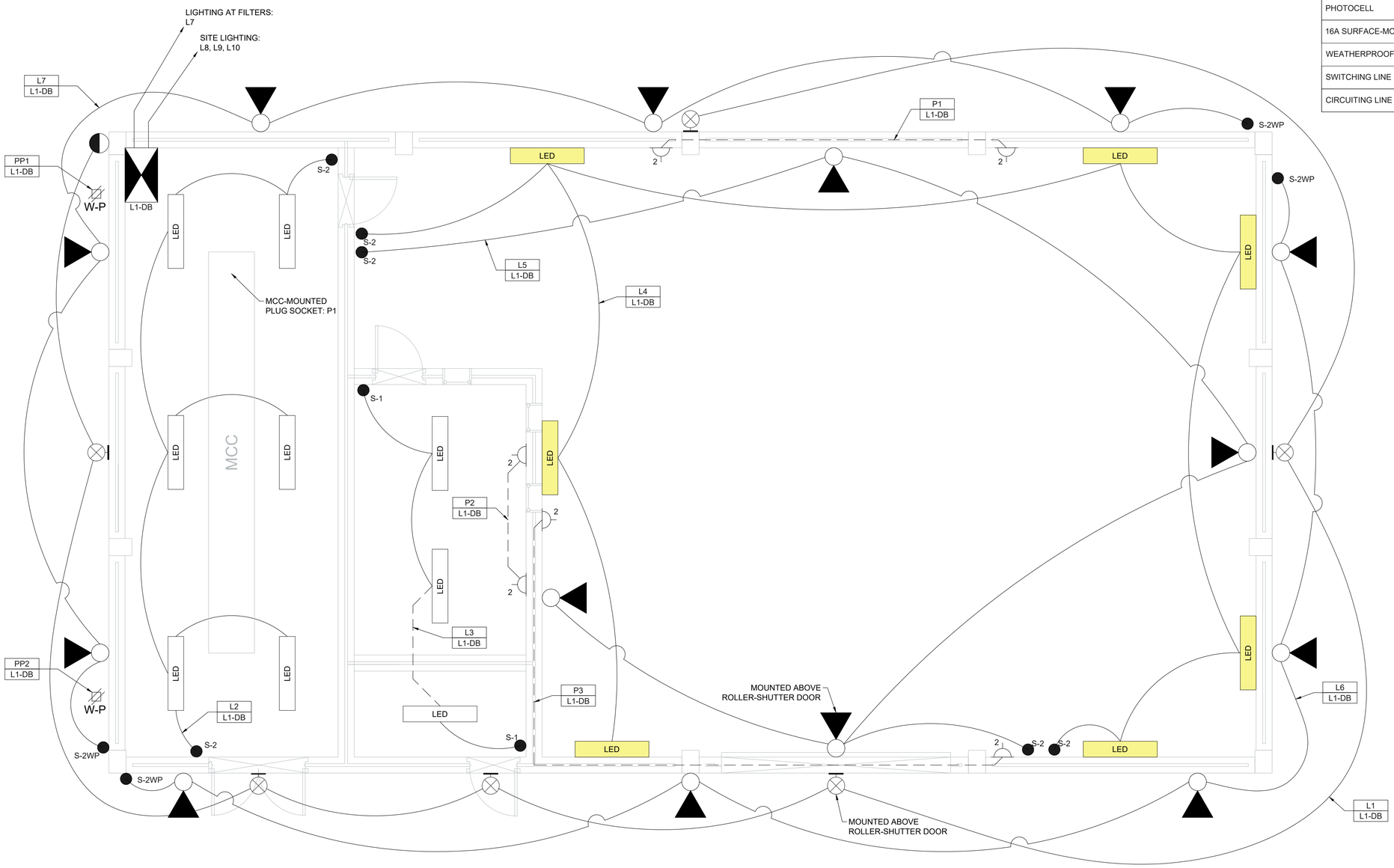
COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2025-10-23

Checked:

Auditing: thirus

LIGHTING AND POWER SCHEDULE			
DESCRIPTION	**WATTAGE**	**SYMBOL**	**QTY**
LOCAL DISTRIBUTION BOARD			1
SUSPENDED VAPOUR-PROOF LED LUMINAIRE, MOUNTED 2800mm AFFL	56 W	LED	9
WALL-MOUNTED VAPOUR-PROOF LED LUMINAIRE, MOUNTED 2800mm AFFL	56 W	LED	7
WEATHERPROOF SURFACE MOUNTED BULKHEAD LAMP, MOUNTING HEIGHT 2500mm AFFL UNLESS OTHERWISE STATED	28 W		6
WEATHERPROOF FLOODLIGHT, MOUNTED 4000mm AFFL UNLESS OTHERWISE STATED	120 W		14
ONE WAY LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S-1	2
TWO WAY LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S-2	6
TWO WAY WEATHERPROOF LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S2-WP	4
PHOTOCELL			1
16A SURFACE-MOUNTED SWITCH SOCKET OUTLET		2	6
WEATHERPROOF SURFACE-MOUNTED ISOLATOR		W-P	2
SWITCHING LINE			
CIRCUITING LINE			



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REV	DESCRIPTION	DATE	REV BY	CHKD
A	FOR TENDER	'25-10-24	JDC	ABS

REVISIONS

DESIGNED	JDC	
DRAWN	TB	
CHECKED	ABS	

CONSULTING ENGINEERS

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APPROVED
ENGINEERS: _____
DATE: 2025-10-24

