CONTRACT JW14090R
REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

TENDER COVER PAGE **MBD 1**

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF JOHANNESBURG WATER

BID NUMBER: JW14090R **CLOSING DATE: 02 MAY 2025** **CLOSING TIME: 10:30 AM**

DESCRIPTION: REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

CIDB REQUIREMENTS: TENDERERS SHOULD HAVE A CONTRACTOR CIDB GRADING OF 8CE OR HIGHER

BRIEFING SESSION	**COMPULSORY**
BRIEFING DETAILS	**DATE AND TIME: 01 APRIL 2025 AT 13:00 PM** **ADDRESS: SITE LOCATION -26.10291, 28.13239** **VENUE: GULULEE ROAD, LINBRO PARK AH, SANDTON 2090** **TENDERS RECEIVED FROM NON-ATTENDED BIDDERS OF A COMPULSORY BRIEFING SESSION WILL NOT BE ACCEPTED**
TENDER SUBMISSION DETAILS	**BID DOCUMENTS MUST BE DEPOSITED IN THE TENDER BOX SITUATED AT GROUND FLOOR IN JOHANNESBURG WATER** **ADDRESS: TURBINE HALL, 65 NTEMI PILISO STREET, NEWTOWN, JOHANNESBURG, 2001** **PLEASE ALLOW SUFFICIENT TIME TO ACCESS JOHANNESBURG WATER OFFICES IN TURBINE HALL AND DEPOSIT YOUR TENDER DOCUMENT IN THE JOHANNESBURG WATER TENDER BOX SITUATED AT RECEPTION BEFORE TENDER CLOSING TIME.** **TIMES: THE BUILDING WILL OPEN 7 DAYS A WEEK FROM 06:00 UNTIL 18:00**

BIDDER INFORMATION				
NAME OF BIDDER				
POSTAL ADDRESS				
PHYSICAL ADDRESS				
TELEPHONE NUMBER				
CELLPHONE NUMBER				
E-MAIL ADDRESS				
VAT REGISTRATION NUMBER				
TAX COMPLIANCE STATUS	**TCS PIN**		**MAAA No**	
OTHER STATUS	**COIDA Registration No**		**CIDB No**	

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EMPLOYER INFORMATION			
DEPARTMENT	CAPEX	DEPARTMENT	SCM
CONTACT PERSON	JULIET BOLOGO	CONTACT PERSON	NTHABISENG MORE
TELEPHONE NUMBER	011 688 1625	TELEPHONE NUMBER	011 688 1512
EMAIL	juliet.bologo@jwater.co.za	EMAIL	nthabiseng.more@jwater.co.za

DOCUMENTS DOWNLOADED FROM THE ETENDER PORTAL IS AT NO COST BUT MUST COMPLY WITH SUBMISSION REQUIREMENTS.

WITHOUT LIMITATION, JOHANNESBURG WATER TAKES NO RESPONSIBILITY FOR ANY DELAYS IN ANY COURIER OR POSTAL SYSTEM OR ANY LOGISTICAL DELAYS WITHIN THE PREMISES OF JOHANNESBURG WATER. JOHANNESBURG WATER LIKEWISE TAKES NO RESPONSIBILITY FOR OFFERS DELIVERED TO A LOCATION OTHER THAN THE TENDER BOX AS PER THE TENDER SUBMISSION DETAILS STATED IN THE TENDER. PROOF OF POSTING OR OF COURIER DELIVERY WILL NOT BE TAKEN BY JOHANNESBURG WATER AS PROOF OF DELIVERY. TENDER SUBMISSION DOCUMENTS MUST BE IN THE BOX BEFORE TENDER CLOSURE.

The current Johannesburg Water Supply Chain Policy Version 16 is applicable which is available on the JW website www.johannesburgwater.co.za

THE TENDERER IS ENCOURAGED TO SIGN THE TENDER SUBMISSION REGISTER WHEN SUBMITTING THEIR TENDERS.

PLEASE ENSURE YOU SUBMIT 1 x ORIGINAL TENDER HARD DOCUMENT
(IF PRACTICAL, ALSO PROVIDE AN ELECTRONIC COPY IN A MEMORY STICK/USB TO ENSURE INFORMATION IS NOT MISSED WHEN TENDERS ARE BEING EVALUATED BY THE BID EVALUATION COMMITTEE – NON-SUBMISSION OF ELECTRONIC COPY AND MEMORAY STICK/USB WILL NOT LEAD TO DISQUALIFICATION).

Any documents required that are not submitted in the tender box at the deadline will be considered late.

The tenderer accepts that Johannesburg Water will not take responsibility for the misplacement or premature opening of the tender if the outer package is not sealed and marked as stated.

NB: NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE.

NAME OF CONTACT PERSON: ……..

SIGNATURE OF BIDDER: ……

CAPACITY UNDER WHICH THIS BID IS SIGNED: ……..

DATE: ……...

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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 RE-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 TAXPAYER'S 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 PART B:3.

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.

Contract JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

TENDER NOTICE AND INVITATION TO TENDER

1. TENDER NOTICE AND INVITATION TO TENDER

Johannesburg Water (SOC) Ltd invites the tenderer for the following:

CONTRACT NO. JW14090R: - REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

The tender document will be available in the form of a download from the Johannesburg Water website (https://www.johannesburgwater.co.za/scm/supply-chain/tenders/all-open-tenders/) starting from 20 March 2025.

The Employer is Johannesburg Water.

All tenders and supporting documents must be submitted in a sealed envelope and be placed in the Tender box on the ground floor of the Johannesburg Water by no later than 10:30 am on 02 May 2025.

Address is as follows:

TURBINE HALL, 65 NTEMI PILISO STREET, NEWTOWN, JOHANNESBURG, 2001

Johannesburg Water (SOC) Ltd is not obliged to accept the lowest or any tender and Johannesburg Water reserves to appoint:

a) in whole or in part.
b) to more than one tenderer.
c) to the highest points scoring bidder.
d) to the lowest acceptable tender or highest acceptable tender in terms of the point scoring system.
e) to a bidder not scoring the highest points (based on objective grounds in terms of section 2 (1) (f) of the PPPFA) (where applicable).
f) not to consider any bid with justifiable reasons.

A valid and binding contract with the successful tender/s will be concluded once Johannesburg Water has awarded the contract. Johannesburg Water (SOC) Ltd and the successful tenderer/s will sign the contract agreement forms.

Johannesburg Water SOC Ltd

CONTRACT NO: JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

TENDER AND CONTRACT

Prepared by
PMU
PO Box 61542
Marshalltown
2107

V2.0
August 2023

The Tenderer is to indicate in the "Submitted (Yes/No)" column in the below table that they have completed the required section of the tender document. Completion of this checklist will assist the Tenderer in ensuring that they have attended to all the required items for submission with this tender. Additionally, it is an absolute requirement that tenderers comply with National Treasury's CSD registration as well as SARS tax compliance requirements for contract award – refer T2.2.4. The below will form part of the tender document, the tenderers are therefore encouraged to submit the returnable and or documentation with their tender offer to avoid elimination especially with regards to what is stated in the Required for Tender Evaluation column or not obtaining points for Specific Goals. Tenderers are encouraged to ensure that their Tax status remains Tax Compliant on CSD throughout the process to avoid delaying the process or being eliminated at award stage. For infrastructure related projects. Tenderer must have a CIDB Active Status at the requested CIDB requirement at evaluation stage to avoid disqualification.

All documentation listed in the Checklist below shall form part of the Contract.

Table 1

Ref	Description of Returnable/s or Documentation that will form Part of Contract and must therefore to be Completed and / or Submitted by the Tenderer	Required for Tender Evaluation	Required for Tender Award	Required After Tender Award	Submitted (Yes/No)
1	**Tender Cover:**				
	Name of Tender	•			
	Contact Person	•			
	Telephone Number	•			
	Central Supplier Database Registration	•			
	CIDB Registration Number	•			
	COIDA Registration Number			•	
	Tax SARS PIN No.		•		
	MAAA No. for Tax Compliant Status		•		
2	**Mandatory Documents at Particular Stage:**				
	CIDB grading of 8CE or higher. Active Status at the required CIDB grading or higher at the time of Evaluation	•			
	Mandatory Tender Briefing Meeting	•			
	Complete and sign the Form of Offer	•			
3	**Administrative Documentation:**				
T2.1	Signed Certificate of Authority to Sign	•	•		
	MBD 1 - Invitation to Bid - Completed and signed	•	•		
	Central Supplier Database Registration	•			
T2.2.4	MBD 4 - Declaration of interest - Completed and signed	•	•		
	MBD 5 - Declaration for procurement above R10 Million (all applicable taxes included) - Completed and signed.	•	•		
	MBD 6.1 - Preference Points Schedule – Specific Goals and Price Points - Completed and signed.	•			

Ref	Description of Returnable/s or Documentation that will form Part of Contract and must therefore to be Completed and / or Submitted by the Tenderer	Required for Tender Evaluation	Required for Tender Award	Required After Tender Award	Submitted (Yes/No)
T2.2.4	MBD 8 - Bidder's past supply chain management practices – Completed and signed.	•	•		
T2.2.4	MBD 9 - Certificate of Independent Bid Determination – Completed and signed.	•	•		
	Municipal Rates and Taxes for the Company - Current municipal rates for the **company** not older than 90 days (if leasing/renting, submitted proof such as lease agreement where premises are rented), OR Confirmation that suitable arrangements are in place for arrear municipal obligations with your local municipality OR Current municipal rates which is not older than 90 days or valid lease agreement with affidavit from owner of property in cases stated in Proof of Good Standing with Regards to Municipal Accounts document in the Tender.	•	•		
	Municipal Rates and Taxes - Current municipal rates for the **directors** of the entity not older than 90 days (if leasing/renting, submitted proof such of lease agreement where premises are rented), OR Confirmation that suitable arrangements are in place for arrear municipal obligations with your local municipality OR Current municipal rates which is not older than 90 days or valid lease agreement with affidavit from owner of property in cases stated in Proof of Good Standing with Regards to Municipal Accounts document in the Tender	•	•		
	3-year financial statements (audited where applicable)	•	•	•	
	Joint Venture Consortium or equivalent Agreement signed by all parties if applicable	•	•		
	Any qualifications. If "Yes", reference to such qualification/s must be indicated on a cover letter. Please be aware that alterations on the tender document may result in your tender being **eliminated as the qualification may impede on the ability to evaluate like with like.**	•	•		
4.	**Functionality Documentation:**				
	Documentary Evidence Required for Criteria 1 – **(Contactable Reference Letters and Completion / Final Approval Certificates)**	•			
	Documentary Evidence Required for Criteria 2 – **(CV, qualifications and valid registration)**	•			
	Documentary Evidence Required for Criteria 3 – **(CV, qualifications and valid registration)**	•			

Ref	Description of Returnable/s or Documentation that will form Part of Contract and must therefore to be Completed and / or Submitted by the Tenderer	Required for Tender Evaluation	Required for Tender Award	Required After Tender Award	Submitted (Yes/No)
	Documentary Evidence Required for Criteria 4 – **(CV, qualifications and valid registration)**	•			
	Documentary Evidence Required for Criteria 5 – **(Site specific method statement)**	•			
5.	**Specific Goals:**				
	Documentary Evidence Required for Criteria 1 – **(Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable)**	•			
	Documentary Evidence Required for Criteria 2 – **(Proof of municipal account / valid lease agreement, letter from the Ward Council confirming the business address. Businesses that operate from personal properties are required to submit an affidavit)**	•			
	Documentary Evidence Required for Criteria 3 – **(Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable)**	•			
6.	**Scope of Work:**				
	Scope of Work and or Specifications	•			
7.	**Pricing Schedule:**				
	Bill of Quantities/ Schedule of Quantities. completed	•			
	Alterations authenticated – Refer to Acknowledgment of Tender Conditions	•			
8.	**Site Information:**				
	Site Information	•			
9.	**Occupational Health, Safety and Environmental Specification**				
	Acknowledgement of SHE Specification & Annexures	•			
10.	**Tender Drawings:**				
	Acknowledgement of Project Tender Drawings	•			
11.	**Terms and Conditions:**				
	General Conditions of Contract	•			
	Tender Data	•			
	Pricing Data	•	•		
12.	**Other Documents**				
	Form of Acceptance (do not complete Form of Acceptance it will be completed by JW official)			•	
	Public Liability Insurance			•	
	Valid Registration with Compensation for			•	

Ref	Description of Returnable/s or Documentation that will form Part of Contract and must therefore to be Completed and / or Submitted by the Tenderer	Required for Tender Evaluation	Required for Tender Award	Required After Tender Award	Submitted (Yes/No)
	Occupation Injuries and Diseases Act				
	Performance Security – where applicable for industrial related services			•	
	Comprehensive Health and Safety Plan (compliance with OHSE Specification - if applicable			•	
	Bank Details Form			•	

Tenderers will be notified of any omitted, outstanding, missing and or incomplete administrative documents and will be offered a period of 3 days to complete or submit those pages i.e., Municipal Bidding Documents (MBD), authority to sign and other administrative documents that require completion and signatures. These exclude documentation on functionality, price, points for specific goals and MBD6.2 Local Production and Content.

Tenders that are received contrary to the above requirements will be disqualified after three (3) days period has lapsed.

If locality is a specific goal in MBD6.1 – the requested documentation may not be used to allocate points for specific goals.

Signature: _____Date_____

Employer:		Contractor:	
Witness:		Witness:	

Johannesburg Water (SOC) Ltd

CONTRACT NO: JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

PART 1: TENDERING PROCEDURES

TABLE OF CONTENTS

T1.1..... TENDER DATA TP3

T1.1.1 Conditions of Tender TP3

T1.1.2 Tender Data.....TP3

T1.1 TENDER DATA

T1.1.1 Conditions of Tender

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of the CIDB Standard for Uniformity in Construction Procurement (August 2019). (See www.cidb.org.za).

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.

T1.1.2 Tender Data

The clause numbers in the Tender Data refer to the corresponding clause numbers in the Conditions of Tender.

The additional Conditions of Tender are:

Clause number	Tender Data
C.1.1	The Employer is, Johannesburg Water (SOC) Limited
C.1.2	The tender document issued by the Employer comprise: **Volume 1** **Tender Part 1: Tendering Procedures** T1.1 Tender Notice and Invitation to Tender T1.2 Tender Data **Tender Part 2: Returnable Documents** T2.1 List of Returnable Documents T2.2 Returnable Schedules, including the Enterprise Declaration Affidavit which may be bound in a separate volume **Contract Part 1: Agreement and Contract Data** C1.1 Form of Offer and Acceptance C1.2 Contract Data C1.3 Forms of Securities **Contract Part 2: Pricing Data** C2.1 Pricing Instructions C2.2 Bill of Quantities **Volume 2** **Contract Part 3: Scope of Work** C3.1 Scope of Work C3.2 Particular Specifications **Contract Part 4: Site Information** C4 Site Information **Volume 3** Occupational Health, Safety and Environmental Specification Environmental Management Plan **Volume 4** Tender Drawings

Clause number	Tender Data
C.1.4	The Employer's representative is: Contact Person: Juliet Bologo Telephone: 011 688 1625 E-mail address: juliet.bologo@jwater.co.za The SCM representative is: Contact Person: Nthabiseng More Telephone: 011 688 1512 E-mail address: nthabiseng.more@jwater.co.za
C.2.1	**Eligibility criteria and requirements** **CIDB registration and grading:** 1) Only tenderers who are registered with the CIDB and were 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 for an **8 CE** class of construction work, are eligible to submit tenders. Tenders must have an Active status at the required CIDB grading at time of tender evaluation for the bidder to meet the eligibility criteria and requirement. 2) Joint ventures are eligible to submit tenders provided that: i) every member of the joint venture is registered with the CIDB; and ii) the combined contractor grading designation calculated in accordance with the CIDB Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for an **8 CE** class of construction work. **Failure to meet to Eligibility criteria and requirements will result in disqualification.**
C.2.8	Replace the contents of the clause with the following: "Request clarification of the tender documents, if necessary, by notifying the Employer's Officials indicated on the Tender Notice and Invitation to Tender in writing at least seven (7) working days before the closing time stated in the foregoing notice and clause C.2.15.1"
C.2.10.5	Add the following to the clause: A price or rate is to be entered against each item in the Bill of Quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to be covered by the other prices in the Schedule.
C.2.11	The evaluation on price alteration will be conducted as follows: Where the tender award strategy is to evaluate and award per item or category, the following must apply: a) If there is an alteration on the rate but no alteration on the total for the item or category, the bidder will not be disqualified. b) If there is an alteration on the total for the item/s without authentication, bidders will only be disqualified for alteration per item or category. Where the tender award strategy is to evaluate and award total bid offer, the following must apply: a) If there is an alteration on the rate, total for the line item, sub-total/ sum brought/carried forward for the section but no alteration on the total bid offer, the bidder will not be disqualified. b) If there is an alteration on the total bid offer on form of offer, then the amount in words must be considered or vice-versa. c) If there is an unauthenticated alteration on the total bid offer and the amount in words is not authenticated, the bidders will be disqualified for the entire tender.

Clause number	Tender Data
	Where the tender pricing schedule or bill of quantities is requesting rates/price from bidder/s without providing a total, the following will apply: a) (i) If there is an unauthenticated alteration on the unit rate/price the bidder must be disqualified. **Corrections may not be made using correction fluid, correction tape or the like, bid received contrary to this will be disqualified.**
C.2.12.1	Replace Contents Alternative offers will **not** be permitted.
C.2.12.2	Failure to complete bid amount on the form of offer and sign full will result in the elimination of the tenderer.
C.2.13.3	Each tender offer shall be submitted as an original. Tenderers are also requested to submit a soft copy in a USB (Tenderers who do not submit a soft copy will not be disqualified)
C.2.13.5	The Employer's address for delivery of tender offers and identification details to be shown on the Tenderer's offer package are: **Location of tender box:** Ground Floor Entrance **Physical address:** Johannesburg Water (SOC) Ltd Turbine Hall 65 Ntemi Piliso Street Newtown Johannesburg 2001 **Identification details:** Tender reference number, Title of Tender and the closing date and time of the tender, *as well as the Tenderer's name, their Authorised Representative's name, postal address and telephonic contact numbers*.
C.2.13.6 & C.3.5	A two-envelope procedure will **not** be followed.
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	The tender offer validity period is 90 days.
C.2.16.1	Add the following to the clause: "If the tender validity expires on a Saturday, Sunday or public holiday, the Tender Offer shall remain valid and open for acceptance until the closure of business on the following working day."
C.2.23	The Tenderer is required to submit with his tender: 1) Valid SARS Compliance status Pin for Tenders issued by the South African Revenue Services. 2) Proof of CSD registration i.e. MA number 3) A Certificate of Contractor Registration issued by the CIDB. 4) where the tendered amount inclusive of VAT exceeds R 10 million:

Clause number	Tender Data
	i. audited annual financial statement for 3 years, or for the period since establishment if established during the last 3 years, if required by law to prepare annual financial statements for auditing; ii. if the bidder is not required by law to prepare financial statements, then the bidder is required to submit their unaudited financial statements prepared by an independent accounting professional. 5) Proof that the tenderer and directors of the tenderer are not in arrears for more than 90 days with municipal rates and taxes and municipal service charges, The latest municipal account is to be attached, or a signed copy of the valid lease agreement if the tenderer or director of the tenderer is currently leasing premises and not responsible for paying municipal accounts. i. Should the municipal statement that was submitted with the tender document before tender closing date and time be in arrears for more than 90 days at time of award, the tenderer will be requested to submit the latest municipal statement which shows that the tenderer is not in arrears for more than 90 days. If the statement at that time is in arrears for more than 90 days, the tenderer must submit before the stipulated deadline, the written proof of an approved arrangement with the municipality. ii. The proof may be a copy of the agreement or an updated municipal statement which reflects the arrangement. iii. Should this tender be considered for award of the contract, based on proof of submission and should proof of such submission be found to be invalid, erroneous or inaccurate, the tenderer will no longer be considered for the award of the contract. iv. Statement must not be older than 90 days from the closing date of this tender. Attach latest municipal account statement behind this page. v. In cases where the director of the tenderer resides with their spouse, parent, partner or sibling the owner of the property that confirm where the director of the tenderer resides must submit an affidavit stating such and explaining the relationship. This would happen in the case where the submitted municipal statement or lease agreement is not in the name of the director of the tenderer. Point (i) will be applicable. vi. In cases where the business address of the tenderer is also the official residence of the director of the tenderer, the director of the tenderer must submit an affidavit stating such. Proof that the municipal statement is not in arrears for more than 90 days or a valid lease agreement must be submitted. Point (i) will be applicable. 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.
C.2.24	Add the following new clause: **Canvassing and obtaining of additional information by tenderers** Accept that: i) No Tenderer shall make any attempt either directly or indirectly to canvass any of the Employers officials or the Employer's agent in respect of his tender, after the opening of the tenders but prior to the Employer arriving at a decision thereon. i) No Tenderer shall make any attempt to obtain particulars of any relevant information, other than that disclosed at the opening of tenders

Clause number	Tender Data
C.2.25	Add the following new clause: **Prohibitions on awards to persons in service of the state** Accept that the Employer is prohibited to award a tender to a person - a) who is in the service of the state; or b) if that person is not a natural person, of which any director, manager, principal shareholder or stakeholder is a person in the service of the state; or c) a person who is an advisor or consultant contracted with the municipality or municipal entity. "In the service of the state" means to be - i) a member of: - • any municipal council. • any provincial legislature; or • the National Assembly or the National Council of Provinces. ii) a member of the board of directors of any municipal entity. iii) an official of any municipality or municipal entity. iv) an employee of any national or provincial department. v) provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999). vi) a member of the accounting authority of any national or provincial public entity; or vii) an employee of Parliament or a provincial legislature." In order to give effect to the above, the questionnaire for the declaration of interests in the tender of persons in service of state in Section T2.1 must be completed.
C.2.26	Add the following new clause: **Awards to close family members of persons in the service of the state** Accept that the notes to the Employer's annual financial statements must disclose particulars of any award of more than R 2 000 to a person who is a spouse, child or parent of a person in the service of the state (defined in clause C.2.25), or has been in the service of the state in the previous twelve months, including. a) the name of that person; b) the capacity in which that person is in the service of the state; and c) the amount of the award. To give effect to the above, the questionnaire for the declaration of interests in the tender of persons in service of state in part T2 – Returnable Documents must be completed in full and signed.
C.2.27	Add the following new clause: **Tax Compliance** In the case of a Joint Venture/Consortium the tax Compliance status Pin must be submitted for each member of the Joint Venture/Consortium.