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADING OF MCGREGOR WTW

TITLE
LIGHTING AND POWER LAYOUT - MAIN PROCESS BUILDING

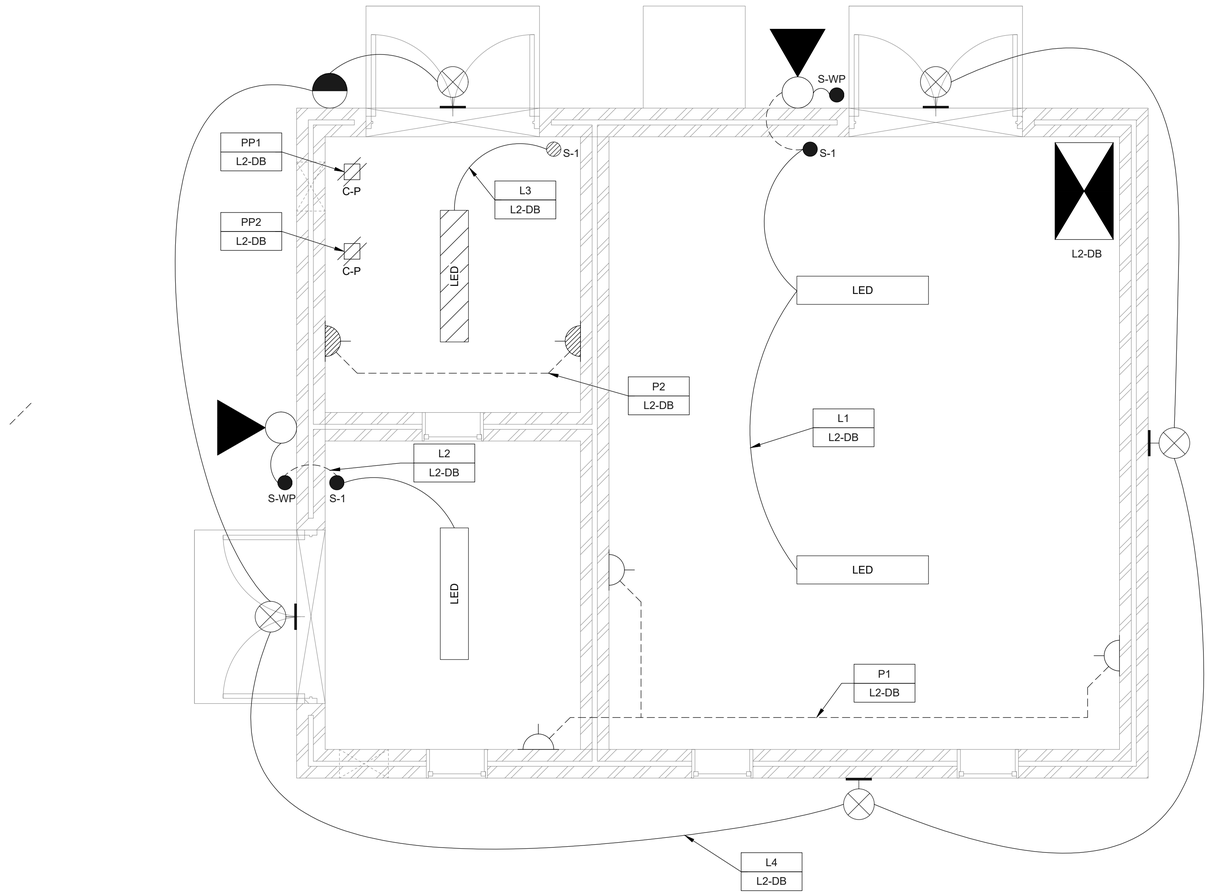
SCALE	SHEET
on A1 1:40	1 OF 2
CONTRACT No.	PROJECT No. 24193C

DRAWING No. 24193-E-004-01 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Auditing: thinus Checked: Date: 2025-10-24

LIGHTING AND POWER SCHEDULE			
DESCRIPTION	**WATTAGE**	**SYMBOL**	**QTY**
LOCAL DISTRIBUTION BOARD			1
SOFFIT-MOUNTED, VAPOUR-PROOF LED LUMINAIRE	56 W	LED	3
SOFFIT-MOUNTED, VAPOUR-PROOF, CORROSION PROOF LED LUMINAIRE	56 W	LED	1
WEATHERPROOF SURFACE MOUNTED BULKHEAD LAMP, MOUNTING HEIGHT 2500mm AFFL	28 W		5
WEATHERPROOF FLOODLIGHT, MOUNTED 3000mm AFFL	120 W		2
ONE WAY LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S-1	2
ONE WAY LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL, CORROSION PROOF		S-1	1
ONE WAY WEATHERPROOF LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S-WP	2
PHOTOCELL			1
16A SURFACE-MOUNTED SWITCH SOCKET OUTLET			3
16A SURFACE-MOUNTED SWITCH SOCKET OUTLET, CORROSION PROOF			2
CORROSION PROOF ISOLATOR		C-P	2
SWITCHING LINE			
CIRCUITING LINE			



The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR

0 30 60

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	FOR TENDER	'25-10-24	JDC	ABS

REVISIONS

DESIGNED	JDC	
DRAWN	DRA	
CHECKED	ABS	

CONSULTING ENGINEERS

LYNERS
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email: bellville@lyners.co.za

APPROVED

ENGINEERS: _____

DATE: 2025-10-24

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADING OF MCGREGOR WTW

TITLE

LIGHTING AND POWER LAYOUT - DOSING BUILDING

SCALE	SHEET
1 : 30 on A1	2 OF 2
CONTRACT No.	PROJECT No. 24193C

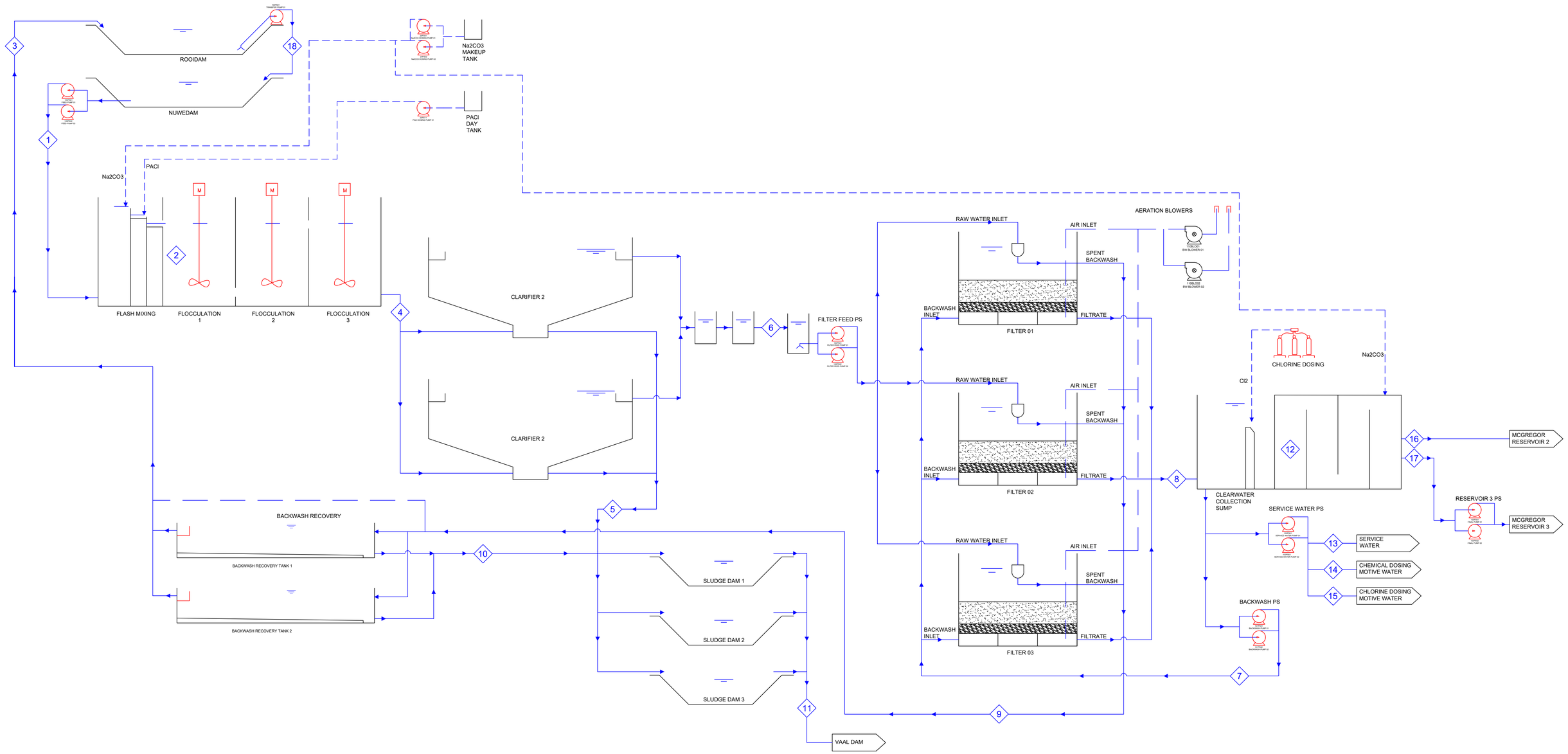
DRAWING No. 24193-E-004-02 REV A

COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2025-10-24

Checked:

Auditing: thinus



STREAM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
STREAM NAME	DAM FEED	PRE-CONDITIONING STREAM	RECOVERED BACKWASH	CLARIFIER FEED	CLARIFIER WASTE STREAM	FILTER FEED	BW FEED	FILTRATE	SPENT BACKWASH	BACKWASH RECOVERY SLUDGE	SLUDGE DAM SUPERNATANT	CHLORINE CONTACT CHANNEL	SERVICE WATER	CHEMICAL DOSING MOTIVE WATER	CHLORINE DOSING MOTIVE WATER	RESERVOIR 2	RESERVOIR 3	ROOI DAM TO NUWE DAM
AVG. FLOW (m3/h)	79.34	80.78	5.47	80.78	0.70	80.08	6.84	80.08	6.84	1.37	2.07	75.04	0.36	1.44	3.60	70.00	35.00	38.89
INSTANTANEOUS FLOW (m3/h)	79.34	80.78	5.47	80.78	168.00	80.78	391.04	80.78	391.04	1.37	168.00	85.82	0.36	1.44	3.60	80.78	40.39	38.89

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WATER TREATMENT SPECIALIST: REFLEKT WATER

MAIN CONSULTANT: LYNERS — Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE: ☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION ☐ AS BUILT

PrEng: Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS — PROCESS FLOW DIAGRAM