Clause number	Tender Data
C.2.28	Add the following new clause: i) Tenderers will be notified of any omitted, outstanding, missing and or incomplete administrative documents and will be offered a period of 3 days to complete or submit those pages i.e., Municipal Bidding Documents (MBD), authority to sign and other administrative documents that require completion and signatures. These exclude documentation on functionality, price and preference points for specific goals. ii) Tenders that are received contrary to the above requirements will be disqualified after three (3) days period has lapsed. iii) In cases where locality is a specific goal and the bidder did not submit the required documentation, the tenderer upon submitting the municipal statement, lease agreement or letter from ward councilor confirming business address as per above, may not be eligible for points under specific goals if such documentation was not submitted with the tender document.
C.3.2	Replace the contents of the clause with the following: 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 seven (7) calendar 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. Replace the contents of the clause with the following: There is a new SCM Policy clause regarding the latest time that employee can publish an addendum.
C.3.4.2	Tenders will be opened in public soon after closing time and recording of received documents but not later than 11:00 at the tender office located at Turbine Hall, 65 Ntemi Piliso, Newtown, 2001, Ground Floor. Tenderers' names and total prices, where practical will be, read out
C.3.9	Replace Existing Clause Arithmetic Errors **Construction related tenders** JW undertakes to check the highest scoring bid for arithmetical errors and correcting them as follows: JW shall check for arithmetic errors using the following sequence: (i) Check the amount in words against the amount in figures on the *Form of Offer*, (ii) Check the Form of Offer against the Summary Schedule Total, (iii) Check the Section Sub-Totals per section against the Summary Total for summation errors, (iv) Check the Section Sub-Totals in the Summary Schedule against Section Sub-Totals in the Bill of Quantities. (v) Check the Section Sub-Totals against the Item Totals for summation errors. (vi) Check the Item Totals against the product of the Item Rate and the Quantity Provided. If a bill of quantities or price schedule applies JW will request the bidder to correct the arithmetic errors as follows: (i) In respect of the Form of Offer, where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern. The bidder must be requested to adjust the amount in figures to correspond with the amount in words.

Clause number	Tender Data
	JW will notify the tenderer of all errors or omissions that are identified in the tender offer and either request the tenderer to confirm the offer as tendered or JW will accept the corrected total of prices. Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows: (i) 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. (ii) 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 requested to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices. Clarification session(s) shall be held with Tenderer where there is pricing discrepancies, errors are highlighted and identified corrections are explained. Tenderer is afforded an opportunity to provide clarification, accept or reject identified corrections in writing. (i) In the event that the Tenderer accepts identified corrections, JW will proceed with evaluation. (ii) In the event that the Tenderer rejects the identified correction(s), JW must review the Tenderer's motivation and risks associated with the proposed change. This is not an opportunity for Tenderers to change the bid offer. A bidder that does not agree to the above will be disqualified. Risk related to the Arithmetic Corrections shall be assessed. Where risks are identified, tenderers shall provide JW with any other material or information that has a bearing on the tender offer, the tenderer's commercial position (including joint venture agreements), quotations preferencing arrangements or samples of materials considered necessary by JW 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 JW request or fails to attend any meeting in which it has been formally invited to clarify any issue, the tender offer will be regarded as non-responsive.
C.3.11	Tenderer to complete, sign and return MBD6.1 with the tender submission. Tenderer to claim the points in the space provided and submit documentary evidence to support the points claimed for specific goals.

STAGE	DESCRIPTION
Stage 1	Mandatory Evaluation
Stage 2	Administrative Evaluation
Stage 3	Technical Evaluation

Clause number	Tender Data

Stage 1: Mandatory Evaluation

Description		Complied	
No	**Description**	**Yes**	**No**
1	CIBD grading 8 CE or higher. Active Status at the required CIDB grading or higher at the time of Evaluation		
2	Mandatory Tender Briefing Meeting		
3	Form of Offer Completed and Signed		

Tenderers who **FAIL** to meet the mandatory criteria or requirements of tender will result in disqualification.

Clause number	Tender Data

Stage 2: Administrative Evaluation

Description			Complied	
Reference	**Description**	**Requirement**	**Yes**	**No**
Certificate of Authority	Signed Certificate of Authority to Sign or signed board resolution	Completed and signed certificate of authority to sign or signed board resolution		
MBD 1	Invitation to Bid	Complete and submit complete and signed MBD 1 Form		
CSD	Central Supplier Database Registration	Provide proof of CSD registration		
MBD 4	Declaration of interest	Complete and submit signed MBD 4 Form		
MBD 5	Declaration for procurement above 10 million (all applicable taxes included)	Complete and submit signed MBD 5 Form		
MBD 6.1	Preference Points Claim in Terms of The Preferential Procurement Regulations 2022	Complete and submit signed MBD 6.1 Form		
MBD 8	Declaration of bidder's past supply chain management practices	Complete and submit signed MBD 8 Form		
MBD 9	Certificate of Independent Bid Determination	Complete and submit signed MBD 9 Form		

Clause number	Tender Data

Description			Complied	
Reference	**Description**	**Requirement**	**Yes**	**No**
Annexure – Proof of Specific Goals	Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable	Submit applicable documentation with the tender submission		
Annexure – Proof of Specific Goals	Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable	Submit applicable documentation with the tender submission		
Annexure – Proof of Specific Goals	Proof of municipal account / valid lease agreement, letter from the Ward Council confirming the business address	Submit applicable documentation with the tender submission		
Annexure T2.2.4	Municipal statement of account for Company (not older than three (03) months from the closing date of tender or a valid lease agreement at time of tender closure)	Submit applicable documentation with the tender submission		

Clause number	**Tender Data**

Description			Complied	
Reference	**Description**	**Requirement**	**Yes**	**No**
Annexure	Municipal statement of account for Director/s (not older than three (03) months from the closing date of tender or a valid lease agreement at time of tender closure)	Submit applicable documentation with the tender submission		
Annexure	3-year financial statements (audited where applicable)	Submit applicable documentation with the tender submission		
Annexure	Joint Venture Consortium or equivalent Agreement signed by all parties, where applicable	Where applicable, submit applicable documentation with the tender submission		

Tenderers will be notified of any omitted, outstanding, missing and or incomplete administrative documents and will be offered a period of 3 days to complete or submit those pages i.e., Municipal Bidding Documents (MBD), authority to sign and other administrative documents that require completion and signatures. These exclude documentation on functionality, price and preference points for specific goals.

Tenders that are received contrary to the above requirements will be disqualified after three (3) days period has lapsed.

Any document or form submitted or completed upon request (was not included in the initial tender submission before the closing date) will not be used to claim points for specific goals.

Clause number	Tender Data

Stage 3: Technical Evaluation

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE		MAX SCORE	SCORE
1	Tenderers Experience with Respect to Steel Pipe Projects of Diameter 600mm or more and construction cost of R15 million or more	Supporting Documents Required include Reference Letters as per T2.1.7 (Or on Client Letter Head with all required Information) and Completion / Final Approval Certificates. **Note**: *This reference letter must be completed by the referee/previous client of the tenderer and included in the tender submission. Alternatively, the Clients letterhead may be used provided it complies with the functional requirements. A separate form must be completed for each reference as a requirement in the evaluation criteria. The information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting in participating in any future government tenders.*	**NUMBER OF COMPLETED STEEL PIPE PROJECTS OF DIAMETER 600MM OR MORE AND CONSTRUCTION COST OF R15 MILLION OR MORE**	Zero (0) Completed Projects	**20**	**0**
				Completed one (1) project		**8**
				Completed two (2) projects		**16**
				Completed more than two (2) projects		**20**

Clause number	Tender Data

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE		MAX SCORE	SCORE

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE		MAX SCORE	SCORE
2	Post Qualification Experience of **Contract Manager** Only **Contract Managers** with qualifications of	Tenderer must Provide CV of **Contract Manager** in the format given on T2.1.9 and certified copies of qualifications and valid registration certificate	**NUMBER OF PIPE LAYING PROJECTS OF A MINIMUM DIAMETER OF 600MM (PER**	0 - 2 Completed Projects	**20**	**0**
				3 - 4 Completed Projects		**8**

Clause number	Tender Data

	BTech/ BSc/ BEng: Engineering (Civil/ Mechanical) or higher **AND** ECSA Professional Registration (Pr. Eng. / Pr. Technologist) will obtain a score for experience of a **Contract Manager**. However, the date of registration of **Contract Manager** will not impact post qualification number of projects.	*Tenderers may provide their own CVs but the information provided should contain all information in T2.1.9* *Note: The information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting in participating in any future government tenders.*	**PROJECT) COMPLETED AS CONTRACT MANAGER**	5 - 6 Completed Projects		**16**
				More than 6 Completed Projects		**20**

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE		MAX SCORE	SCORE
3	Post Qualification Experience of **Site Manager**	Tenderer must Provide CV of **Site Manager** in the format given on T2.1.9 and certified	**NUMBER OF PIPE LAYING PROJECTS OF**	Zero (0) Completed Projects	**20**	**0**

Clause number	Tender Data						
		Only **Site Managers** with qualifications of National Diploma (Civil/ Mechanical) Engineering or higher **AND** Registered as a Candidate Engineering Professional with the ECSA or higher will be considered	copies of qualifications and valid registration certificate *Tenderers may provide their own CVs but the information provided should contain all information in T2.1.9* *Note: The information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting in participating in any future government tenders.*	**WELDED STEEL PIPE WITH A MINIMUM DIAMETER OF 600MM (PER PROJECT) COMPLETED AS SITE AGENT/SITE MANAGER**	1 - 2 Completed Projects		**8**
					3 - 4 Completed Projects		**16**
					More than 4 Completed Projects		**20**

Clause number	Tender Data

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE		MAX SCORE	SCORE
4	Post Qualification Experience of **Safety Officer** Only **Safety Officers** with qualifications of National Diploma (Safety Management/ Environmental Health/Environmental Science/ Environmental Management), SAMTRAC / SHEOMTRAC/ SHEMTRAC / MESHTRAC /NEBOSH / Safety Officers Course (NQF 5) or more **AND** Registered with SACPCMP in the "Construction Health and Safety" Sector will be considered. However, the time of registration of Safety Officer will not impact post qualification number of projects.	Tenderer must Provide CV of **Safety Officer** in the format given on T2.1.9 and certified copies of qualifications and valid registration certificate. All Civil/ Mechanical Engineering projects will be considered *Tenderers may provide their own CVs but the information provided should contain all information in T2.1.9* *Note: The information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting in participating in any future government tenders*	**NUMBER OF CIVIL / MECHANICAL ENGINEERING PROJECTS COMPLETED AS SAFETY OFFICER**	Zero (0) Completed Projects	**20**	**0**
				1 - 2 Completed Projects		**8**
				3 - 4 Completed Projects		**16**
				More than 4 Completed Projects		**20**

Clause number	Tender Data

CRITERIA NO #	CRITERIA	EVIDENCE	SUB-CRITERIA/CLAUSE	MAX SCORE	SCORE
5	Site Specific Method Statement	Tenderer must provide a Site Specific Method Statement which addresses the following sections: **Method Statement Section 1 - Approach Statement and Introduction** (Maximum - 4 Pages) which illustrates an understanding of the scope. This is inclusive of the following **major components** of section 1: ○ Laying of the steel pipeline, including pipe jacking ○ Construction of air valve chambers ○ Construction of scour valve chamber ○ Construction of a pressure reducing valve building ○ Construction of a metering chamber ○ Construction of a reservoir control valve building	Site Specific Method Statement not submitted	**20**	**0**
			Tenderer has partially covered major components of two or less method statement sections		**8**
			Tenderer has partially covered major components of all the three method statement sections		**16**
			Tenderer has covered all of the major components of all the three method statement sections		**20**

Clause number	Tender Data					
			Method Statement Section 2 - Quality Control Plan (Maximum 4 Pages) including all necessary standards to be used, resources available and procedures to ensure quality. This is inclusive of the following **major components** of section 2: ○ Laying of the steel pipeline, including pipe jacking ○ Construction of air valve chambers ○ Construction of scour valve chamber ○ Construction of a pressure reducing valve building ○ Construction of a metering chamber ○ Construction of a reservoir control valve building		

Clause number	Tender Data

		Method Statement Section 3 - Project Programme/ Schedule **Major components** of section 3: (On MS Projects or any other Gantt chart) outlining critical path, aligned to the scope of works, aligned to the contractual timelines, and including all contractual dates. This is inclusive of the following major components: ○ Laying of the steel pipeline, including pipe jacking ○ Construction of air valve chambers ○ Construction of scour valve chamber ○ Construction of a pressure reducing valve building ○ Construction of a metering chamber ○ Construction of a reservoir control valve building			
Minimum Required Score					**80**
Maximum Score Allocated					**100**

Tenderers who **FAIL** to meet the minimum required score or requirements of tender will result in disqualification.

Clause number	Tender Data
C.3.11.2 & C.3.11.3	The procedure for the evaluation of responsive tenders is Method 2 (Financial Offer and Specific Goals): **1. APPLICATION OF THE PREFERRENCE POINTS SCORING SYSTEM** <u>The following preference point systems are applicable to all bids:</u> - the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included). - The Specific Goals for the tender will be stated in MBD 6.1. In MBD 6.1, the tenderer must indicate how many points they are claiming for each Specific Goal and must submit all the required supporting documentation for the points to be verified and awarded by JW. The BEC will evaluate the submitted supporting documentation and confirm Specific Goal points claimed by the tenderer. Specific goals to be allocated by the Bid Evaluation Committee will depend on verification documentation submitted. - Only tenderers that have completed and signed MBD 6.1 and submitted applicable verification documents will be allocated Specific Goal points for preferencing. (a) The value of this bid is estimated to exceed R50 000 000 (all applicable taxes included) and therefore the 90/10 preference point system shall be applicable. (b) Preference points for this bid shall be awarded for: Price; and Specific Goals. (c) The maximum points for this bid are allocated as follows: **DESCRIPTION** / **POINTS** **PRICE** / 90 **SPECIFIC GOALS** / 10 **Total points for Price and Specific Goals must not exceed** / **100** (d) Failure on the part of a bidder to submit proof of specific goals points claimed in MBD 6.1 will not result in disqualification but will result in points not being awarded for Specific Goals. **Specific Goals** In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations 2022, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as must be supported by proof/ documentation stated in the conditions of this tender.

Clause number	Tender Data
	Specific goals may include contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender or disability. **Race:** I. Ownership by black people II. Black Designated Group: Ownership by black people that are unemployed Ownership by black people who are youth Ownership by black people living in rural or underdeveloped areas or townships Ownership by black people with disabilities Ownership by black people who are military veterans Cooperative owned by black people **Gender:** I. Persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of gender are women. Ownership by persons that are classified as female or women according to the Department of Home Affairs of South African. **Disability:** I. Persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of disability are disabled persons. Reconstruction and Development Programme (RDP) objectives as published in Government Gazette No. 16085 dated 23 November 1994 i.e., **Local Manufacture:** I. Promotion of procurement of locally manufactured goods in South Africa to promote job creation in light of the high unemployment rate in South Africa which has a greater impact previously disadvantaged individuals and black youth. **Locality:** I. Promotion of procurement from local business in the geographical areas that JW operate in. This is also directed at creating employment in the areas JW operate in. The BSC may allocate points as follows: • Promotion of enterprises located in the Gauteng Province • Promotion of enterprises located in a specific region within COJ (the 7 regions. A to G) • Promotion of enterprises located in the City of Johannesburg municipality • Promotion of enterprises located rural or underdeveloped areas or townships.

Clause number	Tender Data
	Qualifying Small Enterprises (QSE) I. Promotion of procurement from QSE's that are black owned. **Exempted Micro Enterprises (EME):** I. Promotion of procurement from EME's that are black own. **SUB-CONTRACTING:** Promotion of sub-contracting a Historically Disadvantaged Individuals (HDI) company. Consider sub-contract only in cases where there are no company which can meet any of the specific goals. Check if the portion of the work cannot be subcontracted in terms of specific goals. One goal may be chosen, or a combination of goals may be decided upon including a sub-goal i.e., owned by black people that are disabled etc., **JOINT VENTURE, CONSORTIUM OR EQUIVALENT:** For Joint Venture Agreements, Consortiums or equivalent, the agreement must show percentages of ownership and work to be completed by each party. This agreement must form part of the tender submission. To determine the Joint Venture, Consortium or equivalent score for specific goals, JW will look at the consolidated BBBEE certificate to determine the points for specific goals that will be awarded to the tenderer. If a consolidated BBBEE certificate is not submitted, the parties to the joint venture, consortium or equivalent must submit their individual BBBEE certificates issued by a SANAS accredited verification agency or the documents listed below on 4.6 and the joint venture, consortium or equivalent agreement in order for JW to determine the proportional points for specific goals. Documentation to be provided: • JV, Consortium, or equivalent agreement • Consolidated BBBEE certificate issued by an SANAS accredited verification agency. Certificate must be valid

Clause number	Tender Data

Table 1:

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system)
Businesses located within the boundaries of COJ municipality	4
Business owned by 51% or more- Women	3
Business owned by 51% or more- by Black Youth	3
Total	**10**

The following verification documents must be submitted with the tender document:

SPECIFIC GOALS – ANY ONE COMBINATION OR ANY	MEANS OF VERIFICATION THAT MAY BE SELECTED OR A COMBINATION THEREOF
Business owned by 51% or more - Black Youth	Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable
Business owned by 51% or more- Women	Valid Construction Sector BBBEE Certificate issued by SANAS accredited verification agency or DTI/CIPC BBBEE Certificate for Exempted Micro Enterprises or Affidavit sworn under oath, OR CIPC registration document showing percentage of ownership and share certificate where applicable
Businesses located within the boundaries of COJ municipality	Proof of municipal account / valid lease agreement, letter from the Ward Council confirming the business address. Businesses that operate from personal properties are required to submit an affidavit

Note: The joint venture, consortium, or equivalent agreement in order for JW to determine the proportional points for specific goals.

Example, If there are two parties in a Joint Venture with a 50:50 ownership of the Joint Venture and one party is located within the boundaries of COJ and one is located in Tshwane, if one of the goals is locality and has total points of 4, the JV will only be entitled the proportional points of 2.

Clause number	Tender Data

The following are the requirements for a valid Sworn Affidavit in terms of the BBBEE Sector Codes of Good Practise:

Affidavit Prescribed Formats	Category	Financial Threshold
Generic Enterprises		
	BO QSE	Between R10m and R50m
	BO EME	Less than R10m
Sector Specific Enterprises		
	BO QSE	Between R10m and R50m
	BO EME	Less than R10m
Construction Sector Code		
	EME Contractor	Less than R3m
	BO EME BEP	Less than R1.8m
Financial Sector Code		
	BO QSE	Between R10m and R50m
	BO EME	Less than R10m
Information Communication Technology Sector Code (ICT)		
	BO QSE	Between R10m and R50m
	BO EME	Less than R10m
Marketing, Advertising & Communication Sector Code (MAC)		
> Public Relations	BO QSE	Between R5m and R10m
> Marketing, Advertising & Communications	BO EME	Less than R5m
Property Sector Code		
> Service-based	BO QSE	Between R5m and R10m
	EME	Less than R5m
> Agency-based	BO QSE	Between R2.5m and R35m
> Asset-based	EME	Less than R2.5m
	BO QSE	Between R80m and R400m
Tourism Sector Code		
	BO QSE	Between R5m and R45m
	BO EME	Less than R5m
Specialised Enterprises		
	BO QSE	Between R10m and R50m
	BO EME	Less than R10m

Note: A sworn affidavit received from a tenderer that does not meet the above requirement will not be considered for the allocation of points for specific goals.

Requirements for a valid BBBEE Certificate are as follows:

a) Copy of a certified valid BBBEE certificate (Only Valid BBBEE accredited by SANAS), or a valid Sworn Affidavit issued by the DTIC or the CIPC or in a similar format complying with commissioner of oath Act.

b) Bidders who do NOT qualify as EME's and QSE's as outlined above must submit B-BBEE verification certificates that are issued by an Agency accredited by SANAS.

Clause number	Tender Data
	c) Bidders who fail to submit a certified copy of their valid B-BBEE certificate or valid sworn affidavit or valid DTI / CIPC B-BBEE certificate will score zero points for specific goals. Valid Sworn Affidavits or certified copies of B-BBEE Certificate must comply with the requirements outlined in the Justices of the Peace and Commissioners of Oaths Act, no 16 of 1963 and its Regulations promulgated in Government Notice GNR 1258 of 21 July 1972 Justices of the Peace and Commissioners of Oaths Act, No. 16 of 1963. i.e. (i) The deponent shall sign the declaration in the presence of the commissioner of oaths (COA). (ii) Below the deponent's signature the COA shall certify that the deponent has acknowledged that he knows and understands the contents of the declaration and the COA shall state the manner, place, and date of taking the declaration. (iii) The COA shall sign the declaration and print his full name and business address below his signature; and state his designation and the area for which he holds his appointment, or the office held by him if he holds his appointment ex officio. (iv) Copy of certified copies will not be accepted. **Note**: A tenderer failing to submit proof of specific goals claimed as per indicated above will not be disqualified but will be allocated zero points for specific goals and will be allocated points for pricing. 2. **ADJUDICATION USING A POINT SYSTEM** (a) The bidder obtaining the highest number of total points will be awarded the contract. (b) Preference points shall be calculated after prices have been brought to a comparative basis taking into account all factors of non-firm prices and all unconditional discounts;. (c) Points scored must be rounded off to the nearest 2 decimal places. (d) In the event that two or more bids have scored equal total points, the successful bid must be the one scoring the highest number of points for specific goals. (e) However, when functionality is part of the evaluation process and two or more bids have scored equal points including equal preference points for specific goals, the successful bid must be the one scoring the highest score for functionality. (f) Should two or more bids be equal in all respects, the award shall be decided by the drawing of lots.

Clause number	Tender Data
	3. POINTS AWARDED FOR PRICE THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS A maximum of 90 points is allocated for price on the following basis: **90/10** $$Ps = 90\left(1 - \frac{Pt - P\min}{P\min}\right)$$ Where Ps = Points scored for comparative price of bid under consideration Pt = Comparative price of bid under consideration Pmin = Comparative price of lowest acceptable bid
C.3.12	Add the following to the clause: "Accept that the submission of a Tender shall be construed as an acknowledgement by the Tenderer that they are satisfied with the insurance cover, the Employer will affect under the contract."
C.3.13.1	Add to the existing clause: Tender offers will only be accepted if: a) the tenderer submits a valid SARS tax Compliance status Pin for tenders issued by the South African Revenue Services or has made arrangements to meet outstanding tax obligations; b) Proof of CSD registration ie MA xxxxx number; c) the tenderer submits a letter of intent from an approved insurer undertaking to provide the Performance Guarantee to the format included in Part T2.2.22 of this procurement document d) the tenderer is registered with the Construction Industry Development Board in an appropriate contractor grading designation; e) the tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector; f) the tenderer has not: i) abused the Employer's Supply Chain Management System; or ii) failed to perform on any previous contract and has been given a written notice to this effect; g) the tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the Employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract; h) the tenderer is registered and in good standing with the compensation fund or with a licensed compensation insurer;

Clause number	Tender Data
	i) the Employer is reasonably satisfied that the tenderer has in terms of the Construction Regulations, 2014, issued in terms of the Occupational Health and Safety Act, 1993, the necessary competencies and resources to carry out the work safely; and j) the tenderer: i) has sufficiently substantiated his experience in this type work; ii) has the required and experienced key personnel.
C.3.17	The number of paper copies of the signed contract to be provided by the Employer is one.
	There are no additional conditions of tender.

-- END OF PART ---

Johannesburg Water SOC Ltd

REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

RETURNABLE DOCUMENTS AND SCHEDULES

T2.1 LIST OF RETURNABLE DOCUMENTS

The tenderer must complete the following returnable documents:

Document		Page
1. Returnable Schedules required for tender evaluation purposes		
T2.1.1	Record of addenda to tender documents	RD.4
T2.1.2	Certificate of Authority	RD.5
T2.1.3	Compulsory Enterprise Questionnaire	RD.10
T2.1.4	Preferential Procurement	RD.12
MBD 6.1	Preference points claim form in terms of the preferential procurement regulations	RD.13
MBD 4	Declaration of any potential conflict of interest	RD.21
MBD 8	Declaration of bidder's past Supply Chain management practices	RD.24
MBD 5	Declaration for Procurement above R10 Million (VAT Included)	RD.26
MBD 9	Certificate of independent bid determination	RD.29
T2.1.5	Proposed qualifications	RD.32
T2.1.6	Schedule of the Tenderer's experience	RD.33
T2.1.7	Contactable reference template	RD.34
T2.1.8	Schedule of key personnel	RD.35
T2.1.9	Curriculum vitae of key personnel	RD.36

T2.2 LIST OF RETURNABLE DOCUMENTS

Document		Page
2. Other documents required only for tender evaluation purposes		
T2.2.1	Certificate of Contractor Registration issued by the Construction Industry Development Board	RD.40
T2.2.2	SARS Tax Compliance Status Pin and Proof of CSD registration i.e. MA number	RD.41

T2.3 LIST OF RETURNABLE SCHEDULES

Document		Page
3. Other documents that will be incorporated into the contract		
T2.3.1	JW 6.4 Returnable Annexure A – SHE Acknowledgment Form	RD.43
T2.3.2	JW 6.5 Returnable Annexure B: Acknowledgement of Tender Drawings	RD.44
T2.3.3	Minutes of the Mandatory Tender Briefing Meeting	RD.46

NOTE: The Tenderer is required to complete each and every schedule listed above to the best of his ability as the evaluation of tenders and the eventual contract will be based on the information provided by the tenderer.

T2.1 LIST OF RETURNABLE DOCUMENTS

Document		Page
1. Returnable Schedules required for tender evaluation purposes		
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T2.1.3	Compulsory Enterprise Questionnaire	RD.10
T2.1.4	Preferential Procurement	RD.12
T2.1.5	Proposed qualifications	RD.32
T2.1.6	Schedule of the Tenderer's experience	RD.33
T2.1.7	Contactable reference template	RD.34
T2.1.8	Schedule of key personnel	RD.35
T2.1.9	Curriculum vitae of key personnel	RD.36

T2.1.1 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.		

Attach additional pages if more space is required.

Signed ..... Date .....

Name ..... Position .....

Tenderer .....

T2.1.2 CERTIFICATE OF AUTHORITY

Indicate the status of the Tenderer by ticking the appropriate box hereunder. The Tenderer must complete the certificate set out below for the relevant category.

(I) COMPANY	(II) CLOSE CORPORATION	(III) PARTNERSHIP	(IV) JOINT VENTURE	(V) SOLE PROPRIETOR

(I) Certificate For Company

I, ……, chairperson of the Board of Directors of ....., hereby confirm that by resolution of the Board (copy attached) taken on ....., Mr/Ms ....., acting in the capacity of ....., was authorized to sign all documents in connection with the tender for Contract No. JW14090R and any contract resulting from it on behalf of the company.

Chairman: .....

As Witnesses: 1.....

2.....

Date: .....

(II) Certificate For Close Corporation

We, the undersigned, being the key members in the business trading as.....

..... hereby authorize Mr/Ms..... , acting in the capacity of

....., to sign all documents in connection with the tender and any contract resulting from it on our behalf.

NAME	ADDRESS	SIGNATURE	DATE

Note : This certificate is to be completed and signed by all of the key members upon whom rests the direction of the affairs of the Close Corporation as a whole.

(III) Certificate For Partnership

We, the undersigned, being the key partners in the business trading as,

……., hereby authorize Mr/Ms……,

acting in the capacity of..... , to sign all documents in connection.

with the tender and any contract resulting from it on our behalf.

NAME	ADDRESS	SIGNATURE	DATE

Note : This certificate is to be completed and signed by all of the key partners upon whom rests the direction of the affairs of the Partnership as a whole.

(IV) Certificate For Joint Venture

This Returnable Schedule is to be completed by joint ventures.

We, the undersigned, are submitting this tender offer in Joint Venture and hereby authorise Mr/Ms ..... , authorised signatory of the company . . . . . , 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.

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
Lead partner		Signature. . . . . . Name …… Designation
		Signature. . . . . . Name …… Designation
		Signature. . . . . . Name …… Designation
		Signature. . . . . . Name …… Designation

Note: This certificate is to be completed and signed by all of the key partners upon whom rests the direction of the affairs of the Joint Venture as a whole.

(V) Certificate For Sole Proprietor

I, ..., hereby confirm that I am the sole owner of the Business trading as …….....

Signature of Sole owner: .....

As Witnesses:

1.....

2. .....

Date: .....

T2.1.3 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 4: 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 5: Particulars of companies and close corporations

Company registration number . . . . . .

Close corporation number . . . . . .

Proof of CSD registration ie MA xxxxxxxxx number. . . . . .

SARS Tax Compliance status Pin number . . . .

Section 6: Record in the service of the state

Indicate by marking the relevant boxes with a cross, if any sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months in the service of any of the following:

- ☐ a member of any municipal council
- ☐ a member of any provincial legislature
- ☐ a member of the National Assembly or the National Council of Province
- ☐ a member of the board of directors of any municipal entity
- ☐ an official of any municipality or municipal entity
- ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
- ☐ a member of an accounting authority of any national or provincial public entity
- ☐ an employee of Parliament or a provincial legislature

If any of the above boxes are marked, disclose the following:

Name of sole proprietor, partner, director, manager, principal shareholder or stakeholder	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*insert separate page if necessary

Section 7: Record of spouses, children and parents in the service of the state

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent of a sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months been in the service of any of the following:

- ☐ a member of any municipal council
- ☐ a member of any provincial legislature
- ☐ a member of the National Assembly or the National Council of Province
- ☐ a member of the board of directors of any municipal entity
- ☐ an official of any municipality or municipal entity
- ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
- ☐ a member of an accounting authority of any national or provincial public entity
- ☐ an employee of Parliament or a provincial legislature

Name of spouse, child or parent	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*insert separate page if necessary

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

i) authorizes the Employer to verify the tax compliance status 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;

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

iv) 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 ..... Date .....

Name ..... Position .....

Enterprise name .....

T2.1.4 PREFERENTIAL PROCUREMENT

Forms for Completion by the Tenderer included in this section are:

Form No.	Form Title	Description	Page
MBD 6.1	Empowerment and Preferential Procurement	Procedures and adjudication criteria for the information of the Tenderer	RD.13
MBD 4	Declaration of any potential Conflict of Interest	Form to be completed by the Tenderer	RD.21
MBD 8	Declaration of bidder's past supply chain management practices	Form to be completed by the Tenderer	RD.24
MBD 5	Declaration for Procurement above R10 Million (VAT Included)	Form to be completed by the Tenderer	RD.26
MBD 9	Certificate of Independent Bid Determination	Form to be completed by the Tenderer	RD.29

Note:

All information supplied must be current and valid. Proposed or imminent changes to a Tenderer's status may be mentioned but the declarations must reflect current circumstances.

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

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

---

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 90/10 preference point system.

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	90
SPECIFIC GOALS	10
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 **THE 90/10 PREFERENCE POINT SYSTEMS**

A maximum of 90 points is allocated for price on the following basis:

90/10

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

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmin = Price of lowest acceptable tender

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

4.1 POINTS AWARDED FOR PRICE

A maximum of 90 points is allocated for price on the following basis:

90/10

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

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmax = Price of highest acceptable tender

5. POINTS AWARDED FOR SPECIFIC GOALS

5.1 In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in Table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:

5.2 In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—

(a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or

(b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,

then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

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

***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)	Number of points claimed (90/10 system) (To be completed by the tenderer)
Businesses located within the boundaries of COJ municipality	4	
Business owned by 51% or more-Women	3	
Business owned by 51% or more- by Black Youth	3	
Total	**10**	

6. DECLARATION WITH REGARD TO COMPANY/FIRM

6.1 Name of company/firm…….
6.2 Company registration number: ……...
6.3 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]

6.4 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**: …… …… …… ……

6.5 SUB-CONTRACTING

6.5.1 Will any portion of the contract be sub-contracted?

(***Tick applicable box***)

YES		NO	

6.5.2 If yes, indicate:

i) What percentage of the contract will be subcontracted_____

ii) The name of the sub-contractor(s):

……

……

……

……

……

iii) The black sharehold of the sub-contractor(s):

……

……

……

……

……

iv) Whether the sub-contractor(s) is an EME or QSE
(Tick applicable box)

YES		NO	

v) Specify, by ticking the appropriate box, if subcontracting with an enterprise in terms of Preferential Procurement Regulations,2022:

Designated Group: An EME or QSE which is at last 51% owned by:	EME √	QSE √
Black people		
Black people who are youth		
People who are women		
Black people with disabilities		
Black people living in rural or underdeveloped areas or townships		
Cooperative owned by black people		
Black people who are military veterans		
OR		
Any EME		
Any QSE		

6.6 DECLARATION WITH REGARD TO COMPANY/FIRM

6.6.1 Name of company/firm: ……

6.6.2 VAT number registration number: ……

6.6.3 Company registration number: ……

6.7 TYPE OF COMPANY/ FIRM

- □ Partnership/Joint Venture / Consortium
- □ One person business/sole propriety
- □ Close corporation
- □ Company
- □ (Pty) Limited

[TICK APPLICABLE BOX]

6.8 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

……

……

……

……

6.9 COMPANY CLASSIFICATION

- □ Manufacturer
- □ Supplier
- □ Professional service provider
- □ Other service providers, e.g. transporter, etc.

[*TICK APPLICABLE BOX*]

6.10 MUNICIPAL INFORMATION

Municipality where business is situated: .....

Registered Account Number: .....

Stand Number: .....

6.11 Total number of years the company/firm has been in business: .....

6.12 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the Specific Goals in MBD 6.1 qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

i) The information furnished is true and correct;

ii) In the event of a contract being awarded as a result of points claimed as shown in MBD 6.1, the contractor is required to furnish documentary proof as requested in the Tender Data to the satisfaction of the purchaser that the claims are correct;

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

(a) disqualify the person from the bidding 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 bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury 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.

WITNESSES

1. .....

2. .....

.....
SIGNATURE(S) OF BIDDERS(S)

DATE: .....

ADDRESS .....

.....

.....

MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state[1].

2. 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 bidder 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 bidder or his or her representative:……..

3.2 Identity Number…….

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

3.4 Company 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. ….……

……..

[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) a 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.

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 bidder 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…….
……

3.14 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:……..
……..

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

Full Name	Identity Number	State Employee Number

…….. ……..

Signature **Date**

……. ……

Capacity **Name of Bidder**

MBD 8

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

1 The bid of any bidder may be disregarded if that bidder, or any of its directors have-

a. abused the institution's supply chain management system;
b. committed fraud or any other improper conduct in relation to such system; or
c. failed to perform on any previous contract.

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

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury's database as companies or persons 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 National Treasury after the *audi alteram partem* rule was applied).	Yes □	No □
4.1.1	If so, furnish particulars:		
4.2	Is the bidder 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 (No 12 of 2004)? **To access this Register, enter the National Treasury's website, www.treasury.gov.za, click on the icon "Register for Tender Defaulters" or submit your written request for a hard copy of the Register to facsimile number (012) 3265445.**	Yes □	No □
4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court outside of the Republic of South Africa) for fraud or corruption during the past five years?	Yes □	No □
4.3.1	If so, furnish particulars:		
4.4	Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes □	No □
4.4.1	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME)…… CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS TRUE AND CORRECT.

I ACCEPT THAT, IN addition TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

……...	**……..**
Signature	**Date**
……	**……..**
Position	**Name of Bidder**

MBD 5

DECLARATION FOR PROCUREMENT ABOVE R10 MILLION (VAT INCLUDED)

For all procurement expected to exceed R10 million (VAT 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. If the bidder is not required by law to prepare annual financial statements for auditing, they shall be required to furnish their Annual Financial Statements -

i. for the past three years , or
ii. since their establishment if established during the past three years

Do you have any outstanding undisputed commitments for municipal services towards a municipality 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 a municipality 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

……..……

……..…….

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.

…….. ……..
Signature Date

…… ……
Position Name of Bidder

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1. This Municipal Bidding Document (MBD) must form part of all bids[1] invited.

2. Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging)[2].Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.

3. Municipal Supply Regulation 38 (1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:

   a. take all reasonable steps to prevent such abuse;

   b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and

   c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.

4. This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.

5 In order to give effect to the above, the attached Certificate of Bid Determination (MBD9) must be completed and submitted with the bid:

[1] **Includes price quotations, advertised competitive bids, limited bids and proposals.**

[2] **Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.**

MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

_____

(Bid Number and Description) in response to the invitation for the bid made by:

_____

(Name of Municipality / Municipal Entity) 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 Bidder)

1. I have read, and I understand the contents of this Certificate;

2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;

3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;

4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;

5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:

   (a) has been requested to submit a bid in response to this bid invitation;
   (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
   (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium[3] will not be construed as collusive bidding.

7. In particular, without limiting the generality of paragraphs 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 bid;

[3] **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.**

(e) the submission of a bid which does not meet the specifications and conditions of the bid; or
(f) bidding with the intention not to win the bid.

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 bid invitation relates.

9. The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid 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 bids and contracts, bids 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.

…… …… ……
Signature Date

…… …… ……
Position Name of Bidder

T2.1.5 PROPOSED AMENDMENTS AND QUALIFICATIONS

The Tenderer should record any deviations or qualifications he may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such qualifications in a covering letter to his tender and reference such letter in this schedule.

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 qualifications.

Page	Clause or item	Proposal

Signed ..... Date .....

Name ..... Position .....

Tenderer .....

T2.1.6 SCHEDULE OF THE TENDERER'S EXPERIENCE

EMPLOYER: CONTACT PERSON AND TELEPHONE NUMBER	EMPLOYER'S AGENT OR REPRESENTATIVE: CONTACT PERSON AND TELEPHONE NUMBER	NATURE OF WORK	VALUE OF WORK (inclusive of VAT)	DATE COMPLETED OR EXPECTED TO BE COMPLETED

T2.1.7 CONTACTABLE REFERENCE TEMPLATE

To Johannesburg Water (SOC) Ltd

I, the undersigned being duly authorised to do so, hereby furnish a reference to Johannesburg Water relative to tender Contract No**. JW14090R** for **Replacement of a 600mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township**

Name of tenderer_____

Description of Project _____

Pipe Diameter and Material_____

Value of Contract _____

Name of authorised person: ……

Signature:……..…….. Date ……..……

Telephone/Mobile: ……

Email:
……

Completed on behalf (Name of Client)
……

NB: This document must be completed by the referee and included in the tender submission. Alternatively, the client's letterhead may be used for this purpose provided it complies with the functional criteria requirements. A separate form must be completed for each reference as required in the evaluation criteria. Information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting and restriction from participating in any future government tender.

Employer:		Contractor:	
Witness:		Witness:	

T2.1.8 SCHEDULE OF KEY PERSONNEL

In terms of the Project Specification and the Conditions of Tender, unskilled workers may only be brought in from outside the local community if such personnel are not available locally.

The Tenderer shall list below the personnel which they intend to utilize on the Works, including key personnel which may have to be brought in from outside if not available locally.

CATEGORY OF EMPLOYEE	NUMBER OF PERSONS					
	KEY PERSONNEL, PART OF THE CONTRACTOR'S ORGANISATION		KEY PERSONNEL TO BE IMPORTED IF NOT AVAILABLE LOCALLY		UNSKILLED PERSONNEL TO BE RECRUITED FROM LOCAL COMMUNITY	
	HDI	NON-HDI	HDI	NON-HDI	HDI	NON-HDI
Site Agent, Contracts Manager						
Foremen, Quality Control and Safety Personnel						
Technicians, Surveyors, etc.						
Artisans and other Skilled workers						
Plant Operators						
Unskilled Workers						
Others: ……..... .....…. ……						

SIGNATURE:.....…… DATE: …….....