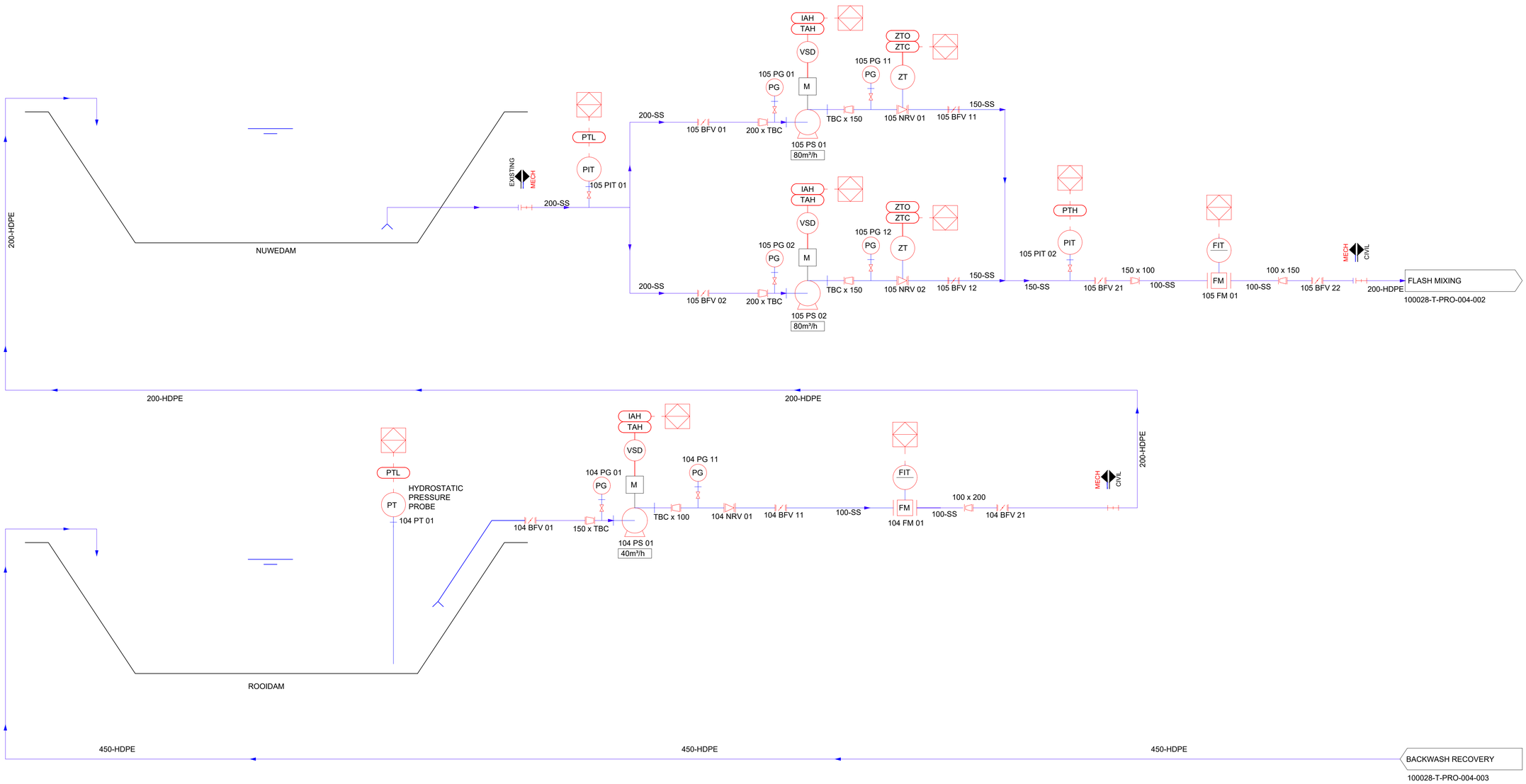
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PFD-002-001

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
A	TENDER	2025-10-27

REVISION: A



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WATER TREATMENT SPECIALIST: FLEKT WATER

MAIN CONSULTANT: LYNERS — Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT:
UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE:
☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION
☐ AS BUILT

PrEng:
Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS
P&ID
WTW FEED PUMPS & DAM TRANSFER PUMPS

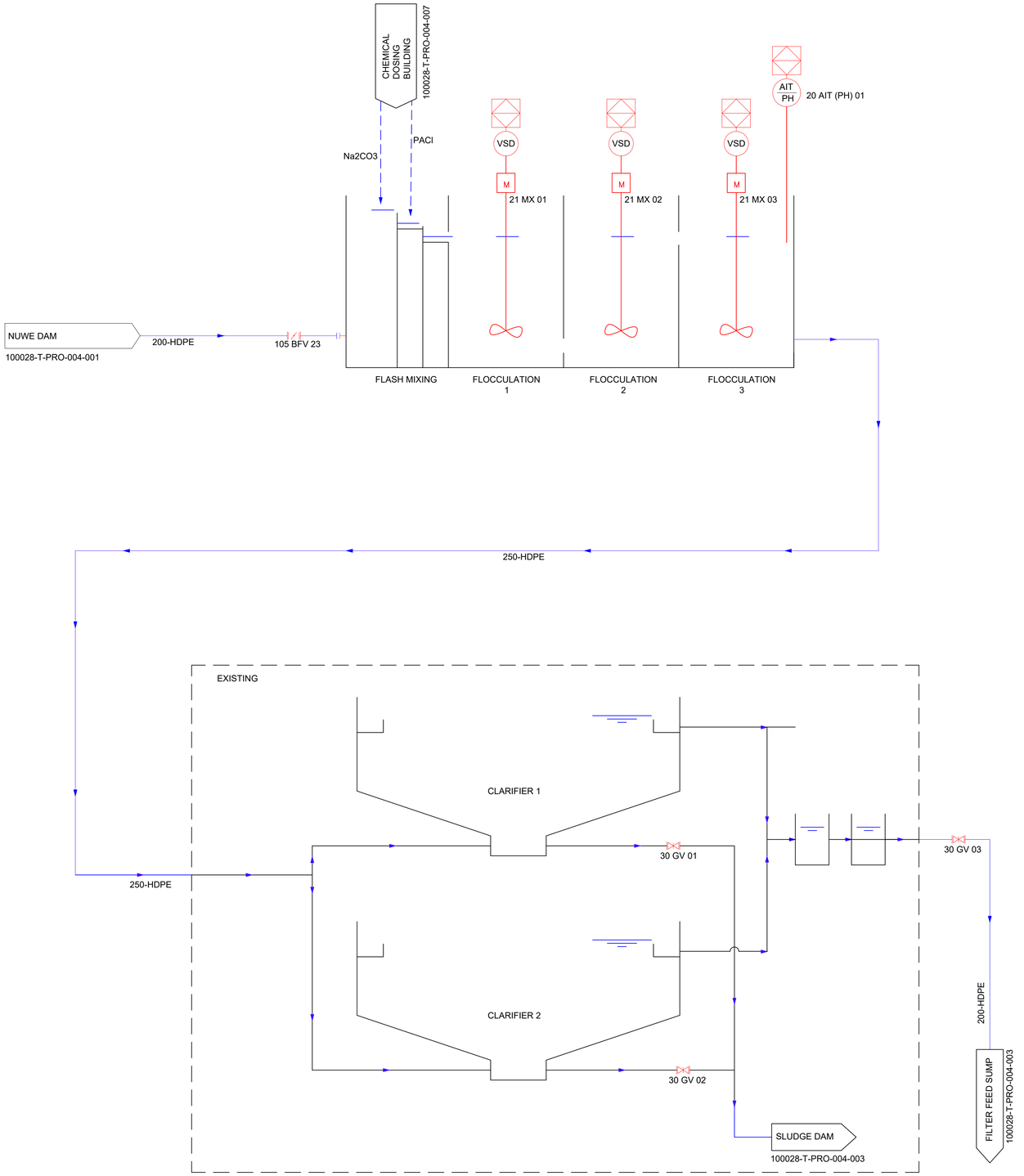
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-001