(of person authorized to sign on behalf of the Tenderer)

T2.1.9 CURRICULUM VITAE OF KEY PERSONNEL

Provide separate forms for each position listed in Form: Key Personnel

Proposed role in the project	

1. **Surname**	
2. **First Name**	

3. Education (Submit certified copies of qualifications)

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained

4. Registration/ Membership of Professional Bodies (Submit copies of registration certificates)

Institution/ Professional Body	Category of Registration	Registration Number

5. Post Qualification Experience

Company/ Organisation	(Date from – Date to)	Years of Employment	Position

6. Project-based Experience

Project Name	
Project Client	
Project Dates	
Project Value	
Project position (e.g. Contracts Manager, Site Agent, etc.)	
Description of Duties	
Description of Project Scope (including pipe diameter)	

Project Name	
Project Client	
Project Dates	
Project Value	
Project position (e.g. Contracts Manager, Site Agent, etc.)	
Description of Duties	
Description of Project Scope (including pipe diameter)	

Project Name	
Project Client	
Project Dates	
Project Value	
Project position (e.g. Contracts Manager, Site Agent, etc.)	
Description of Duties	
Description of Project Scope (including pipe diameter)	

Project Name	
Project Client	
Project Dates	
Project Value	
Project position (e.g. Contracts Manager, Site Agent, etc.)	
Description of Duties	
Description of Project Scope (including pipe diameter)	

Duplicate relevant section to add more information, if required.

Certification:

I, the undersigned, certify that, to the best of my knowledge and belief, this data correctly describes me, my qualifications and my experience.

....

Signature of person named in the schedule *Date*

T2.2 LIST OF RETURNABLE DOCUMENTS

Document		Page
2. Other documents required only for tender evaluation purposes		
T2.2.1	Certificate of Contractor Registration issued by the Construction Industry Development Board	RD.40
T2.2.2	SARS Tax Compliance Status Pin and Proof of CSD registration i.e. MA xxxxxxxxxx number	RD.41

T2.2.1 CONTRACTOR'S CERTIFICATE OF REGISTRATION WITH CIDB

NB: The Tenderer shall attach hereto the Contractor's Certificate of Registration with CIDB OR provide the CIDB registration number that JW can use to verify CIDB requirements for this tender.

.

CIDB status to be active at the required CIDB grading at time of evaluation to avoid disqualification.

SIGNATURE: .....…… DATE: …….....

(of person authorized to sign on behalf of the Tenderer)

Employer:		Contractor:	
Witness:		Witness:	

T2.2.2 SARS TAX COMPLIANCE STATUS PIN AND PROOF OF CSD REGISTRATION

The Tenderer must attach hereto a copy SARS Tax Compliance Status Pin and Proof of CSD registration i.e. MA xxxxxxxxxx number.

SIGNATURE:.....…… DATE: …….....

(of person authorized to sign on behalf of the Tenderer)

T2.3 LIST OF RETURNABLE SCHEDULES

Document		Page
3. Other documents that will be incorporated into the contract		
T2.3.1	JW 6.4 Returnable Annexure A – SHE Acknowledgment Form	RD.43
T2.3.2	JW 6.5 Returnable Annexure B: Acknowledgement of Tender Drawings	RD.44
T2.3.3	Minutes of the Mandatory Tender Briefing Meeting	RD.46

T2.3.1 Returnable Annexure A: Acknowledgement of SHE Specification & Annexures

DECLARATION BY CONTRACTOR

I, the undersigned, and representing the tenderer as indicated hereby acknowledge that I have obtained copies of the following listed documentation and confirm that I fully understand the contents thereof and confirm compliance thereto in the event of being successful:

- OHS Specification (Volume 3)
- Annexure 1: Baseline Risk Assessment
- Annexure 2: Medical Screening Policy
- Annexure 3: Sign off form
- Annexure 4: Environmental Management Plan

We furthermore commit to:

- Comply with all applicable SHE related legal and other requirements.
- Inform all staff of their role in managing environmental impacts and safety hazards on site.

Signed at …… on this …….. Day of …… 20……...

Name of tenderer	
Name of Authorized person	
Authorized Signature*	

*Signature must be as per form T2.1.2 as applicable

T2.3.2 Returnable Annexure B: Acknowledgement of Tender Drawings

DECLARATION BY CONTRACTOR

I, the undersigned, and representing the tenderer as indicated hereby acknowledge that I have obtained copies of the following listed documentation and confirm that I fully understand the contents thereof and confirm compliance thereto in the event of being successful:

The drawings that are issued for **TENDER PURPOSES** are those noted below:

DRAWING NUMBER	DESCRIPTION
JW14090R-DET01-W01	LIST OF DRAWINGS
JW14090R-DET02-W01	LOCALITY PLAN
JW14090R-DET03-W01	LAYOUT PLAN
JW14090R-DET04-W01	LPARC LAYOUT PLAN
JW14090R-DET05-W01	GUARD HOUSE
JW14090R-DET06-W01	TYPICAL THRUST BLOCKS DETAILS
JW14090R-DET07-W01	ROAD CROSSING BY PIPE JACKING: SECTION 1 SCHEDULE
JW14090R-DET08-W01	STEEL PIPE TAPERS AND BENDS
JW14090R-DET09-W01	STEEL PIPE PROTECTIVE COATING,PIPE JOINTING FOR PLAIN AND BELL ENDED
JW14090R-DET10-W01	STANDARD DETAILS FOR TRENCH EXCAVATION AND BACKFILL FOR STEEL PIPES > 400mm ND
JW14090R-DET11-W01	AIR VALVE CHAMBER ON 1100mm ND PIPE
JW14090R-DET12-W01	AIR VALVE CHAMBER PADLOCK PIN DETAILS
JW14090R-DET13-W01	TYPICAL SCOUR VALVE CHAMBER FOR PIPES > 400mm ND
JW14090R-DET14-W01	AIR VALVE CHAMBER ON 1000mm ND PIPE
JW14090R-DET15-W01	ISOLATION VALVE CHAMBER AND INCLUDING OFF TAKE
JW14090R-DET16-W01	ISOLATION VALVE CHAMBER COVER SLAB
JW14090R-DET17-W01	PRESSURE REDUCING AND RESERVOIR CONTROL VALVE CONFIGURATION
JW14090R-DET18-W01	PRESSURE REDUCING AND FLOW METER PIPE SCHEDULE
JW14090R-DET19-W01	RESERVOIR CONTROL VALVE PIPE SCHEDULE
JW14090R-DET20-W01	RES 1 RESERVOIR INLET ARRANGEMENTS
JW14090R-DET21-W01	RES 2 RESERVOIR INLET ARRANGEMENTS
JW14090R-DET22-W01	NODE AND JUNCTION DETAILS
JW14090R-DET23-W01	PIPE MARKERS
JW14090R-DET24-W01	NAME BOARD
JW14090R-DET25-W01	STEEL STAIRCASE LAYOUT
JW14090R-DET26-W01	NAME BOARD HOLDER
JW14090R-DET27-W01	TYPICAL INSULATION KIT
JW14090R-DET28-W01	REINFORCEMENT DETAILS - TYPICAL SCOUR VALVE CHAMBER FOR PIPE >400 ND
JW14090R-DET29A-W01	REINFORCEMENT DETAILS - RESERVOIR CONTROL VALVE BUILDING - BENDING SCHEDULE
JW14090R-DET30-W01	REINFORCEMENT DETAILS - RESERVOIR CONTROL VALVE BUILDING
JW14090R-DET31A-W01	REINFORCEMENT DETAILS - RESERVOIR CONTROL VALVE BUILDING

Signed at …… on this …….. Day of …… 20……...

Name of tenderer	
Name of Authorized person	
Authorized Signature*	

*Signature must be as per form T2.1.2 as applicable

T2.3.3 Minutes of the Mandatory Tender Briefing Meeting

Minutes of the Mandatory Tender Briefing Meeting

Johannesburg Water (SOC) Ltd

CONTRACT JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL WATER PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

PART 1: AGREEMENT AND CONTRACT DATA

Employer:		**Contractor:**	
Witness:		**Witness:**	

TABLE OF CONTENTS

		PAGE
C1.1	**FORM OF OFFER (ACCEPTANCE & AGREEMENT)**	C.3
C1.1.1	Form of Offer	C.3
C1.1.2	Form of Acceptance	C.5
C.1.1.3	Schedule of Deviations	C.6
C1.2	**CONTRACT DATA**	
C.1.2.1	Part 1: Data Provided by the Employer	C.8
C1.2.2	Part 2: Data provided by the Contractor	C.25
C1.3	**FORMS AND SECURITIES**	C.28

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.1 FORM OF OFFER (ACCEPTANCE & AGREEMENT)

C1.1.1 Form of Offer

The Contractor is to complete and sign the Form of Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract in respect of the following works:

JW 14090R: Replacement of a 600mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

The Tenderer, identified in the Offer signature block below, has examined the documents listed in the Tender Data and addenda thereto as listed in the Tender Schedules, and by submitting this Offer has accepted the Conditions of Tender.

By the representative of the Tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance, the Contractor 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 Contractor, whereupon the Contractor becomes the party named as the Contractor in the Conditions of Contract identified in the Contract Data.

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

For the Contractor

_____
(Name and address of organisation)

Name and signature of witness _____ _____

Employer:		**Contractor:**	
Witness:		**Witness:**	

	(Name)	(Signature)
Date		

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.1.2 Form of Acceptance

The Employer is to complete and sign the form of acceptance

By signing this part of the Form of Offer and Acceptance, the Employer identified below accepts the Contractor'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 Contractor's Offer shall form an agreement between the Employer and the Contractor 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 1 Agreement and Contract Data, (which includes this Agreement)
Part 2 Pricing Data
Part 3 Scope of Work
Part 4 Site Information

and drawings, pricing schedules (Bill of Quantities) and documents or parts thereof, which may be incorporated by reference into Parts 1 to 4 above.
Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules as well as any changes to the terms of the Offer agreed by the Contractor and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Agreement. No amendments to or deviations from said documents are valid unless contained in this Schedule, which must be duly signed by the authorised representative(s) of both parties.

The Contractor shall within twenty-eight **(28) days** 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 Contact Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data at, or just after, the date of this Agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this Agreement.

Notwithstanding anything contained herein, this Agreement comes into effect on the date when the Contractor receives one fully completed copy of this document, including the Schedule of Deviations (if any). Unless the Contractor (now the Contractor) within five days after the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this Agreement, this Agreement shall constitute a binding contract between the parties.

FOR EMPLOYER OFFICIAL USE ONLY

Name(s)	_____	_____
Capacity	_____	_____
For the Employer	**Johannesburg Water SOC (Ltd), Turbine Hall, 65 Ntemi Piliso Street, Newtown.**	
	(Name and address of organisation)	
Name and signature of witness	_____	_____

Employer:		**Contractor:**	
Witness:		**Witness:**	

(Name) (Signature)

Date

C1.1.3 Schedule of Deviations

Notes:

1. The extent of deviations from the tender documents issued by the employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender;
2. A Contractor'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; and
4. Any change or addition to the tender documents arising from the above arrangements 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

5 Subject

Details

6 Subject

Details

7 Subject

Details

By the duly authorised representatives signing this Schedule of Deviations, the Employer and the Contractor agree to and accept the foregoing Schedule of deviations as the only deviations from and

Employer:		**Contractor:**	
Witness:		**Witness:**	

amendments to the documents listed in the Tender Data and addenda thereto as listed in the Tender Schedules, as well as any confirmation, clarification or change to the terms of the offer agreed by the Contractor and the Employer during the 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 Contractor of a completed and signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this Agreement.

For the Contractor:

Signature(s) _____ _____

Name(s) _____ _____

Capacity _____ _____

For the Contractor _____
(Name and address of organisation)

Name and signature of witness _____ _____
(Name) (Signature)

Date _____

For the Employer:

Name(s) _____ _____

Capacity _____ _____

For the Employer **Johannesburg Water SOC (Ltd), Turbine Hall, 65 Ntemi Piliso Street, Newtown**
(Name and address of organisation)

Name and signature of witness _____ _____
(Name) (Signature)

Date _____

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.2 CONTRACT DATA

C1.2.1 Part 1: Data Provided by the Employer

CONDITIONS OF CONTRACT

The General Conditions of Contract for Construction Works Third Edition (2015), published by the South African Institution of Civil Engineering, is applicable to this Contract.

Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (Telephone number: 011-805 5947)

C1.2.1.1 Contract Specific Data

The following contract specific data are applicable to this Contract:

GCC Clause	Information
1.1.1.13	The Defects Liability Period is 52 weeks from the date of the Certificate of Completion.
1.1.1.14	The time for achieving Practical Completion is 18 months.
1. 1.1.15	The name of the Employer is Johannesburg Water (SOC) Limited Contact person is: Mr William Chitsa
1.1.1.26	The Pricing Strategy is a Re-measurement Contract.
1.2.1.2	The address of the Employer is: Physical: Turbine Hall, 65 Ntemi Piliso Street, Newtown Postal: P.O. Box 61542, Marshalltown, 2107 Tel: 011 688 1603 Fax: 011 688 1521
3.2.3	Specific Approval – The Employer's Agent is required to obtain the Employer's approval for the following: • Approval of Variation Orders • The use of contingencies • Approval to exceed the Contract Sum • Approval of Subcontracting Plan and work package breakdown • Stoppage/ suspension of works • Continuation of Works During Dispute Resolution
4.4.2	Add the following after this clause: Apart from subcontractors identified by the Contractor for the execution of certain sections of the Works, subcontractors shall also include SMME's (Small Medium and Micro Enterprises), who are identified from the Local Community for the execution of certain sections of the Works identified by the Employer or Employer and Contractor. The appointment of subcontractors and the allocation of work to subcontractors shall, in addition to the provisions of the General Conditions of Contract, comply with, but not be limited to, the provisions of **C1.2.1.2.14** (see below).

Employer:		**Contractor:**	
Witness:		**Witness:**	

GCC Clause	Information
	A minimum value of 30% of the Contract Price shall be subcontracted to SMME's. Where the identified items for subcontracting do not form 30% of the Contract Price, the Contractor shall identify additional works that will be subcontracted to ensure compliance with the minimum subcontracting percentage.
4.10.1	Delete Clause 4.10.1 and replace with the following: The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all employees (excluding local labourers) and for their payment, housing, feeding and transport (provided that any use of any part of the Site for said purposes shall be subject to the prior approval of the Employer's Agent) and the Contractor indemnifies the Employer against any liability arising out of the Contractor's said arrangements, whether such arrangements involve the use of the Site or not. The Contractor shall employ a minimum of 15 general labourers from Local Communities (otherwise known as Local Labour), in accordance with the Tender Data, Scope of Work, Site Information, and Specifications. All Local Labour shall be recruited through the Community Liaison Officer (CLO) and/or Labour Desk Officer (LDO). The Contractor remains fully responsible for all Local Labour that are employed for the execution of the Works, as if they were the Contractor's own labour.
4.11.1	Add the following to this clause: Competent Employees shall include, amongst others, the following Key Personnel: • Contracts Manager • Site Manager • Safety Officer The minimum requirements in terms of qualifications and experience of these Key Personnel are listed in **C1.2.1.2.15** (see below).
5.3.1	The documentation required before commencement with Works execution are: • Approved Health and Safety File (Clause 4.3) • Approval of the Environmental File (Clause 4.3) • Initial programme & cashflow projections (Clause 5.6) • Guarantee from Bank or Insurance Company (Clause 6.2) • Insurance of the Works, Plant, etc. (Clause 8.6), including but not limited to: ○ SASRIA Policy ○ Liability Insurance ○ Insurance of Construction Machinery and Plant ○ Insurance of Motor Vehicle Liability, etc. • Compliance Certificate in respect of COID • Signed Notification to the Department of Labour • Construction Permit (where applicable). The Employer will require Health and Safety documentation from the Contractor to acquire this permit. • Organogram of resources

Employer:		**Contractor:**	
Witness:		**Witness:**	

GCC Clause	Information
	• Subcontract plan/ proposal which includes a number of Subcontractors that meet requirements as per conditions of **C1.2.1.2.14**
5.3.2	The time to submit the documentation required before Commencement of the Works is 28 days.
5.3.3	**Time to instruct commencement of the Works** Delete Clause 5.3.3 and replace with the following: The Contractor shall commence with carrying out the Works upon written instruction from the Employer's Agent to commence with the Works.
5.8.1	Working days shall be Monday to Friday, between 07h00 to 17h00.
5.8.1	The non-working days are Sundays. The special non-working days are all Public Holidays in terms of the Public Holidays Act (as amended), and the annual "Builder's Break" as defined by SAFCEC on an annual basis.
5.13.1	The penalty for failing to complete the Works is the greater of: An amount equal to the daily Time Related P&G rate (as calculated from the Time Related P&G section in the Bill of Quantities) or R10,000.00 per day, whichever is greater.
5.14.1	The requirements for achieving Practical Completion are: • Construction, testing & commissioning of all pipework. • All building works to be connected to water and sewer and have electrical installation with a certificate of compliance. • Installation, testing & commissioning of all valves. • Installation, testing & commissioning of all electrical and C&I infrastructure. • Reinstatements of man-made surfaces, including road surfaces. • Environmental rehabilitation of site.
5.16.3	The latent defects period is 10 years.
6.2.1	The time to deliver the Form of Guarantee is within 28 days from the Commencement Date.
6.2.3	The Performance Guarantee shall be irrevocable, on-demand performance Guarantee, to be issued exactly in the form of the proforma document provided in favour of the client by a recognised financial institution or Cash in lieu of bond will apply. Alternatively for smaller contractors below CIDB 6, a 10% will be retained from every invoice.
6.8.2	**The Contract Price Adjustment is applicable for this contract.** The contract rates shall be fixed for the first 12 months and thereafter the rates will be adjusted by the change in CPA (as published by Statistics SA and will be fixed for the next 12 months)

Employer:		**Contractor:**	
Witness:		**Witness:**	

GCC Clause	Information
	The following formula will be applicable. $(1-x)\left[\frac{aLt}{Lo}+\frac{bPt}{Po}+\frac{cMt}{Mo}+\frac{dFt}{Fo}-1\right]$ In which the symbols have the following meaning as per GCC 2015: "x" is the proportion of "Ac" which is not subject to adjustment. "a", "b", "c" and "d" are the coefficients contained in the Contract Data, which are deemed, irrespective of the actual constituents of the work, to represent the proportionate value of labour, contractors' equipment, material (other than "special materials" specified in the Contract Data) and fuel respectively. "L" is the "Labour Index" "P" is the "Plant Index" "M" is the "Materials Index" "F" is the "Fuel Index" The suffix "o" denotes the base indices applicable to the base month as stated in the Contract Data. The suffix "t" denotes the current indices applicable to the month in which the last day of the period falls to which the relevant monthly statement relates. If any index relevant to any particular certificate is not known at the time when the certificate is prepared, the Engineer shall estimate the value of such index. Any correction which may be necessary when the correct indices become known, shall be made by the Engineer in subsequent payment certificates. The value of the payment certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule, with the following values: The value of "x" is 0,10 The values of the coefficients are: a = 0,32 Labour b = 0,25 Contractor's equipment c = 0,33 Material d = 0,10 Fuel The province where the Site is located is Gauteng and the urban area where the project is implemented is Johannesburg. The Consumer Price Indices for Labour (L), Plant (P), Material (M) and Fuel (F) are as published by Statistics South Africa for the applicable time. The base month is one month before the tender closing date.

Employer:		Contractor:	
Witness:		Witness:	

GCC Clause	Information
6.8.3	Price adjustments for variations in the costs of special materials are **NOT** allowed.
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works is 80%.
6.10.3	The maximum percentage retention on the amounts due to the Contractor is 10% of the Contract Sum.
6.10.4	**Delivery, dissatisfaction with and payment of payment certificates** Delete Clause 6.10.4 and replace with the following: Payment shall be made upon: • The Contractor providing a payment certificate with all required supporting documents to the Employer's Agent on dates to be communicated to the Contractor upon award. • The payment certificate being submitted with an original tax invoice. • A statement being submitted on the last day of the month. Payment will be made within 30 days of receipt of the Contractor's statement. Payment shall be subject to the Contractor submitting an Original Tax Invoice compliant with SARS requirements for a Valid Tax Invoice to the Employer for the amount due. Any dissatisfaction in respect of such payment certificate shall be dealt with in terms of Clause 10.2.
6.10.5	Payment of Retention Money Add to Clause 6.10.5 the following: Payment will be subject to Johannesburg Water processes as outlined in clause 6.10.4 as amended.
6.10.6.2	Delete Clause 6.10.6.2
6.11	Delete Clause 6.11
7.8.2	**Cost of making good of defects** Amend Clause 7.8.2.1 as follows: In the first line, correct the spelling of 'therefore'.
8.4.1.1	Add to the end of Clause 8.4.1.1 the following text: "hereby indemnifies the Employer against any liability in respect of damage or physical loss of property of any person or injury or death of any person due to non-compliance with the Occupational Health and Safety Act (Act 85 of 1993).
8.6.1.1.2	The value of plant and materials supplied by the Employer to be included in the insurance sum is R0.
8.6.1.1.3	The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is an amount equal to 15% of the Contract Price.

Employer:		**Contractor:**	
Witness:		**Witness:**	

GCC Clause	Information
8.6.1.3	The limit of indemnity for liability insurance is R20,000,000 (Twenty million Rand) for any single claim – the number of claims to be unlimited during the Construction and Defects Liability Periods
8.6.1.5	In addition to the insurances required in terms of General Conditions of Contract Clauses 8.6.1.1 to 8.6.1.4 the following insurance is also required: a. The Contractor shall insure all Construction Machinery and Plant (including tools, offices and other temporary structures and content) and other items, other than those intended for incorporation into the works, owned, leased or hired and brought on to the Site against all risks of physical loss or damage for the period that such Plant shall be on the Site to the full value thereof. In respect of Machinery and Plant brought on to the Site by or on behalf of Sub-Contractors, the Contractor shall be deemed to have complied with the provisions of this Sub-Clause if it has ensured that such Sub-Contractors have similarly insured such Plant and Machinery. Such insurance shall be effected with an Insurer and in terms approved by the Employer (which approval shall not be unreasonably withheld) and the Contractor shall, when required, submit to the Employer's Insurance Brokers, via the Employer's Agent, the policy or policies of insurance and receipts for payment of the current premiums. b. The Contractor and the Sub-contractors shall effect and maintain at their cost, insurance under the provision of the Compensation for Occupational Injuries and Diseases Act (COID), 1993 (Act No. 130 of 1993) c. The Contractor and the Sub-Contractors shall effect and maintain at their own cost, motor vehicle liability insurance with at least indemnification for "balance of third party" risks, including passenger liability with a limit of indemnity of not less than R2,5 million. d. 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. e. Any other Insurance cover that may be deemed necessary by the Contractor to ensure full and successful completion of the Works.
9.1.5.6	No loss of profit shall be paid by the Employer as a result of contract termination due to any circumstances.
10.4.2	Dispute resolution shall be by Amicable Settlement, failing which, any dispute shall be resolved by way of ad-hoc Adjudication.
10.5.1	Dispute resolution shall be by Amicable Settlement, failing which, any dispute shall be resolved by way of ad-hoc Adjudication

Employer:		**Contractor:**	
Witness:		**Witness:**	

GCC Clause	Information
10.5.3	The number of Adjudication Board Members to be appointed is one (1).
10.6.1	Dispute resolution shall be by Amicable Settlement, failing which, any dispute shall be resolved by way of ad-hoc Adjudication
10.7.1	In the event that the parties fail to agree on a adjudicator, the adjudicator will be nominated by Johannesburg Water

C1.2.1.2 Additions

The additional Conditions of Contract are:

C1.2.1.2.1 Penalties

In addition to GCC clause 5.13, during the Contract Period should the Contractor:

a) Fail to report

- The Employer shall levy a penalty on Contractor, should the latter fail to provide reporting as required in C1.2.1.2.6, C1.2.1.2.14 and the specification highlighted in the Scope of Work, with regard to content and frequency, whilst as per the Pricing Data section no payment for work completed shall be processed.
- The penalty value shall be R5,000.00 per report per occasion; and
- If the Contractor fails to complete the aforementioned more than three incidents and should the Employer or his duly authorised representative find that the Contractor is hindering his (the Employer's) deliverables to JW Senior Management, he shall reserve the right to:

  i. perform the Works internally or through another Contractor; and
  ii. deduct additional costs incurred by the Employer from monies owed to the Contractor or from the Contractor's Guarantee. Additional costs incurred by the Employer shall include all claims from Contract affected parties, claims such as but not be limited to claims from customers, any costs associated with the loss of water, and all costs associated with the procurement of an alternative Contractor.
  iii. terminate the Contract.

No liability in terms of this clause shall be attached to the Contractor if he can prove to the satisfaction of the Employer that the nature of the failure is due to fire, war, riot, strikes, act of God, lockout, accident or other unforeseen occurrences or circumstances beyond the Contractor's control, provided, however, that in all cases the Contractor has notified the Employer in writing within 24 hours of it first coming to his notice, that delivery shall be delayed or become impossible for the above-mentioned reasons.

b) Fail to pay any labourer or SMME

- The Employer shall levy a penalty on the Contractor, should the latter fail to provide payment to any labourer or SMME as required in the specification highlighted in the Scope of Work and specified in the appointment agreements with the Contractor and the labourer or SMME.
- The penalty value shall be R 50,000.00 per incident per occasion; and
- If the Contractor fails to complete the aforementioned more than three incidents and should the Employer or his duly authorised representative find that the Contractor is

hindering his (the Employer's) deliverables to JW Senior Management, he shall reserve the right to:

i. perform the Works internally or through another Contractor; and
ii. deduct additional costs incurred by the Employer from monies owed to the Contractor or from the Contractor's Guarantee. Additional costs incurred by the Employer shall include all claims from Contract affected parties, claims such as but not be limited to claims from customers, any costs associated with the loss of water, and all costs associated with the procurement of an alternative Contractor.
iii. terminate the Contract.

No liability in terms of this clause shall be attached to the Contractor if he can prove to the satisfaction of the Employer that the nature of the failure is due to fire, war, riot, strikes, act of God, lockout, accident or other unforeseen occurrences or circumstances beyond the Contractor's control, provided, however, that in all cases the Contractor has notified the Employer in writing within 24 hours of it first coming to his notice, that delivery shall be delayed or become impossible for the above-mentioned reasons.

c) Failure to meet target participation by local SMME

If the Contractor fails to achieve the monetary value of the target set by the Employer for contract participation by local SMME Contractors in terms of **C1.2.1.2.14**, the Contractor shall be liable to the Employer for a sum calculated in accordance with the Contract Data and the aforementioned Scope as a penalty for such underachievement.

The penalty for failing to achieve the monetary value of the target set by the Employer for contract participation by Targeted Enterprises and local SMME Contractors in terms of the Scope of Works is 50% of the monetary value by which the achieved monetary value falls short of the target monetary value.

d) Failure to meet the occupational health and safety compliance target

Monthly compliance rating will be calculated for each Contractor as per a formula determined by the Employer focusing on or incorporating outcomes of assurance (e.g. monthly audit), operational (e.g. behavioural based safety inspection) assessments and other requirements, as necessary.
Each Contractor is required to maintain a minimum compliance rating of 93% (Ninety Three Percent).

The Employer may impose a penalty value of R20,000.00 per audit report.

e) Failure to meet the environmental compliance target

Monthly compliance rating will be calculated for each Contractor as per a formula determined by the Employer focusing on or incorporating outcomes of assurance (e.g. monthly audit), operational assessments and other requirements, as necessary.
Each Contractor is required to maintain a minimum compliance rating of 93% (Ninety Three Percent). The Employer may impose a penalty value of R20,000.00 per audit report.

f) Penalties payable

If penalties are payable, they will be deducted prior to the addition of (VAT) but after the calculation of retention.

g) Penalties irreversible

The Contractor shall note that all penalties once imposed shall be non-recoverable or non-reversible, even if the default is remedied.

C1.2.1.2.2 Source of instructions

The Contractor shall neither seek nor accept instructions from any authority external to the Employer's Agent in connection with the performance of his services under this Contract. The Contractor shall refrain from any action which may adversely affect the Employer and shall fulfill his commitments with fullest regard for the interest of the Employer. The Contractor may only accept and comply with instructions from the Employer's Health and Safety Representative or the Employer's Environmental Representative with regards to matters regarding Health & Safety or Environmental Management respectively, but with further approval from the Employer's Agent.

C1.2.1.2.3 Officials not to benefit

The Contractor warrants that no official of the Employer has been or shall be admitted by the Contractor to any direct or indirect benefit arising from this Contract or the award thereof. The Contractor agrees that breach of this provision is a breach of the Contract.

C1.2.1.2.4 Prevention of corruption

The Employer shall be entitled to cancel the Contract and to recover from the Contractor the amount of any loss resulting from such cancellation, if the Contractor has offered or given any person any gift or consideration of any kind as an inducement or reward for doing or intending to do any action in relation to the obtaining or the execution of the Contract or any other contract with the Employer or for showing or intending to show favor or disfavor to any person in relation to the Contract or any other contract with the Employer. If similar acts have been done by any persons employed by the Contractor or acting on his behalf

whether with or without the knowledge of the Contractor in relation to this or any other Contract with the Employer the same consequences shall apply.

C1.2.1.2.5 Confidential nature of documents

All maps, drawings, photographs, mosaics, plans, reports, recommendations, estimates, documents and all other data compiled by or received by the Contractor under the Contract shall be the property of the Employer, shall be treated as confidential and shall be delivered only to the Employer's Agent or his duly authorized representative on completion of the Works; their contents shall not be made known by the Contractor to any person other than the personnel of the Contractor performing services under this Contract without the prior written consent of the Employer.

C1.2.1.2.6 Returns of labour, SMME, plant, equipment and material

The Contractor shall provide a return in detail in the form and at such intervals as the Employer's Agent or his duly authorized representative may prescribe showing the supervisory staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting construction plant, equipment and material as the Employer's Agent or his duly authorized representative may require. The supporting documents required for SMMEs include but are not limited to the following:

- A completed and signed sub-contracting agreement between the Contractor and the SMME
- Valid CIPC registration (i.e. CK, COR)
- SA ID copies of owners
- Active CIDB membership: minimum grading 1CE
- Valid CSD compliance status
- Valid EME affidavit
- COIDA certificate
- Company Profile including similar experience and skilled personnel CVs
- Health and Safety Plan
- Proof of Payments

The supporting documents required for local labourers include but are not limited to the following

- A completed and signed employment contract between the Contractor and labourer
- Certified Copies of IDs
- Monthly Individual proof of payment
- Monthly timesheets
- Training returns
- UIF forms (proof of registration from Labour)

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.2.1.2.7 Materials and workmanship

All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Employer's Agent's instructions and shall be subjected from time to time to such tests as the Employer's Agent may direct at the place of manufacture or fabrication, or on the Site or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any materials used and shall supply samples of materials before incorporation in the Works for testing as may be selected and required by the Employer's Agent. All testing equipment and instruments provided by the Contractor shall be used only by the Employer's Agent or by the Contractor in accordance with the instructions of the Employer's Agent.

a) No material not conforming with the Specifications in the Contract shall be used for the Works without prior written approval of the Employer and instruction of the Employer's Agent, provided always that if the use of such material results or may result in increasing the Contract Price, the procedure in GCC clause 6.3 (Variations) shall apply.

C1.2.1.2.8 Examination of the work before covering up

No work shall be covered up or put out of view without the approval of the Employer's Agent or his duly authorized representative and the Contractor shall afford full opportunity for the Employer's Agent or his duly authorized representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Employer's Agent whenever any such work or foundations is or are ready or about to be ready for examination. The Employer's Agent or his duly authorized representative shall without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations.

C1.2.1.2.9 Employer's Agent's power to order removal of improper work and materials

The Employer's Agent or his duly authorized representative shall during the progress of the Works have power to order in writing from time to time, and the Contractor shall execute at his cost and expense, the following operations:

a) removal from the Site within such time or times as may be specified in the order of any materials which in the opinion of the Employer's Agent are not in accordance with the Contract.
b) substitution of proper and suitable materials; and
c) removal and proper re-execution (notwithstanding any previous test thereof or interim payment therefore) of any work which in respect of materials or workmanship is not in the opinion of the Employer's Agent or his duly authorized representative in accordance with the Contract.

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.2.1.2.10 Default of Contractor in carrying out Employer's Agent's or his duly authorized representative's Instructions

In case of default on the part of the Contractor in carrying out an instruction of the Employer's Agent or his duly authorized representative, the Employer shall be entitled to employ and pay other persons to carry out the same, and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Employer and may be deducted by the Employer from any monies due or which may become due to the Contractor.

C1.2.1.2.11 Date falling on public holiday or weekend

Where under the terms of the Contract any act is to be done or any period is to expire upon a certain day and that day or that period fall on a day of rest or recognized public holiday or weekend, the Contract shall have effect as if the act were to be done or the period to expire upon the working day following such day.

C1.2.1.2.12 Ambiguities and inconsistencies

The Employer or the Contractor shall notify the other as soon as either becomes aware of an ambiguity or inconsistency in or between the documents, which are part of this Contract. Governed by the spirit and intention of the Contract, the Employer shall give a binding instruction resolving the ambiguity or inconsistency.

C1.2.1.2.13 False claims by the Contractor

a. Failure, by the Contractor, to demonstrate or present any feature declared during the procurement stage shall constitute grounds for Contract termination or the market related equivalent price discount, if no market related value is available, the Employer shall give a final ruling on the amount. This shall be at the discretion of the Employer based on the implication of such omission. Should the Contractor refuse to accept the Employer's price, the Contract shall be terminated.

b. Any false claims by the Contractor or his staff (with or without his knowledge), based on Works to be performed or completed per site stage shall constitute grounds for Contract termination and result in blacklisting on the Employer's database.

The Contractor shall note that any of the above shall constitute non-performance on the part of the Contractor, further resulting in him forfeiting his full Contract Guarantee.

C1.2.1.2.14 Special Conditions

The successful Contractor must subcontract a minimum of 17% of the value of this Contract to an entity(s) described below. The value of the Contract for the purposes of this calculation shall be equal to the Contract Price (excluding VAT) as described in the General Conditions of Contract.

Employer:		**Contractor:**	
Witness:		**Witness:**	

The subcontractor/s chosen for this purpose must be registered on National Treasury's Central Supplier Database (CSD) and must be from one of the following designated groups:

- An EME or QSE which is at least 51% owned by black people;
- An EME or QSE which is at least 51% owned by black people who are youth;
- An EME or QSE which is at least 51% owned by black women;
- An EME or QSE which is at least 51% owned by black people with disabilities;
- An EME or QSE which is 51% owned by black people living in rural or underdeveloped areas or townships;
- A cooperative which is at least 51% owned by black people;
- An EME or QSE which is at least 51% owned by black people who are military veterans;
- an EME or QSE .

1. Subcontractors must be chosen from National Treasury's Central Supplier Database which can be accessed on National Treasury's website.
2. Provision was made for subcontracting in the Bill of Quantities. Subcontracting activities are indicated in the Bill of Quantities. Where the provision for subcontracting is less than the minimum subcontracting requirement, the Contractor will identify additional subcontracting items or tasks that will meet the subcontracting minimum of 17% of the value of this Contract. In complying with this condition, the following shall be adhered with:
    - The Contractor shall develop a Subcontracting Plan that sets out the details of the proposed Subcontracting arrangements including, but not limited to, competitive bidding process to be used for the appointment of SMME's, scope of work to be allocated, criteria for the selection of Subcontractor(s), Subcontractor agreements, cost of the work to be Subcontracted, etc.
    - The Subcontracting Plan shall be issued to the Employer's Agent for approval, prior to the engagement of any Subcontractor(s) by the Contractor. The activities, time periods, linkages, etc. associated with the development and approval of the Subcontracting Plan shall be included in the Project Programme, which Programme is subject to the approval of the Employer's Agent.
    - Where the identified items for subcontracting do not form 17% of the Contract Price, the Contractor shall identify additional works that will be subcontracted to ensure compliance with the minimum subcontracting percentage
    - In the event that a rate supplied by the Contractor for a specific BoQ work item is not sufficient to cover Subcontractor costs/rates for that specific item, the Contractor shall provide a detailed rate breakdown for that specific BoQ item (and each and every subsequent BoQ work item where the rate is not sufficient to cover Subcontractor cost); and shall indicate costs (amongst others) for labour, material, handling, mark-ups, etc. to prove that the rate that was submitted during tender stage was in fact market related; and in balance with other rates that were submitted for work items that will not be undertaken by Subcontractors.
    - Should any delays be experienced during the period of the Contract due to the appointment of subcontractors by the Contractor, work stoppages by subcontractors,

industrial action by subcontractors, etc. such delays shall be assigned to the Contractor, and no claims for Extension of Time will be entertained by the Employer.

- The Contractor will be liable to pay a penalty if the Subcontracting target of 17% has not been met by the end of the Contract. The Employer will deduct this penalty amount through the Payment Certificate process. The Employer will have full discretion as to when the penalty will be applied (i.e. the month in which the penalty amount will be deducted). In calculating the total amount that has been (will be) paid to SMME's, all amounts that have actually been reimbursed to SMME's will be taken into account including P&G's, amounts for actual work done, etc.
- The penalty amount described above shall be equal to 50% (fifty percent) of the difference between the target Subcontract amount (i.e. 17% of the Contract Price) and the actual amount that has been spent on Subcontractors/SMME's by the end of the Contract.

3. A Subcontracting agreement between the Main Contractor and the Subcontractor shall be submitted to JW upon appointment and must include the following minimum information:
    - Name of Subcontractor and BBBEE status
    - Subcontractor *domicilium* and registered address of business, as well as status of compliance with all applicable legal requirements.
    - Area and location of project
    - Scope of Work issued to the Subcontractor
    - Value of the Work issued including P&G's (this information must be submitted in a format that is readily auditable).
    - Assistance provided/to be provided to the Subcontractor by the Contractor, e.g. acquisition of materials, machinery, tools, etc.
    - Indicate the remuneration rate of all local labourers (the latest Gazetted labour rates)
    - A Skills Transfer Plan which will indicate, amongst others, the proposed skills that will be transferred to the Subcontractor, individuals that will be identified for skills transfer, the amount that will be spent by the Contractor on skills transfer, evidence that will be produced by the Contractor (such as training certificates, training registers, etc.), etc.
    - A specific provision that enables the Contractor to pay the Subcontractor's suppliers, labour (skilled, local, etc.) or any other service provider of the Subcontractor, should the Subcontractor fail to do so. This provision shall include (but not be limited to) the following conditions/proviso's:
        - Invoices that are due for payment from suppliers and the like must be invoices that have been approved for payment, and be based on work or services that have actually been completed or delivered. Payments that are due to labour will be based on approved timesheets.
        - The Contractor is to ensure that any invoice presented for payment is indeed an approved invoice, and that the necessary work or services have been delivered or completed. The approved invoice shall be settled (paid) by the Contractor (on behalf of the Subcontractor) by the due date for payment.

- The Contractor will be entitled to deduct payments made to any third party, on behalf of the Subcontractor, from subsequent payments that may become due to the Subcontractor.
- The Contractor will be entitled to bill the Subcontractor a mark-up on the payments made on behalf of the sub-contractor. The mark-up shall not be more than 10% (ten percent) of the amount actually paid (i.e. the amount (excluding VAT) reflected on the invoice that has been settled). The mark-up amount shall be deducted from subsequent payments that may become due to the Subcontractor.
- Proof of any such payments made on behalf of the Subcontractor shall be issued to the Employer's Agent, on request, with all necessary supporting information that the Employer's Agent may request
- Payments made on behalf of the Subcontractor are not subject to the Contractor first being paid by the Employer. Therefore, the Contractor shall pay approved invoices, on behalf of the Subcontractor, irrespective of whether the Contractor has first been paid by the Employer. The Contractor will be entitled to levy interest on all payments that have been made in this regard, in accordance with the necessary interest payment provisions contained in the General and Special Conditions of Contract.

4. The successful Contractor shall submit periodic SMME/Subcontractor reports to the Employer's Agent as follows:
    - Status of progress against the Subcontracting Plan (described above), to the approval of the Employer's Agent
    - Subcontractor *domicilium* and registered address of business, as well as ongoing status of compliance with all applicable legal requirements.
    - Name of Subcontractor and BBBEE status
    - Area and location of project
    - Scope of work issued to the Subcontractor
    - Value of the work issued (this information must be submitted in a format that is readily auditable)
    - Monthly payments made to the subcontractor (this information must be submitted in a format that is readily auditable)
    - Assistance provided to the Subcontractor e.g. advance payments, acquisition of materials, machinery, tools, etc.
    - Performance of the Subcontractor, with evidence to support this performance assessment.

5. Upon completion of the project, the Contractor is required to provide a final report to JW on skills transferred to / acquired by the Subcontractor(s) engaged on the Project, description and value of work performed, as well as their overall performance.
6. The Contractor shall also indicate whether the experience gained by the Subcontractor is sufficient to assist the Subcontractor to improve their CIDB grading, with full details of supporting information.

C1.2.1.2.15 Competent Employees

Competent Employees	Qualifications	Experience
Contracts Manager	Minimum Qualifications of **Contract Manager** Only Contract Managers with qualifications of BTech/ BSc/ BEng: Engineering (Civil/ Mechanical) or higher AND ECSA Professional Registration (Pr. Eng. / Pr. Technologist) will obtain a score for experience of a Contract Manager. However, the date of registration of Contract Manager will not impact post qualification number of projects	Minimum of five (5) completed Pipe Laying Projects of a Minimum Diameter of 600mm (Per Project) Completed As Contract Manager
Site Manager	Minimum Qualifications of **Site Manager** Only Site Managers with qualifications of National Diploma (Civil/ Mechanical) Engineering or higher AND Registered as a Candidate Engineering Professional with the ECSA or higher will be considered	Minimum of three (3)) completed Pipe Laying Projects of Welded Steel Pipe With a Minimum Diameter of 600mm (Per Project) Completed As Site Manager
Safety Officer	Post Qualification Experience of **Safety Officer** Only Safety Officers with qualifications of National Diploma (Safety Management/ Environmental Health/Environmental Science/ Environmental Management), SAMTRAC / SHEOMTRAC/ SHEMTRAC / MESHTRAC /NEBOSH / Safety Officers Course (NQF 5) or more AND Registered with SACPCMP in the “Construction Health and Safety” Sector will be considered. However, the time of registration of Safety Officer will not impact post qualification number of projects	Minimum of three (3) completed civil/ mechanical engineering projects as safety officer

C1.2.1.2.16 Tie-in Limitations

The connection of new pipework to the existing water infrastructure is prohibited between Friday and Monday every week and five days before the Builders Break. All tie-ins must be completed within 10 hours of work.