REVISION: A

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
A	FOR TENDER	2025-10-27



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WATER TREATMENT SPECIALIST: FLEKT WATER

MAIN CONSULTANT: LYNERS Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT:
UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE:
☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION
☐ AS BUILT

PrEng:
Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS
P&ID
FLASH MIXING, FLOCCULATION & CLARIFICATION

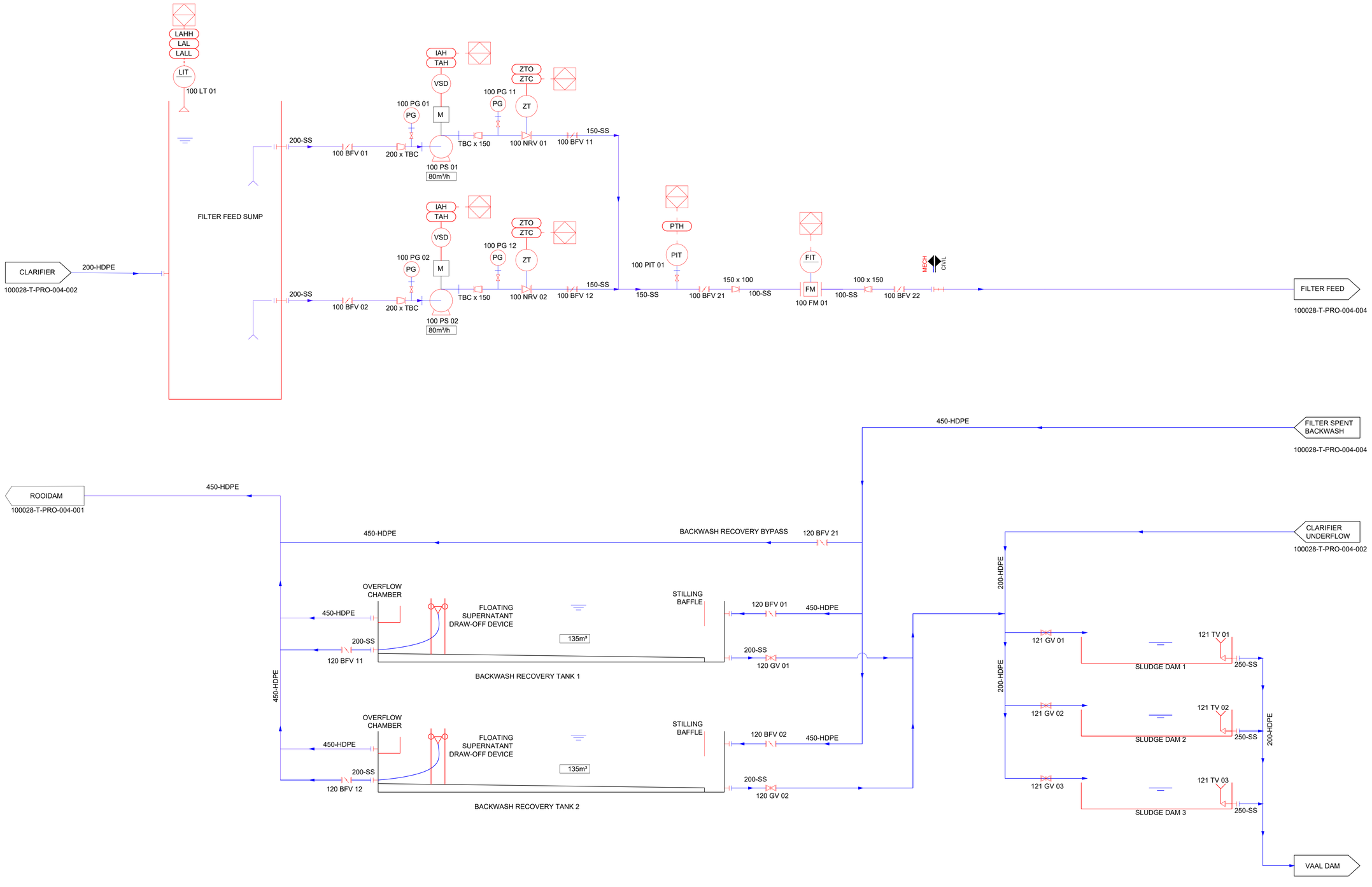
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-002

REVISION: A

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
A	FOR TENDER	2025-10-27



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WATER TREATMENT SPECIALIST: FLEKT WATER

MAIN CONSULTANT: LYNERS — Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE: ☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION ☐ AS BUILT

PrEng: Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS — P&ID — FILTER FEED PUMPS, BACKWASH RECOVERY & SLUDGE DAMS