C1.2.1.3 Variations to General Conditions of Contract

Add the following Table:

3.2.4	**Employer's Agent for Health and Safety** Replace Clause 3.2.4 with the following: 'In terms of Clause 1.3.2, all parties to the Contract shall be subject to the relevant requirements of the Construction Regulations 2014 (as amended) of the Occupational Health and Safety Act, Act 85 of 1993 (as amended).' Add the following at the end of the above new replacement Clause 3.2.4: 'Where the Employer is obliged to appoint an Employer's Agent for Health and Safety in terms of the Construction Regulations 2014 (as amended) of the Occupational Health and Safety Act (Act 85 of 1993 as amended), and where such Employer's Agent for Health and Safety has complied with the registration requirements of a Construction Health and Safety Agent as a specified category in terms of section 18 (1) (c) of the Project and Construction Management Professions Act (Act 48 of 2000), the applicable clauses of the latest edition of the "Standard Scope of Services for Construction Health and Safety Agents Registered In Terms Of Section 18(1)(c) of the Project And Construction Management Professions Act (Act No. 48 Of 2000)", including Clauses 2.2.5 "STAGE 5 - CONSTRUCTION DOCUMENTATION AND MANAGEMENT", and 2.2.6 "STAGE 6 - PROJECT CLOSE – OUT", and 2.2.7 "ADDITIONAL RELATED SERVICES", as published in "Registration Rules for Construction Health and Safety Agents in Terms of Section 18 (1) (c) of the Project and Construction Management Professions Act, 2000 (Act No. 48 of 2000)" by the South African Council for Construction and Project Management Professionals in terms of the Project and Construction Management Professions Act (Act 48 of 2000 as amended), shall also apply.'
5.1.1.2	**Time Calculations** SEPARATE THE PHRASE "shall be excluded from the calculation of the time-span concerned." BY MOVING IT ONTO A NEW LINE AS A NEW PARAGRAPH, AND PROMOTE THAT PARAGRAPH BY ONE PARAGRAPH LEVEL TO A POSITION WHERE IT FORMS THE LAST PART OF SUB-CLAUSE 5.1.1, SO THAT SUB-CLAUSE 5.1.1.2 READS AS FOLLOWS: 5.1.1.2 The day on which the timespan commences shall be excluded from the calculation of the timespan concerned."
5.7.1	**Rate of progress** ON PAGE 25, IN THE TOP PARAGRAPH, FOR THE SENTENCE COMMENCING WITH

	"Such steps shall…" REPLACE THE SENTENCE "Such steps shall be approved by the Employer's Agent, which approval shall not be unreasonably withheld." WITH "Such steps shall be subject to the approval of the Employer's Agent, which approval shall not be unreasonably withheld."
6.5.1.3	**Basis of payment for dayworks** ON PAGE 40, IN THE LAST LINE OF THE SUB-CLAUSE, REPLACE THE PHRASE "ruling plant hire rates" WITH "ruling construction equipment hire rates"

GCC Clause	Information
Clause 1.1.9	The name of the Contractor is……... The Contact person is……
Clause 1.2.1.2	The address of the Contractor is: Physical Address: Postal Address: Tel: Fax: Email:
Clause 1.1.1.14	The time for achieving Practical Completion is 18 months from the Commencement Date
Clause 6.2.1	The security to be provided by the Contractor shall be one of the following: Fixed Performance Guarantee of 10% of the Contract Sum (which sum shall exclude VAT)
Clause 6.8.3	The variation in cost of special materials is Type Unit Rate ***NOT APPLICABLE***

C1.2.2 Part 2: Data Provided by the Contractor

Employer:		**Contractor:**	
Witness:		**Witness:**	

Johannesburg Water (SOC) Ltd

CONTRACT NO. JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

PART 1.3: FORMS AND SECURITIES

Employer:		**Contractor:**	
Witness:		**Witness:**	

TABLE OF CONTENTS

		PAGE
C1.3	**FORMS AND SECURITIES**	
C1.3.1	Form of Guarantee	C.**Error! Bookmark not defined.**
C1.3.2	Blasting Indemnity	C.33
C1.3.3	Health and Safety Contract Between Employer and Contractor In Terms of Section 37(2) Of The Occupational Health and Safety Act No 85 Of 1993	C.39
C1.3.4	Health and Safety Contract General Information	C.40

C1.3 FORMS AND SECURITIES

FORMS FOR COMPLETION BY THE CONTRACTOR

THE FOLLOWING FORMS ARE TO BE COMPLETED BY THE CONTRACTOR AFTER THE TENDER HAS BEEN AWARDED TO THE SUCCESSFUL TENDERER

a) Form of Guarantee
b) Blasting Indemnity
c) Agreement in terms of the Occupational Health and Safety Act
d) Occupational Health And Safety Indemnity Undertaking

The forms will be completed by the Contractor who will be instructed to do so in the Form of Acceptance. The completed forms will become part of the Contract.

The Form of Guarantee is a pro forma document. The Contractor will provide an original document, from a financial institution, with the same text within the time stated in the Contract Data. Only a Bank or approved Insurance Company or Guarantee Corporation is acceptable as Guarantor.

Employer:		**Contractor:**	
Witness:		**Witness:**	

Employer:		**Contractor:**	
Witness:		**Witness:**	

TO BE PRINTED ON THE OFFICIAL LETTERHEAD 0F THE GUARANTOR.

PERFORMANCE GURANTEE

For use with the General Conditions of Contract for Construction Works, ……. Edition, ….

C1.3.1 GUARANTEE REFERENCE NUMBER

Whereas [insert the full name of the Employer], registration number: [insert registration number], of [insert full physical address] (the "Employer") has awarded a contract for [insert a detailed description of the contract], under contract number: [insert details] (the "Contract"), to [insert full names of the Contractor], registration number [insert details], of [insert full physical address] (the "Contractor").

And whereas the Contract requires the Contractor to provide to the Employer an on-demand performance guarantee for the due and proper performance by the Contractor of its obligations in terms of the Contract.

Now therefore:

[insert full names of the Guarantor], registration number [Insert details], of [insert the full physical address] (the "Guarantor"), duly represented by the undersigned: [insert the full names of the signatory], and [insert the full names of the signatory], acting herein in their respective capacities as: [insert full title] and [insert full title] respectively, of the Guarantor, and being duly authorized to sign this on demand performance guarantee (this "Guarantee") and to incur obligations in relation thereto, in the name, and on behalf, of the Guarantor under, and in terms of, a Resolution of the Board of Directors or other written authority of the Guarantor, hereby irrevocably and unconditionally guarantees and undertakes:

1. To pay the Employer the sum or sums not exceeding the following aggregate amount: R [insert the amount] (the "Guaranteed Amount") upon receipt of the documents identified in clauses 1.1 to 1.3 below

1.1. 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 1.2;

Employer:		**Contractor:**	
Witness:		**Witness:**	

1.2. A first written demand issued by the Employer to the Guarantor e-mailed to ……with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 1.1 above and the sum certified has still not been paid;

1.3. A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum.

2. To pay to the Employer the Guaranteed Amount or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor emailed to ……. calling up this Performance Guarantee, such demand stating that:

2.1. The Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 2; or

2.2. 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 2; and

2.3. 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.

3. To pay to the Employer on demand any sum or sums not exceeding the Guaranteed Amount on presentation of a written demand signed by the Employer (the "Demand"), supported by a written statement signed by the Employer certifying that the Contractor, in the opinion of the Employer as at the date of issue of such Demand, is in breach of its obligations under the Contract or that a defect had occurred following the performance by the Contractor of its obligations under the Contract, and without being required to prove or set out the nature of any such breach or defect.

4. Payment by the Guarantor in terms of 1 to 3 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

5. The Guarantor hereby acknowledges that:

5.1. 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;

5.2. Its obligation under this Performance Guarantee is restricted to the payment of money.

Employer:		**Contractor:**	
Witness:		**Witness:**	

6. 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.

7. Neither the failure of the Employer to enforce strict or substantial compliance by the Contractor with its obligations under the Contract nor any act, conduct or omission by the Employer prejudicial to the interests of the Guarantor will discharge the Guarantor from liability under this Guarantee.

8. This Performance Guarantee, with the required demand notices in terms of 1 to 3, shall be regarded as a liquid document for the purpose of obtaining a court order.

9. This Performance Guarantee is neither negotiable nor transferable.

10. 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 date on which the Certificate of Completion of the Works has been issued or 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 Certificate of Completion of the Works has been issued.

11. The Guarantor chooses the physical address [insert the full physical address] care of [insert the full names], as well as the e-mail address ……., for the service of all notices for all purposes in connection herewith.

12. This Guarantor is governed by the laws of the Republic of South Africa and any dispute arising hereunder shall be subject to the jurisdiction of the South African courts. In respect of such proceedings, each of the Parties specifically consents to the non-exclusive jurisdiction of the High Court of South Africa (Gauteng Local Division, Johannesburg).

Signed at …… for and on behalf of ……..

Guarantor's signatory (1)

Name: **……**

Designation: **……..…** **…….**

Employer:		**Contractor:**	
Witness:		**Witness:**	

Guarantor's signatory (2)

Name: ……..

Designation: ……. ……

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.3.2 Blasting Indemnity

Given by

_____

*Company Registration No._____

Address

_____

a *Company incorporated with limited liability according to the company laws of the Republic of South Africa, *Partnership, *Close Corporation, *Public Company (hereinafter called the Contractor), represented herein by _____
in his capacity as the Contractor's _____ duly authorised hereto by a resolution of the Contractor dated _____
a certified copy of which resolution is attached to this Indemnity.

WHEREAS the Contractor has entered into a Contract with the Johannesburg Water (SOC) Ltd (hereinafter called the Employer) for,

_____
and the Company requires this Indemnity from the Contractor

NOW THEREFORE THIS DEED WITNESSETH that the Contractor does hereby indemnify and hold harmless the Company in respect of all loss or damage that may be incurred or sustained by the Employer by reason of or in any way arising out of or caused by blasting operations that may be carried out by the Contractor in connection with the aforementioned Contract and also in respect of all claims that may be made against the Employer in consequence of such blasting operations, by reason of or in any way arising out of any accidents or damage to persons, life or properly or any other cause whatsoever, and also in respect of all legal or other expenses that may be incurred by the Employer in examining, resisting or settling any such claims; for the due performance of which the Contractor binds itself according to law.

THUS DONE AND SIGNED for and on behalf of the Contractor at
_____ on the

_____ day of _____ 20_____ in the presence of the subscribing witnesses.

Employer:		**Contractor:**	
Witness:		**Witness:**	

As witnesses

1. _____ _____
Name & Surname Signature

2. _____
Name & Surname Signature

Duly authorised to sign on behalf of _____

Address _____

_____

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.3.3 Health and Safety Contract Between Employer and Contractor In Terms of Section 37(2) Of The Occupational Health and Safety Act No 85 Of 1993

Written agreement between Johannesburg Water ((Proprietary) Limited (hereinafter referred to as "the Employer) and _____ (hereinafter referred to as "the mandatary") as envisaged by Section 37(2) of the Occupational Health and Safety Act, No. 85, of 1993 as amended.

I_____representing _____ (mandatary) do hereby acknowledge that _____ (mandatary) is an employer in its own right and shall be regarded as the employer for purposes of the contract work specified in the body of the principal agreement with duties as prescribed in the Occupational Health and Safety Act, No. 85 of 1993 as amended so as to ensure that all work will be performed or machinery and plant used in accordance with the provisions of the said Act. I furthermore agree to comply with the requirements of the Employer as contained in the Occupational Health and Safety Specification included with the principal agreement and to liaise with the employer should I, for whatever reason, be unable to perform in terms of this agreement.

Signed this _____ day of _____ at _____

Signature on behalf of mandatary _____

Signature on behalf of Employer _____

Compensation Fund Registration No. of mandatary _____

Good Standing Certificate : ☐ yes ☐ no (tick one box)

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.3.4 Health and Safety Contract: General Information

1. The Occupational Health and Safety Act comprises Sections 1 to 50 and all un-repealed regulations promulgated in terms of the former Machinery and Occupational Safety Act No 6 of 1983 as amended, as well as other regulations which may be promulgated in terms of the OHS Act.
2. 'Mandatary' is defined as including an agent, a contractor or a subcontractor for work, but without derogating from his status in his own right as an employer or user of plant and machinery
3. Section 37 of the Occupational Health and Safety Act potentially punishes employers (principals) for the unlawful acts or omissions of mandataries (contractors) save where a written agreement between the parties has been concluded containing arrangements and procedures to ensure compliance with the said Aid by the mandatary.
4. All documents attached or referred to in the above agreement from an integral part of the agreement.
5. To perform in terms of this agreement mandataries must be familiar with the relevant provisions of the Act.
6. Mandataries who utilise the services of their own mandataries (subcontractors) are advised to conclude a similar written agreement.
7. Be advised that this agreement places the onus on the mandatary to contact the Employer in the event of inability to perform as per this agreement. The Employer, however, reserves the right to unilaterally take any steps as may be necessary to enforce this agreement.
8. The contractor shall be responsible for the full and proper implementation of the terms and provisions of the Act and its regulations in the area in which the work is to be undertaken by the Contractor.
9. The Contractor shall be responsible for the well-being, in relation to health and safety, of all persons coming upon or into such area in accordance with that legislation, including the implementation of any directives issued by management of the Employer in this respect.
10. The work to be done is **JW14090R: REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP**
11. The area in which the work is to be conducted is **LINBRO PARK AND ALEXANDRA TOWNSHIP, JOHANNESBURG**
12. The Contractor shall familiarise himself with such area and all risks existing thereon and undertakes to report to the representative of the Employer any hazard or risk to health and safety which arises during the contract work in the area concerned and over which the Contractor may have no control. All necessary and appropriate safety / health equipment shall be issued by the Contractor to all persons working on or coming into the area.

Employer:		**Contractor:**	
Witness:		**Witness:**	

C1.3.4.1 Occupational Health and Safety Indemnity Undertaking

I, the undersigned _____

in my capacity as _____

of the firm _____

1. Hereby undertake to ensure that I/my firm and/or employees and/or subcontractors and/or his employees -

   1.1 comply strictly with the provisions of the Occupational Health and Safety Act of 1993 (as amended) and/or the regulations promulgated in terms thereof, with specific reference to section 37(2) of the said act, as well as any relevant legislation, in the course of the performance/execution of any service and/or work in, to or on any of the Employer's buildings, construction sites and/or premises;
   1.2 ensure that consultants and/or visitors comply with any instructions and measures relating to occupational health and safety, as prescribed by the Employer; and
   1.3 comply strictly with the statutorily prescribed work systems, operational equipment, machinery and occupational health and safety conditions;

2. And as an independent employer and contractor, hereby indemnify, in terms of the above undertakings, the Employer -

   2.1 in respect of any costs that I/my firm and/or employees and/or subcontractors and their employees may incur of necessity in compliance with the above undertakings; and
   2.2 against any claims that may be instituted against the Employer and/or any liability that the Employer may incur, whether instituted and/or caused by me/my firm's employees, agents, consultants, subcontractors and/or their employees and visitors or the Employer's clients or neighbours in respect of any incidents related to my/my firm's activities and as a result of which the occupational health and safety of the persons involved have been detrimentally affected; and
   2.3 against similar claims that I, managers or directors of my firm may have against the Employer and any damages for which I, managers or directors of my firm hold the Employer liable.

3. My firm's compensation commissioner number is _____ and I confirm that my firm and its subcontractors' fees have been paid up and obligations in respect of the compensation commissioner have been complied with and further that I shall furnish proof thereof in writing on request.

4 I hereby confirm that I have the authority to sign this indemnity undertaking and that the Employer is not obliged to confirm such confirmation.

Signed at _____ This _____ day of _____

_____

Signature Capacity

As witnesses:

1 _____

2 _____

Employer:		**Contractor:**	
Witness:		**Witness:**	

Employer:		**Contractor:**	
Witness:		**Witness:**	

Johannesburg Water SOC Ltd

Johannesburg Water

REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 1

PART 2: PRICING DATA

TABLE OF CONTENTS

PAGE (S)

C2 PRICING DATA 3

C2.1 … PRICING INSTRUCTIONS 3

C2.1.1 GENERAL PREAMBLE TO THE BILL OF QUANTITIES (CIVIL ENGINEERING WORKS) 3

C2.1.2 Sufficiency of tender 6

C2.1.3 Special payment conditions 6

C2.1.4 SMME Portion of the Works 9

BILL OF QUANTITIES 10

SUMMARY OF BILL OF QUANTITIES 11

C2 PRICING DATA

C2.1 PRICING INSTRUCTIONS

C2.1.1 GENERAL PREAMBLE TO THE BILL OF QUANTITIES (CIVIL ENGINEERING WORKS)

a) All items in the Bill of Quantities, except where otherwise specified in Clause 8 of a Standardised Specification or in the Project Specification, shall be measured and shall cover operations as recommended in the standard system of measurement of civil engineering quantities, published under the title "Civil Engineering Quantities", by the South African Institution of Civil Engineering.

b) The basis and principles of measurement and payment are described in this section (Pricing Instructions) and Clause 8 of each of the Standardised Specifications for Civil Engineering Construction. The applicable SANS 1200 Standardised Specifications are listed in the Scope of Work, Portion 1: Project Specifications. Variations and amendments to the Project Standard Specifications are contained in the Scope of Work, Portion 2: Variations and/or Additions to the Project Standard Specifications.

c) Descriptions in the Bill 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 Bill of Quantities, the requirements of the Standardised Specification or Scope of Work, as applicable, shall prevail.

d) The clauses in a specification in which further information regarding the Schedule item may be found are listed in the "Payment Refers" column in the Schedule. The reference clauses indicated are not necessarily the only sources of information in respect of listed items. Further information and specifications may be found elsewhere in the Contract Documents. Standardised Specifications are identified by the letter or letters which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200G.

e) Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.

f) The quantities set out in the Bill of Quantities are the estimated quantities of the Contract Works, but the Contractor shall be required to undertake whatever quantities may be directed by the Employer's Agent from time to time. The Contract Price for the completed Works shall be computed from the actual quantities of work done, valued at the relevant unit rates and/or prices. The Contractor must not order the quantities of materials stated in the Bill of Quantities until he has confirmed from the Construction Drawings or measurement on Site that such quantities are in fact the correct quantities.

g) The rates and/or prices to be inserted in the Bill of Quantities are to be the full inclusive prices for the work described under the several items. Such rates and/or prices 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, as well as overhead charges and profit. Reasonable charges shall be inserted as these shall be used as a basis for assessment of payment for additional work that may have to be carried out.

h) A price or rate is to be entered against each item in the Bill of Quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to be covered by the other prices or rates in the Schedule.

i) The units of measurement described in the Bill of Quantities are metric units. Alternatives used are as follows:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1000kg)
m^2	=	square metre	No.	=	number
m^2 pass	=	square metre pass	sum	=	lump sum
ha	=	hectare	MN	=	mega-newton
m^3	=	cubic metre	MN.m	=	mega-newton-metre
	m^3km	= cubic metre-kilometre	PC sum	=	Prime Cost sum
l	=	litre	Prov sum	=	Provisional sum
kl	=	kilolitre	%	=	percent
MPa	=	megapascal	kW	=	kilowatt
W/day	=	Workday	R/only	=	Rate only

j) For the purpose of this Bill of Quantities, where applicable, the following words shall have the meanings hereby assigned to them:

Unit : The unit of measurement for each item of work as defined in the SANS 1200.

Quantity : The number of units of work for each item.

Rate : The agreed payment per unit of measurement.

Amount : The product of the quantity and the agreed rate for an item.

Lump sum : An agreed amount for an item, the extent of which is described in the Bills of Quantities but the quantity of work of which is not measured in any units.

k) Arithmetical errors in the Bill of Quantities shall be corrected in accordance with Clause C3.9 of the Conditions of Tender. Should there be any discrepancy between rates and/or prices written in the Assessment Schedule and the Bill of Quantities, the latter shall govern.

l) While the Employer has every intent to complete the full scope of works, the Employer reserves the right to reduce of increase the scope of works according to the dictates of the budget, or to terminate this contract, with adjustment to the agreed rates, sums or fees and without payment of any penalty in this regard. The Service Provider shall however be entitled to pro-rata payment for all services carried out in terms of any adjustment to the Scope of Work or, in the case of termination, remuneration and/or reimbursement.

m) The Bill of Quantities shall be completed by hand in **INK** or **TYPED**.

C2.1.2 Sufficiency of tender

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the construction of the Works and of the rates and prices, which rates and prices shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and completion of the Works.

C2.1.3 Special payment conditions

This clause shall be read in conjunction with the 'Penalties' clause(s). Where the penalty clause shall always receive precedence over this clause, should it be found that duplicative financial corrective measures exist.

C2.1.3.1 Applicability of payment items

All payment items forming part of this Contract shall not apply to ordered Works completed by the Contractor under this Contract, where completed Works:

- are not completed to acceptable quality;
- are not issued by the Employer's Agent;
- are still within the defects and liability period; or
- are not accepted by the Employer's Agent or his duly authorised representative.

C2.1.3.2 Provided previously

The Contractor shall not **re-execute** works under this Contract where he has successfully executed works for the Employer under a previous contract(s) that comply with the requirements of this Contract. However, where applicable the Contractor shall:

1. clearly state this in his qualifications; and

2. still provide the associated rates and prices in the schedule in the associated line item, but not calculate an associated amount.

The Employer shall at his sole discretion decide to re-execute such works.

C2.1.3.3 Working outside normal hours

The additional costs, if any, to perform works outside normal working hours shall be deemed to have been allowed for in the provided activity pricing rates and/or prices.

C2.1.3.4 Materials and equipment

C2.1.3.4.1 Materials

The Employer shall not provide any materials, as this shall be provided by the Contractor and deemed to have been included in the various provided rates and prices.

C2.1.3.4.2 Equipment

The Employer shall not provide any works equipment, as this shall be provided by the Contractor and deemed to have been included in the various provided activity rates and prices.

C2.1.3.4.3 Damage to materials provided by the Employer

Where the Contractor or public damage any materials, provided by the Employer, whilst in the care of the Contractor, he shall immediately report such damage, arrange for the replacement and all replacement costs shall be at his expense.

C2.1.3.5 Permits and way-leaves

All associated costs to obtain permits and way-leaves as required for the execution of the works, where such affect other services, shall be deemed to have been included in the scheduled rates for SANS 1200A or SANS 1200AA or SANS 1200AB where pricing provision for such items have been allowed for in the pricing schedules, alternatively it shall be deemed to be included in the various scheduled activity rates or prices provided by the Contractor.

C2.1.3.6 Locating existing services

The cost to locate existing services shall be included in the various works activity pricing rates and/or prices, including any excavations required and the provision and use of service detection personnel and equipment. Identified existing services shall be suitably marked at regular intervals for reference purposes.

C2.1.3.7 Confined space

The Contractor shall note that a portion of the work will be executed within confined spaces and it shall be deemed that allowance has been made in all provided activity pricing rates and/or prices.

C2.1.3.8 Concrete

Descriptions (prices) of concrete work shall be deemed to include the design of concrete mixes and all testing of concrete and materials other than compressive strength testing of concrete samples from concrete being placed in the works (the Contractor shall only be entitled to payment for those samples and compressive strength tests called for by the Employer's Agent or his duly authorized representative and which pass the test requirements), handling and depositing (by hoisting or lowering) concrete in the forms, working and packing concrete around reinforcement, all "construction joints" other than "designated joints" as defined in SANS 1200G which are given separately, shaping tops of components as required and striking off and curing.

Descriptions (prices) of concrete in surface beds cast in panels shall be deemed to include formwork, fillets and the like in forming the panels.

C2.1.3.9 Formwork

Formwork is measured to the net surfaces of concrete to be supported, except at intersections of beams with beams, columns, walls, etc. and tops of columns with slabs, beams, etc. where no deductions have been made and descriptions (prices) shall be deemed to include use and waste, except where the formwork is of a permanent nature or is to be left in, fitting together to all required shapes, all cutting, intersections, cambering

where required, holes for rods, bolts, pipes and the like, propping, maintaining, keeping damp whilst the concrete is being deposited and removing of formwork.
Formwork "left in" and permanent formwork shall be deemed to include leaving in formwork, props, etc.

Descriptions (prices) of formwork to soffits shall be deemed to include propping not exceeding 3.5m high unless otherwise described. Descriptions (prices) of formwork to walls and columns shall be deemed to be not exceeding 3.5m high above bearing level unless otherwise described.

Descriptions (prices) of formwork to soffits of solid slabs shall be deemed to be to slabs not exceeding 300mm thick unless otherwise described.

C2.1.3.10 Smooth formwork

Descriptions (prices) shall be deemed to include for rubbing off all projections at seams etc. after removal of the formwork, making good any defects with 2:1 cement mortar and leaving a smooth surface with all arises slightly rounded, all to the satisfaction of the Employer's Agent or his duly authorized representative.

C2.1.3.11 Reinforcement

Descriptions (prices) for all steel reinforcement to concrete shall be deemed to include cutting and waste, bending, hooked ends, binding at lappings and intersections with annealed wire, all as above described, hoisting or lowering and maintaining in position whilst the concrete is being deposited and cover blocks and spacers in accordance with the relevant SANS Codes of Practice.

C2.1.3.12 Precast concrete

Descriptions (prices) of precast concrete shall be deemed to include reinforcement required for manufacturing, handling and erection purposes, steel rod or wire loop hooks and/or mortices for Lewis bolts required for handling and transporting, any necessary temporary propping and strutting, bedding, jointing and pointing.

C2.1.3.13 Testing

The cost of testing of the ordered Works shall be included in the various applicable Works items. In particular those:

- clearly intended by or provided for in the specifications.
- involving testing or tests to ensure that the design of the whole of the Works or any part of the Works is appropriate for the purpose which it was intended to fulfil.

No additional or separate payment for testing shall be entertained by the Employer.

C2.1.3.14 Cost of samples

All samples shall be supplied by the Contractor at his own cost unless the supply thereof is clearly intended in the specifications or Bill of Quantities to be at the cost of the Employer. Payment shall not be made for samples which do not comply with the specifications.

C2.1.3.15 Failure to submit reports and associated visual media

The Contractor's payment certificate shall be accompanied by confirmation from the Employer's Agent or his duly authorised representative then at items listed for payment have been successfully executed and/or delivered as required. Failure to obtain such confirmation from the Employer's Agent or his duly authorised representative shall result in non-payment of the Contractor's payment certificate until the default has been corrected or the deemed incomplete items are excluded from the payment certificate.

C2.1.3.16 Payment ONLY for works completed

The Contractor shall note that payment shall only be made for Work activities successfully (delivering the end result) executed, complying with the quality requirements and provided to the Employer's Agent or his duly authorized representative.

C2.1.3.17 Training

The Contractor is required to provide training on all equipment installed during the installation and commissioning periods of the contract. Pricing shall make adequate provision for the training of the Employer's delegated staff members.

C2.1.3.18 Maintenance

Pricing shall include for attendance to maintenance items in accordance with the requirements of the contract conditions and specifications.

C2.1.3.19 Disposal of existing equipment

Pricing shall provide allowance for the successful disposal of all redundant and obsolete equipment indicated for removal from the facility.

C2.1.3.20 Certificate of Compliance

Pricing shall provide allowance for the issuing of the relevant Certificates of Compliance for the installation(s) at the facility. One certificate of compliance is required per electrical distribution board completed, and the certificate shall cover all downstream works.

C2.1.4 SMME Portion of the Works

- The Contractor shall ensure that the Subcontractor(s) complies with the paying all amounts due in respect of his employees and himself in terms of all relevant legislation and regulations including, but not confined to, the
    - Income Tax Act, the
    - Compensation for Occupational Injuries and Diseases Act,
    - Unemployment Insurance Act,
    - Basic Conditions of Employment Act
- Monitoring of the Quality of Work completed by the Sub-contractor/SMME
- Skills transfer during the execution of the project
- Compliance with all aspects of the Scope of Work
- Assistance with sourcing of applicable material in line with the technical data sheets

Further an allowance has been made for "Training" – this is related to CETA accredited training which is to be agreed with the Employer during project execution. No amount can be claimed under this item for on-site or on-the-job training, only for accredited training which the SMME receives.

BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES

SUMMARY OF BILL OF QUANTITIES	
DESCRIPTION	**AMOUNT**
SECTION 1: PRELIMINARY AND GENERAL	R
SECTION 2: EARTHWORKS (PIPE TRENCHES)	R
SECTION 3: PIPELINES	R
SECTION 4: PIPE JACKING	R
SECTION 5: BUILDINGS AND FENCING	R
SUB-TOTAL A	R
Plus 10% for Escalation (Compulsory)	R
SUB-TOTAL B	R
Plus 10% for Contingencies (Compulsory)	R
SUB-TOTAL C	R
PLUS 15% VAT	R
TENDER SUM CARRIED TO FORM OF OFFER	R

BILL OF QUANTITIES

SECTION 1:

PRELIMINARY & GENERAL

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 1				
1	**SANS 1200A**	**GENERAL**				
1,1	**8,3**	**SCHEDULED FIXED-CHARGE AND VALUE-RELATED CHARGES**				
1.1.1	8.3.1	Contractual Requirements	Sum	1		
1.1.2	8.3.2	Establishment of facilities on the site				
1.1.2.1	PSA 8.3.2.1	**Facilities for Employer`s Agent**				
1.1.2.1.1		a.1) Furnished office (3 No.)	Sum	1		
1.1.2.1.2		a.2) Furnished office for Johannesburg Water Engineering Team	Sum	1		
1.1.2.1.3		b) Nameboards (2 No.)	Sum	1		
1.1.2.1.4		c) Communication	Prov Sum	1	R 100 000	R 100 000
1.1.2.1.5		d) Overheads, charges and profit on item c) above	%		R 100 000	
1.1.2.1.6		e) Boardroom	Sum	1		
1.1.2.1.7		f) Computer facilities complete with printer and wifi router with internet connection	Prov Sum	1	R 200 000	R 200 000
1.1.2.1.8		g)Survey equipment, assistants and material"	Prov Sum	1	R 200 000	R 200 000
1.1.2.1.9		h)Parking (8 No.)	Sum	1		
1.1.2.1.10		i) CLO's Office	Sum	1		
1.1.2.2	8.3.2.2	**Facilities for Contractor**				
1.1.2.2.1		(a) Offices and storage sheds	Sum	1		
1.1.2.2.2		(b) Workshops	Sum	1		
1.1.2.2.3		(e) Ablution and latrine facilities	Sum	1		
1.1.2.2.4		(f) Tools and equipment	Sum	1		
1.1.2.2.5		(g) Water supplies, electric power and communications	Sum	1		
1.1.2.2.6		(h) Dealing with water	Sum	1		
1.1.2.2.7		(i) Access	Sum	1		
1.1.2.2.8		(j) Plant	Sum	1		
1.1.3	8.3.3	Other fixed-charge obligations	Sum	1		
1.1.4	8.3.4	Removal of site establishment	Sum	1		
1.1.5	PSA 8.3.5	Additional Contractual Obligations				
1.1.5.1	PSA 8.3.5.1	Issuing of notices to consumers.	Sum	1		
1.1.5.2	PSA 8.3.5.2	OHS Act Obligations	Sum	1		
1.1.5.3	PSA 8.3.5.3	EMP Obligations	Sum	1		
1,2	**8,4**	**SCHEDULED TIME-RELATED ITEMS**				
1.2.1	8.4.1	Contractual Requirements	Sum	1		
1.2.2	8.4.2	Operation and maintenance of facilities on site, for duration of construction, except where otherwise stated				
1.2.2.1	PSA 8.4.2.1	**Facilities for Employer`s Agent**				
1.2.2.1.1		a.1) Furnished office (3 No.)	Month	12		
1.2.2.1.2		a.2) Furnished office for Johannesburg Water Engineering Team	Month	12		
1.2.2.1.3		b) Nameboards (2 No.)	Month	12		
1.2.2.1.4		(c) Communication	Prov. Sum	1	R 200 000	R 200 000
1.2.2.1.5		d) Overhead, charges and profit on item (c) above	%		R 200 000	
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
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1.2.2.1.6		e) Boardroom	Month	12		
1.2.2.1.7		f) Computer facilities complete with printer and wifi router with internet connection	Month	12		
1.2.2.1.8		g)Survey equipment, assistants and material"	Prov Sum	1	R 200 000	R 200 000
1.2.2.1.9		h)Parking (4 No.)	Month	12		
1.2.2.1.10		i) CLO's Office	Month	12		
1.2.2.2	PSA 8.4.2.2	**Facilities for Contractor**				
1.2.2.2.1		(a) Offices and storage sheds	Month	12		
1.2.2.2.2		(b) Workshops	Month	12		
1.2.2.2.5		(e) Ablution and latrine facilities	Month	12		
1.2.2.2.6		(f) Tools and equipment	Month	12		
1.2.2.2.7		(g) Water supplies, electric power and communications	Month	12		
1.2.2.2.8		(h) Dealing with water	Month	12		
1.2.2.2.9		(i) Access	Month	12		
1.2.2.2.10		(j) Plant	Month	12		
1.2.3	8.4.3	Supervision for duration of construction	Month	12		
1.2.4	8.4.4	Company and head office overhead costs for the duration of the contract	Month	12		
1.2.5	PSA 8.4.5	Other Time-related obligations	Month	12		
1.2.6	PSA8.3.5.4	Provide protective safety clothing	Sum	1		
1.2.7	PSA 8.3.5	**Additional Contractual Obligations**				
1.2.7.1	PSA 8.3.5.2	OHS Act Obligation	Month	12		
1.2.7.2	PSA 8.3.5.3	EMP Obligations	Month	12		
1.2.7.3	PSA 8.4.7	On-site security	Month	12		
1.2.7.4	PSA 8.4.6.4	Risk Assessments every month	Month	12		
1.2.8	PSA 8.5	**SUMS STATED PROVISIONALLY BY EMPLOYER'S AGENT**				
1.2.8.1		a) Reinstatement of asphalt by JRA	Prov. Sum	1	R 1 000 000	R 1 000 000
1.2.8.2		b) Temporary protection of services	Prov. Sum	1	R 500 000	R 500 000
1.2.8.3		c) Community Liaison Officer & CSO	Prov. Sum	1	R 300 000	R 300 000
1.2.8.4	PSA 8.4.6.5	d) Training of local labour and SMMEs	Prov. Sum	1	R 1 340 000	R 1 340 000
1.2.8.5		e) Alterations and connection to Municipal services and repair to damaged services where approved by Employer's Agent	Prov. Sum	1	R 500 000	R 500 000
1.2.8.6		f) Employer's Agent's Equipment and Independent testing	Prov. Sum	1	R 500 000	R 500 000
1.2.8.7		g) Relocation of existing services	Prov. Sum	1	R 500 000	R 500 000
1.2.8.8		h) Topographical Survey as per the Employer's Agent's instruction	Prov.Sum	1	R 200 000	R 200 000
1.2.8.9		i) Provision of photographic records	Prov. Sum	1	R 200 000	R 200 000
1.2.8.10		j) Pressure logging, leak detection and conduct water conservation tests on selected pipelines	Prov. Sum	1	R 1 000 000	R 1 000 000
1.2.8.12		l) SANRAL Wayleave Permit	Prov Sum	1	R 700 000	R 700 000
1.2.8.13		m) Provision of as-built information	Prov Sum	1	R 350 000	R 350 000
1.2.8.14		n) Construction Work Permit	Prov. Sum	1	R 300 000	R 300 000
1.2.8.15		o) Pipeline servitude registration	Prov. Sum	1	R 400 000	R 400 000
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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1.2.8.14		p) JW ISD	Stated month	12	R 2 000	R 24 000
1.2.8.15		q)Community awareness material	Stated Sum	1	R 50 000	R 50 000
1.2.8.16		r) Overheads, charges and profit on items (a) to (q) above	%		R 7 864 000	
1,3	**PSA 8.7**	**DAYWORK**				
1.3.1	PSA8.7.1.3	**a) Labour**				
1.3.1.1		1) Foreman/Surveyor	hr	300		
1.3.1.2		2) Artisan	hr	300		
1.3.1.3		3) Semi-skilled labourer	hr	300		
1.3.1.4		4) Unskilled Labourer	hr	300		
1.3.1.5		5) Extra over for night- or non-working times	%			
1.3.2		**b) Materials**				
1.3.2.1		1) Provisional sum for purchase of materials	PC Sum	1	R 250 000	R 250 000
1.3.2.2		2) Mark up on 1) above	%		R 250 000	
1.3.3		**c) Plant and Equipment**				
1.3.3.1		1) Crane 65 - 80 t Capacity	hr	40		
1.3.3.2		2) Wheel loader 140 - 150 Kw	hr	40		
1.3.3.3		3) Plate compactor and tampers	hr	40		
1.3.3.4		4) Motor grader 150 - 160 Kw	hr	40		
1.3.3.5		5) Vibrating roller (500 - 630kg)	hr	40		
1.3.3.6		6) Concrete mixer	hr	40		
1.3.3.7		7) Concrete saw (self propelled)	hr	40		
1.3.3.8		8) TLB	hr	40		
1.3.3.9		9) Side Boom	hr	40		
1.3.3.10		10) LDV's - Capacity 1 ton	hr	40		
1.3.3.11		11) Compressor				
1.3.3.11.1		i. Small up to 200 cfm	hr	40		
1.3.3.11.2		ii. Large greater than 200 cfm	hr	40		
1.3.3.12		12) Generator (Diesel driven)				
1.3.3.12.1		i. Small - 5 kVA (Diesel driven)	hr	40		
1.3.3.12.2		ii. Medium – greater than 5kVA and up to 10 kVA	hr	40		
1.3.3.12.3		iii. Large - greater than 10 kVA	hr	40		
1.3.3.13		13) Tipper truck				
1.3.3.13.1		i. Capacity 6m³ (small)	hr	40		
1.3.3.13.2		ii. Capacity 10m³ (medium)	hr	40		
1.3.3.13.3		iii. Capacity 12m³ (large)	hr	40		
1.3.3.14		14) Crane truck				
1.3.3.14.1		i. Capacity 2 - 4 ton (small)	hr	40		
1.3.3.14.2		ii. Capacity greater than 4 ton up to 6 tons (medium)	hr	40		
1.3.3.14.3		iii. Capacity more than 6 tons up to 8 tons (large)	hr	40		
1.3.3.15		15) Flatbed trucks				
1.3.3.15.1		i. Capacity 3 ton (small)	hr	40		
1.3.3.15.2		ii. Capacity 5 ton (medium)	hr	40		
1.3.3.15.3		iii. Capacity 10 ton (large)	hr	40		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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1.3.3.16		16) Conservancy/ Water tankers				
1.3.3.16.1		i. Capacity 6,000 litres (small)	hr	40		
1.3.3.16.2		ii. Capacity 9,000 litres (medium)	hr	40		
1.3.3.16.3		iii. Capacity 15,000 litres (large)	hr	40		
1.3.3.17		17) Excavator (Crawler excavator)				
1.3.3.17.1		i. 20 tonne	hr	40		
1.3.3.17.2		ii. 30 tonne	hr	40		
1.3.3.18		18) TLB's (Tractor loader backhoe)				
1.3.3.18.1		i. 2x4	hr	40		
1.3.3.18.2		ii. 4x4	hr	40		
1.3.3.19		19) Walk behind vibrating rollers				
1.3.3.19.1		i. Model BW 61 (small)	hr	40		
1.3.3.19.2		ii. Model BW 76 (medium)	hr	40		
1.3.3.19.3		iii. Model BW 90 (large)	hr	40		
1.3.3.20		20) Compactors				
1.3.3.20.1		i. Wacker	hr	40		
1.3.3.20.2		ii. Plate compactor	hr	40		
1.3.3.21		21) Compressors (Potable Diesiel Compressor)				
1.3.3.21.1		i. Small up to 200 cfm	hr	40		
1.3.3.21.2		ii. Large greater than 200 cfm	hr	40		
1.3.3.22		22) Portable water pumps				
1.3.3.22.1		i. Small – up to 2" diameter	hr	40		
1.3.3.22.2		ii. Medium – greater than 2" and up to 6" diameter	hr	40		
1.3.3.22.3		iii. Large – greater than 6"	hr	40		
1,4	**8,8**	**TEMPORARY WORKS**				
1.4.1	PSA 8.8.2	Dealing with traffic or accommodation of traffic and access to properties	Sum	1		
1.4.2	8.8.3	Protection of the existing chambers, by-pass works and electrical substation until construction in vicinity is complete	Sum	1		
1.4.3	PSA 8.8.4	**Existing Services**				
1.4.3.1		(a) i)Supply or hire of specialist equipment	Prov. Sum	1	R 300 000	R 300 000
1.4.3.1		ii) Overhead, charges and profit fee for the Main Contractor to oversee sub-contracted works.	%	10%	R 300 000	R 30 000
1.4.3.2		(b) Excavation by hand in soft material to expose existing services	m^3	20		
1.4.4	PSA 8.8.6	Dealing with water	Sum	1		
1.4.5	PSA 8.8.7	Dealing with other Service Authorities, obtaining of wayleaves, etc	Sum	1		
1.5	PSSC	**Management of SMME**				
1.5.1	PSSC 1	1 Value of Sub-Contracted Works (R _____)				
1.5.2	PSSC 2	2 Overhead, charges and profit fee for the Main Contractor to oversee sub-contracted works.	%			
1.5.3	PSSC 3	3 Training for SMMEs	Prov. Sum		R 1 500 000	R 1 500 000
1.5.4	PSSC 4	4 Overhead, charges and profit for the Main Contractor to provide for training for SMMEs	%		R 1 500 000	
TOTAL CARRIED TO SUMMARY PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