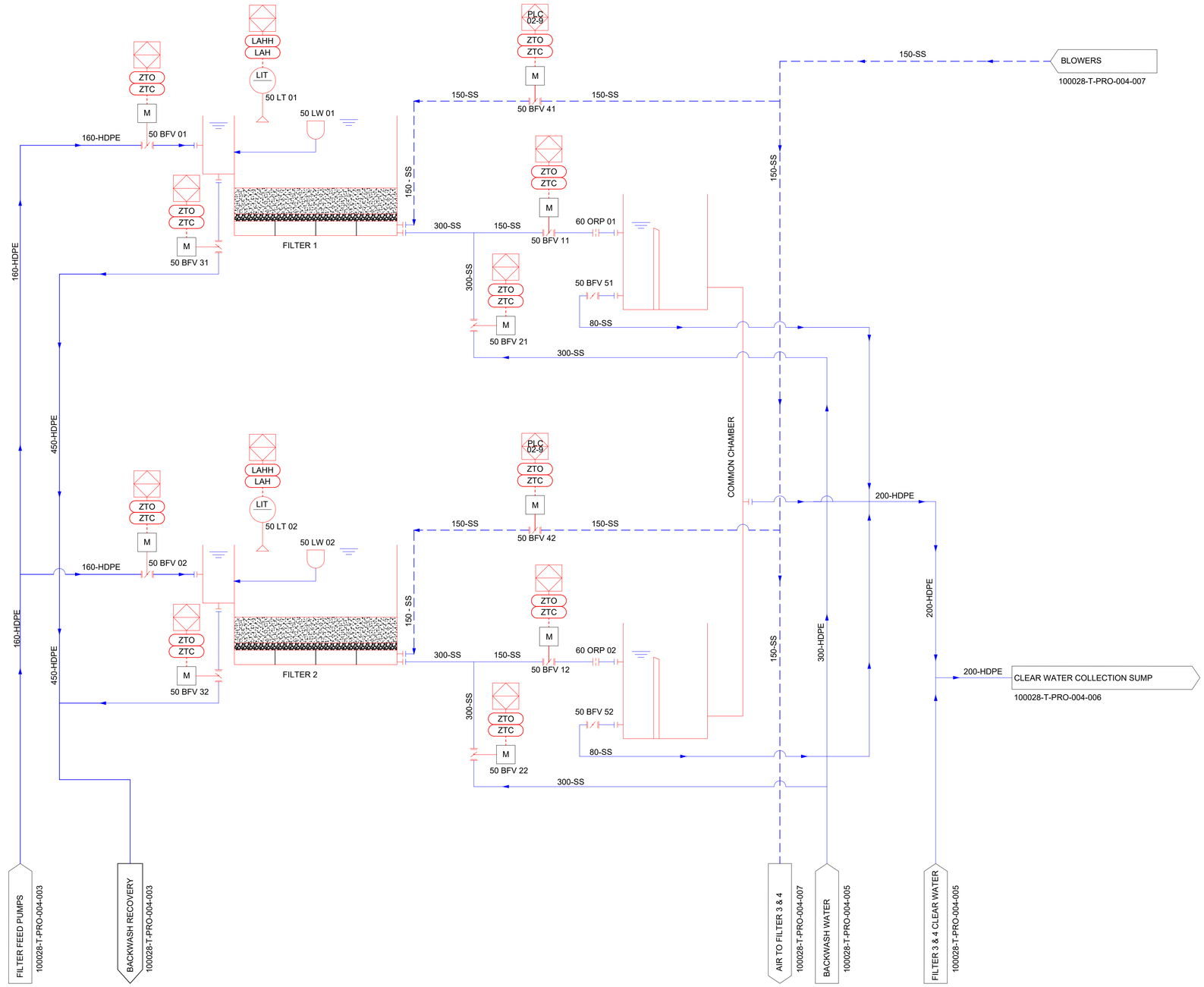
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-003

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
A	FOR TENDER	2025-10-27

REVISION: A



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WATER TREATMENT SPECIALIST: REFLEKT WATER

MAIN CONSULTANT: LYNERS — Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE: ☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION ☐ AS BUILT

PrEng: Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS — P&ID — FILTER 1 & 2

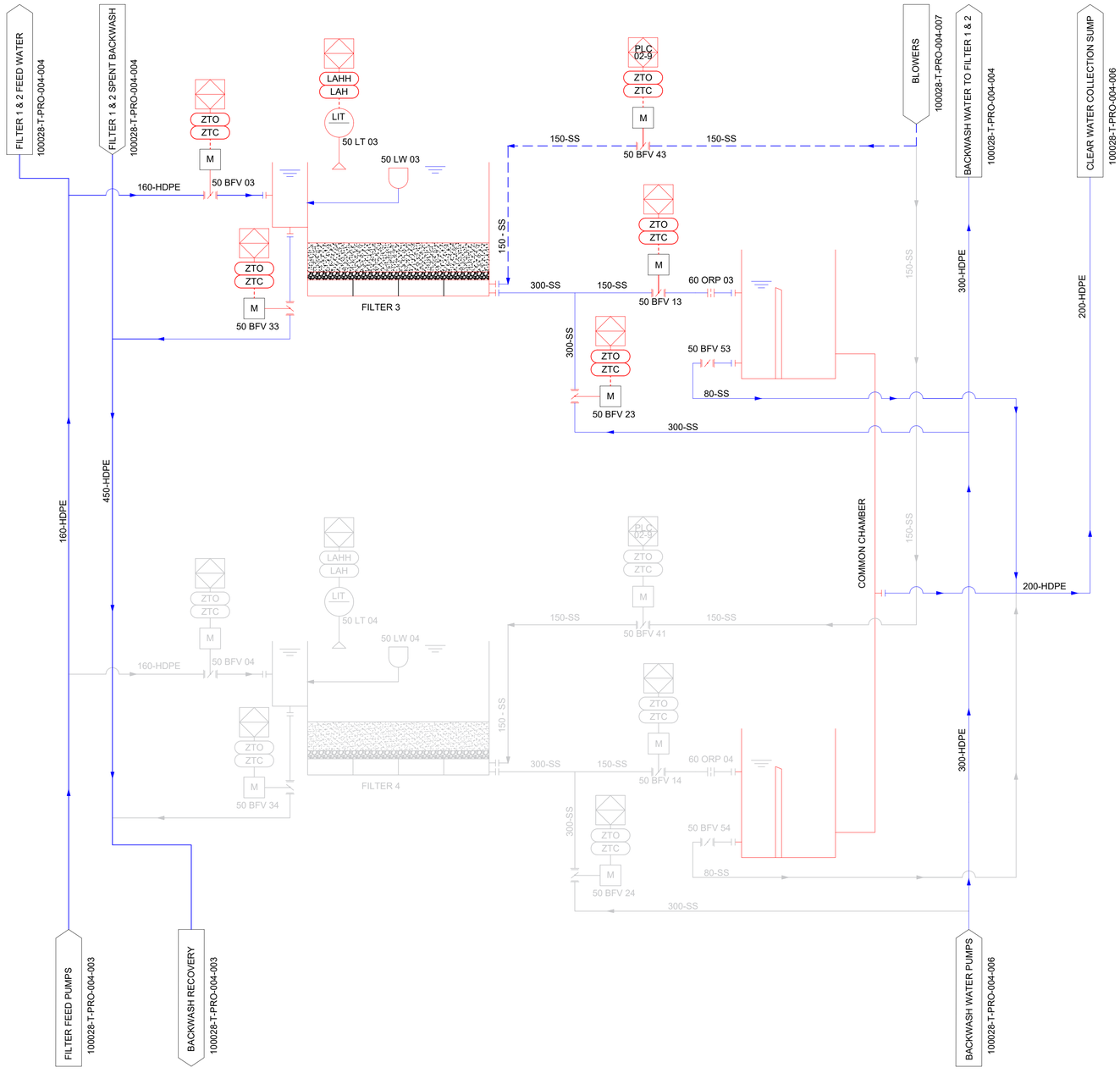
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-004

REVISION: A

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
A	FOR TENDER	2025-10-27



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WATER TREATMENT SPECIALIST: FLEKT WATER

MAIN CONSULTANT: LYNERS — Consulting Engineers & Project Managers

CLIENT: LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE: ☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION ☐ AS BUILT

PrEng: Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS — P&ID — FILTER 3

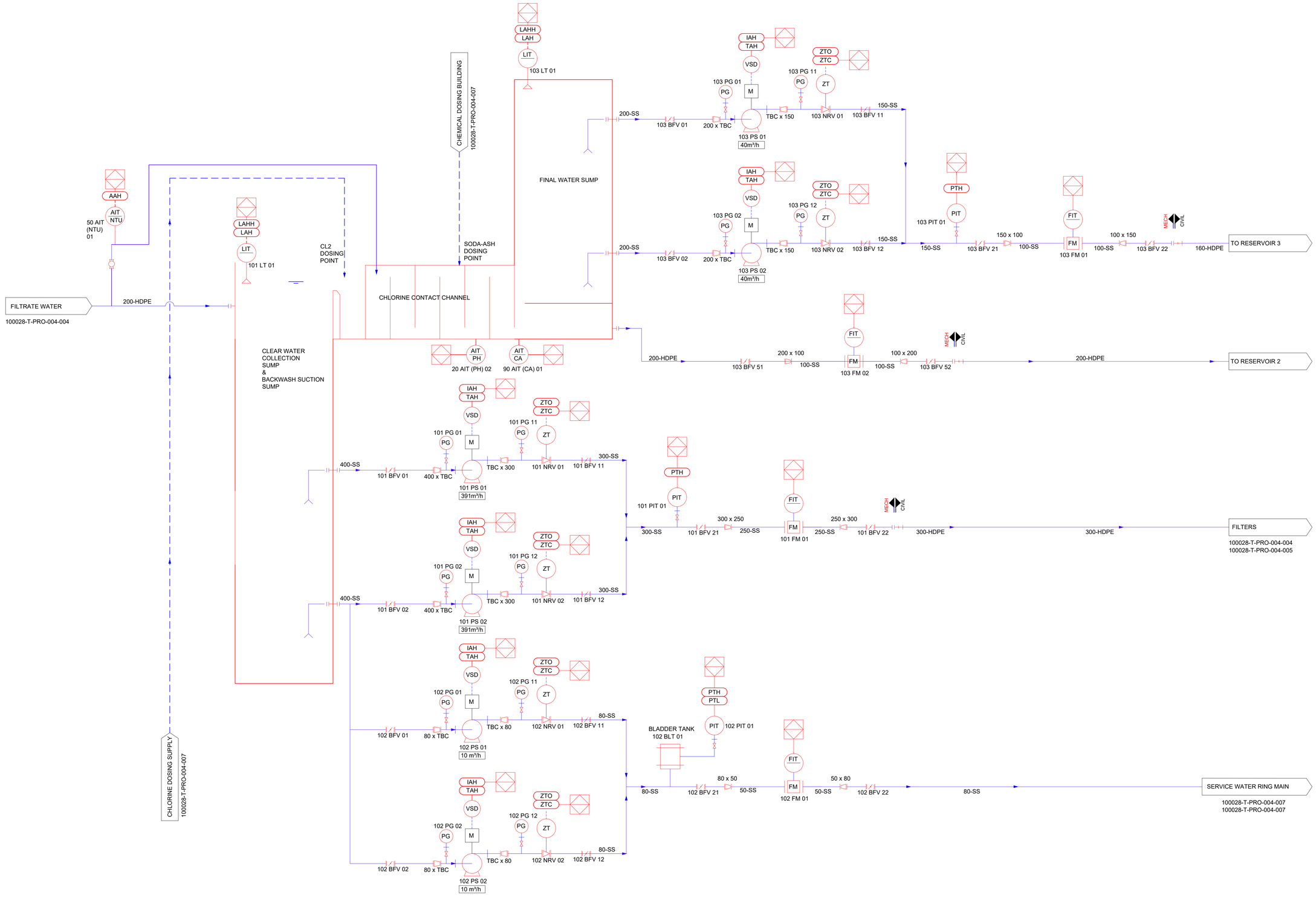
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-005

REVISION SCHEDULE

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WATER TREATMENT SPECIALIST:

FLEKT WATER

MAIN CONSULTANT:

LYNERS

Consulting Engineers & Project Managers

CLIENT:

LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT:

UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

DRAWING STAGE:

☐ CONCEPT DESIGN ■ TENDER ☐ CONSTRUCTION

☐ AS BUILT

PrEng:

Reg Nr 202403290

DRAWN	PAPER SIZE	DESIGNED	CHECKED
SB	A1	JW	MK

SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

P&ID

FINAL WATER PUMPS, BACKWASH PUMPS & SERVICE WATER PUMPS

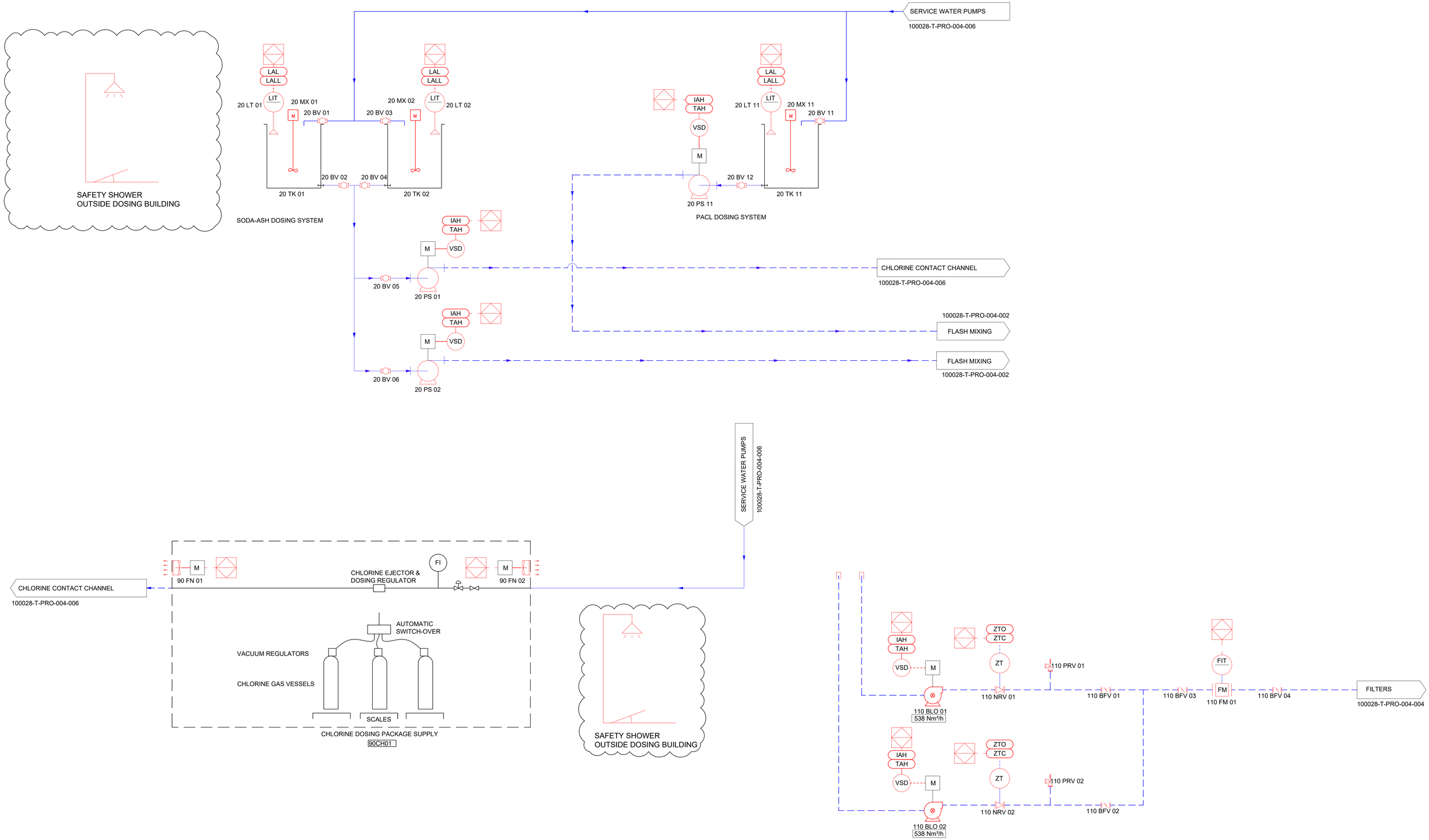
PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-006

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REVISION SCHEDULE

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WATER TREATMENT SPECIALIST:

REFLEKT WATER

MAIN CONSULTANT:

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Consulting Engineers & Project Managers

CLIENT:

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PROJECT:

UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

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☐ AS BUILT

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SCALE: NOT TO SCALE - (NTS)

TITLE: UPGRADING OF THE MCGREGOR WATER TREATMENT WORKS

P&ID

CHEMICAL DOSING & BACKWASH BLOWERS

PROJECT NO: TENDER 46/2025

DRWG NO: 100028-T-PID-004-007

REVISION SCHEDULE

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