Bill of Quantities
Part 2: Civil Works

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 2				
2	**SANS 1200C**	**SITE CLEARANCE**				
2,1	PSC 8.2.1	Clear and grub	m	1 463		
2,2	8.2.2	Remove and grub all large trees and tree stumps, of girth:				
2.2.1		(a) Exceeding 1 m but not 2m	No.	25		
2.2.2		(b) Exceeding 2m but not 3m	No.	1		
2.2.3		(c.)Exceeding 3m	No.	1		
2,3	PSC 8.2.11b	Removal of man-made surfaces				
2.3.1		Roadways, Asphalt and other layers				
2.3.1.1		i) Asphalt (≤ 50mm thick) and including base, sub-base and subgrades layers up to 800mm deep.	m²	15,00		
2.3.1.2		ii) Asphalt (> 50 ≤ 100mm thick) and including base, sub-base and subgrades layers up to 800mm deep.	m²	15,00		
2.3.2		a)Footways and driveways				
2.3.2.1		Asphalt ≤ 50mm thickness	m²	100		
2.3.2.2		Asphalt > 50 ≤ 100mm thickness	m²	100		
2.3.2.3		Interlocking concrete segmental paving blocks (all colours)	m²	100		
2.3.2.4		Concrete slabs (450 x 450mm)	m²	100		
2.3.2.5		Brick paving	m²	100		
2.3.2.6		Unreinforced concrete ≤75mm thick	m²	100		
2.3.2.7		Reinforced concrete ≤75mm thick	m²	100		
2.3.2.8		Grassing	m²	2 000		
2.3.2.9		Kerbing (all types of kerbing)	m	500		
2,5	8.2.4	Reclear surfaces only on instructions from the Engineer	m	1 500		
2,6	PSDB 8.3.8	Form Firebreaks (On Employer's Agent's instruction)	m²	1 200		
2,7	PSC 8.2.12	Backfilling and reinstatement of man-made surfaces	m²	250		
2.7.1	PSC 8.2.12.1	**Backfilling and reinstatement of roads**				
2.7.1.1		**a) Scenario A**				
2.7.1.1.1		i) 150mm base – G2 Graded crushed stone to 102% Mod AASHTO density	m^2	15,00		
2.7.1.1.2		ii) 150mm subbase – G5 Graded crushed stone to 97% Mod AASHTO density	m^2	15,00		
2.7.1.1.3		iii) 150mm Fill – G7 material compacted to 95% Mod AASHTO density	m^2	15,00		
2.7.1.1.4		iv) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO	m^2	15,00		
2.7.1.2		**b) Scenario B**				
2.7.1.2.1		i) 150mm base – G2 material compacted to 97% Mod AASHTO density	m^2	15,00		
2.7.1.2.2		ii) 150mm subbase – C4 Stabilised gravel material to 95% Mod AASHTO density*	m^2	15,00		
2.7.1.2.3		iii) 150mm selected subgrade - Insitu material compacted to 93% Mod AASHTO	m^2	15,00		
2.7.1.3		**c) Scenario C (Foot paths)**				
2.7.1.3.1		i) 150mm base – Recovered material compacted to 93% Mod AASHTO	m^2	15,00		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
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2.7.1.3.2		ii) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO	m^2	15,00		
2.7.1.4		**d) Surfacing**				
2.7.1.4.1		i) 30mm Bitumen hot –mix: Fine	m^2	15,00		
2.7.1.4.2		ii) 70mm Bitumen hot –mix: BTB	m^2	15,00		
2.7.2	PSC 8.2.12.2	**Backfilling and reinstatement footways**				
2.7.2.1		a) Using removed materials:				
2.7.2.1.1		i) Interlocking concrete segmental paving blocks (all colours)	m^2	100,00		
2.7.2.1.2		ii) Concrete slabs (450 x 450mm)	m^2	100		
2.7.2.1.3		iii) Brick paving	m^2	100		
2.7.2.1.4		iv) Grassing	m^2	500		
2.7.2.1.5		v) Kerbing	m	500		
2.7.2.2		b) Using new supplied materials:				
2.7.2.2.1		i) 30mm Bitumen hot –mix: Fine	m^2	100		
2.7.2.2.2		ii) Interlocking concrete segmental paving blocks, including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and blocks				
2.7.2.2.2.1		1) Grey blocks	m^2	100		
2.7.2.2.2.2		2) Coloured blocks	m^2	50		
2.7.2.2.3		iii) Concrete slabs (450 x 450mm) including a 20mm river sand bedding layer, jointing mortar.	m^2	10		
2.7.2.2.4		iv) Brick paving including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and bricks.	m^2	100		
2.7.2.2.5		v) Unreinforced concrete ≤ 75mm thick (15MPa)	m^2	100		
2.7.2.2.6		vi) Reinforced (395 mesh) concrete ≤ 75mm thick (15MPa)	m^2	100		
2.7.2.2.7		vii) Grassing	m^2	2000		
2.7.2.2.8		viii) Concrete channeling, including formwork, leveling and compacting 300 x 125mm cast in situ concrete of 15MPa.	m^2	50		
2.7.2.2.7		ix) Kerbing, including a 50mm bedding (cement and river sand), jointing mortar and 15MPa concrete haunching at all joints.	m	20		
2.10	**PSC 8.2.13**	**Reinstatement of existing masonry walls and steel palisade fences**				
2.10.1		a) Face brick				
2.10.1.1		i) 110mm wall	m^2	100		
2.10.1.2		ii) 220mm wall	m^2	100		
2.10.1.3		iii) 330mm wall	m^2	100		
2.10.2		b) Plastered				
2.10.2.1		i) 110mm wall	m^2	100		
2.10.2.2		ii) 220mm wall	m^2	100		
2.10.2.3		iii) 330mm wall	m^2	100		
2.10.3		c) Steel palisade fences (height = 2.1m)	m^2	100		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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		SECTION 3				
3	**SANS 1200DB**	**EARTHWORKS (PIPE TRENCHES)**				
3,1	PSDB 8.3.1	**Site Clearance and (if specified) Removal of topsoil**				
3.1.1		c) Removal, stockpiling and replacing of Topsoil (depth stated)	m^3	2 594		
3.1.2	8.3.6	Topsoiling	m^3	2 394		
3.1.3	8.3.7	Grassing or other Vegetation Cover	m^2	15 960		
3.2	PSDB 8.3.2	**Excavation**				
3.2.1		(a) Excavate in all materials, for trenches, backfill compact and dispose of surplus material				
		Trenches 1216mm wide for 600mm ND pipes depths up to:				
3.2.1.1		(i) 0 up to 2.5m	m^3	461		
3.2.1.2		(ii) 2,5m up to 3,5m	m^3	795		
3.2.1.3		(iii) 3,5m up to 4,5m	m^3	1 050		
3.2.1.4		(iv 4,5m up to 5,0m	m^3	460		
3.2.1.5		(v) Exceeding 5m	m^3	2 335		
3.2.2		Extra over item (a) above for:				
3.2.2.1	8.3.2 (b) (2)	Hard rock excavation including blasting and disposal of Excavated Rock	m^3	69		
3.2.2.2	PSDB 8.3.2(b)	(2) Non-explosive breaking as per instruction of the Engineer	m^3	50		
3.2.2.3		(3) Hand excavation and backfill where ordered by the Employer's Agent	m^3	50		
3.3	8.3.3.1	Make up deficiency in backfill material:				
3.3.1		(a) From other necessary excavations on site	m^3	300		
3.3.2		(c) By importation from commercial sources	m^3	300		
3.4.3	PSDB 8.3.4 a)	Shore trench opposite structure or service for depths				
3.4.3.1		(a) 0m up to 2m	m	50		
3.4.3.2		(b) 2m up to 3m	m	50		
3.4.3.3		(c.) 3m up to 4m	m	50		
3.4.3.4		(d) 4m up to 5m	m	50		
3.4.3.5		(e.) > 5m	m	50		
3,2	PSDB 8.3.2 b)	Extra over item (a) above for				
3.2.1		(6) Soilcrete backfill where directed by the Employer's Agent	m^3	62		
3.2.2		(8) Dump rock	m^3	250		
3.3	PSDB 8.3.3	Excavation ancillaries				
3,4	PSDB 8.3.3.3	Compaction in road reserves	m^3	298		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

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		SECTION 4				
	SANS 1200 L	**MEDIUM-PRESSURE PIPELINES**				
4.1	PSL 8.2.8	**Recover Old Pipeline**				
4.1.1		a) up to 2 m to pipe invert	m	200		
4.1.2		(b) up to 3 m pipe invert	m	250		
4.1.3		(c) up to 4 m pipe invert	m	250		
4.1.4		(d) over 4 m pipe invert	m	630		
4,1	8.2.1	Supply, Lay, and Bed Pipes				
4.2.1		(a) 600 mm ND, 8 mm thick in accordance with PSL 3.9.2	m	1 380		
4,3	8.2.2	Extra-over 4.2.1 for the Supplying, Laying, and Bedding of Specials Complete with Couplings				
4.3.1		a) 600 mm ND Grade X42 Steel steel pipe bends with bell ends, 8mm wall thickness, 12 mm Cement Mortar Lining, as per drawing				
4.3.1.1		(i) 15 degrees up to 30 degrees bell ends	No	22		
4.3.1.2		(ii) 30 degrees up to 45 degrees bell ends	No	11		
4.3.1.3		(iii) 45 degrees up to 60 degrees bell ends	No	9		
4.3.1.4		(iv) 60 degrees up to 75 degrees bell ends	No	6		
4.3.1.5		(v) 75 degrees up to 90 degrees bell ends	No	7		
4,5	8.2.11	Anchor/Thrust Blocks and Pedestals				
4.5.1		b) Where, at the tender stage, no detailed drawings or dimensions are given or where only typical drawings are given:				
4.5.1.1		Concrete	m^3	40		
4.5.1.2		Formwork	m^2	150		
4.5.1.3		Reinforcement	t	2		
4,5	PSL 8.2.13	**Valve and Hydrant Chambers, etc**				
4.5.1		Isolating valve chamber as per drawing no. JW14090R-AL-DET03-W with Class 35/19 reinforced concrete	No.	2		
4.5.2		Air valve chamber as per drawing no. JW14090R-AL-DET04-W with Class 35/19 reinforced concrete	No.	5		
4.5.4		Scour valve chamber as per drawing no. JW14090R-AL-DET05-W with Class 35/19 reinforced concrete	No.	3		
4.5.4		Water meter chamber as per drawing no. JW14090R-AL-DET06-W with Class 35/19 reinforced concrete	No.	2		
4.5.5		Pressure reducing valve chamber as per drawing no. JW100-DET10.2-W01 with Class 35/19 reinforced concrete	No.	3		
4.5.6		Pressure reducing valve chamber as per drawing no. JW14090R-AL-DET12-W with Class 35/19 reinforced concrete	No.	1		
4.5.7		Pressure reducing valve chamber as per drawing no. JW14090R-AL-DET10-W with Class 35/19 reinforced concrete	No.	1		
4,6	PSL 8.2.17	Connect to Existing Mains				
4.6.1		b) Etc for the other items				
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
4.6.1.1		i) Connection to the existing pipes at start point - Tie in 1 as shown on dwg JW14090R-AL-LAY02-W	No.	1		
4.6.1.2		ii) Connection to the existing pipes at Skeen PRV Station - Tie in 2 as shown on dwg JW14090R-AL-DET 08-W	No.	1		
4.6.1.3		iii) Connection to the existing 600 mm - Tie in 3 as shown on dwg JW14090R-AL-DET 09-W	No.	1		
4.6.1.4		iv) Connection to the existing pipes for chamber at 17th and Vincent Tshabalala St	No.	1		
4.6.1.5		v) Connection to the existing pipes for PRV chamber 14 in Far East Bank	No.	1		
4,7	PSL 8.2.19	**Cathodic Protection**				
4.7.1		i. Procurement of the services and a cathodic protection (CP) specialist for the temporary design of a CP system to be aligned with the existing JW system)	Prov. Sum	1	200 000,00	200 000,00
4.7.2		ii Implementation of the temporary cathodic protection system	Prov. Sum	1	800 000,00	800 000,00
4.7.3		iii. Procurement of the services and a cathodic protection (CP) specialist for the permanent design of a CP system to be aligned with the existing JW system)	Prov. Sum	1	500 000,00	500 000,00
4.7.4		iv. Implementation of the permanent cathodic protection system	Prov. Sum	1	2 500 000,00	2 500 000,00
4.7.5		v. Overheads, charges and profit on item i. to iv. above	%	15%	4 000 000,00	600 000,00
4,8	PSL 8.2.20	**Supply and install fittings assembly**				
4.8.1		for isolating valve chamber in line with specifications as per drawing no. JW14090R-AL-DET03-W				
4.8.1.1		Item No.IV1	No.	2		
4.8.1.2		Item No.IV2	No.	2		
4.8.1.3		Item No.IV3	No.	1		
4.8.1.4		Item No.IV4	No.	2		
4.8.1.5		Item No.IV5	No.	4		
4.8.1.6		Item No.IV6	No.	1		
4.8.1.7		Item No.IV7	No.	1		
4.8.1.8		Item No.IV8	No.	2		
4.8.1.9		Item No.IV9	No.	1		
4.8.1.10		Item No.IV10	No.	1		
4.8.2		for air valve chamber in line with specifications as per drawing no. JW14090R-AL-DET04-W				
4.8.2.1		Item No.AV1	No.	5		
4.8.2.2		Item No.AV2	No.	5		
4.8.2.3		Item No.AV3	No.	5		
4.8.2.4		Item No.AV4	No.	5		
4.8.3		for scour valve chamber in line with specifications as per drawing no. JW14090R-AL-DET05-W				
4.8.3.1		Item No.SV1	No.	1		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
4.8.3.2		Item No.SV2	No.	1		
4.8.3.3		Item No.SV3	No.	1		
4.8.3.4		Item No.SV4	No.	1		
4.8.3.5		Item No.SV5	No.	1		
4.8.3.6		Item No.SV6	No.	1		
4.8.4		for water meter chamber in line with specifications as per drawing no. JW14090R-AL-DET06-W				
4.8.4.1		Item No.WM2	No.	2		
4.8.4.2		Item No.WM3	No.	2		
4.8.4.3		Item No.WM4	No.	2		
4.8.4.4		Item No.WM5	No.	1		
4.8.4.5		Item No.WM6	No.	1		
4.8.4.6		Item No.WM7	No.	1		
4.8.4.7		Item No.WM8	No.	1		
4.8.4.8		Item No.WM9	No.	1		
4.8.5		for tie-ins in line with specifications as per drawing no. JW14090R-AL-DET08-W and JW14090R-AL-DET09-W				
4.8.5.1		Item No.SK1	No.	1		
4.8.5.2		Item No.SK2	No.	1		
4.8.5.3		Item No.SK3	No.	2		
4.8.5.4		Item No.SK4	No.	1		
4.8.5.5		Item No.SK5	No.	1		
4.8.5.6		Item No.SK6	No.	1		
4.8.4.8		Item No.SK7	No.	2		
4.8.5.8		Item No.SK8	No.	1		
4.8.5.9		Item No.LD1	No.	1		
4.8.5.10		Item No.LD2	No.	1		
4.8.5.11		Item No.LD3	No.	1		
4.8.5.12		Item No.LD4	No.	1		
4.8.5.13		Item No.LD5	No.	1		
4.8.5.14		Item No.LD6	No.	1		
4.8.5.15		Item No.LD7	No.	1		
4.8.6		For pressure reducing valve chamber in line with specifications as per drawing no. **JW14090R-AL-DET11-W**				
4.8.6.1		Item No. 1	No.	2		
4.8.6.2		Item No. 2	No.	3		
4.8.6.3		Item No. 3	No.	2		
4.8.6.4		Item No. 4	No.	1		
4.8.6.5		Item No. 5	No.	1		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
4.8.6.6		Item No. 6	No.	1		
4.8.6.7		Item No. 7	No.	1		
4.8.6.8		Item No. 8	No.	1		
4.8.6.9		Item No. 9	No.	1		
4.8.6.10		Item No. 10	No.	1		
4.8.6.11		Item No. 11	No.	1		
4.8.6.12		Item No. 12	No.	4		
4.8.6.13		Item No. 13	No.	2		
4.8.6.14		Item No. 14	No.	3		
4.8.6.15		Item No. 15	No.	1		
4.8.6.16		Item No. 16	No.	1		
4.8.6.17		Item No. 17	No.	1		
4.8.6.18		Item No. 18	No.	1		
4.8.6.19		Item No. 19	No.	1		
4.8.6.20		Item No. 20	No.	1		
4.8.6.21		Item No. 21	No.	1		
4.8.6.22		Item No. 22	No.	1		
4.8.6.23		Item No. 23	No.	1		
4.8.6.24		Item No. 24	No.	2		
4.8.7		for pressure reducing valve chamber in line with specifications as per drawing no. **JW100-DET10.2-W01**				
4.8.7.1		Item Nr 1	No.	2		
4.8.7.2		Item Nr 2	No.	2		
4.8.7.3		Item Nr 3	No.	2		
4.8.7.4		Item Nr 4	No.	2		
4.8.7.5		Item Nr 5	No.	2		
4.8.7.6		Item Nr 6	No.	1		
4.8.7.7		Item Nr 7	No.	1		
4.8.7.8		Item Nr 8	No.	1		
4.8.7.9		Item Nr 9	No.	1		
4.8.7.10		Item Nr 10	No.	2		
4.8.7.11		Item Nr 11	No.	2		
4.8.7.12		Item Nr 12	No.	2		
4.8.7.13		Item Nr 13	No.	2		
4.8.7.14		Item Nr 14	No.	1		
4.8.7.15		Item Nr 15	No.	2		
4.8.7.16		Item Nr 16 - BATTERY POWERED MAGFLOW METER WITH AUTOMATIC METER READER	No.	1		
TOTAL CARRIED FORWARD TO NEXT PAGE						
ITEM NO	**PAYMENT CLAUSE**	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
4.8.7.17		Item Nr 17	No.	1		
4.8.7.18		Item Nr 18 - BATTERY POWERED MAGFLOW METER WITH AUTOMATIC METER READER	No.	1		
4.8.7.19		Item Nr 19	No.	1		
4.8.7.20		Item Nr 20	No.	1		
4.8.7.21		Item Nr 21	No.	2		
4.8.7.22		Item Nr 22	No.	1		
4.8.7.23		Item Nr 23	No.	2		
4.8.8		for pressure reducing valve chamber in line with specifications as per drawing nos. **JWW14090R-AL-DET12-W and JWW14090R-AL-DET13-W**				
4.8.8.1		Item No.PV1A	No.	1		
4.8.8.2		Item No.PV1B	No.	1		
4.8.8.3		Item No.PV2B	No.	2		
4.8.8.4		Item No.PV2A	No.	1		
4.8.8.5		Item No.PV3	No.	2		
4.8.8.6		Item No.PV4	No.	3		
4.8.8.7		Item No.PV5	No.	1		
4.8.8.8		Item No.PV6A	No.	1		
4.8.8.9		Item No.PV6B	No.	1		
4.8.8.10		Item No.PV7	No.	1		
4.8.8.11		Item No.PV8	No.	2		
4.8.8.12		Item No.PV9A	No.	2		
4.8.8.13		Item No.PV9B	No.	2		
4.8.8.14		Item No.PV10	No.	3		
4.8.8.15		Item No.PV11	No.	4		
4.8.8.16		Item No.PV12	No.	1		
4.8.8.17		Item No.PV13	No.	1		
4.8.8.18		Item No.PV14	No.	2		
4.8.8.19		Item No.PV15	No.	1		
4.8.8.20		Item No.PV16	No.	1		
4.8.8.21		Item No.PV17	No.	1		
4.8.8.22		Item No.PV18	No.	1		
4.8.8.23		Item No.PV19	No.	1		
4.8.8.24		Item No.PV20	No.	3		
4,9	PSL 8.2.21	Rehabilitation of Valves	Prov. Sum	1	R 500 000	R500 000,00
4.10	PSL 8.2.22	Overheads, charges and Profit for the Rehabilitation of Valves, including removal, transport and re-installation	%		R 500 000	
4,11	PSL 8.2.23	Breaking and repairing sections of existing chamber walls to remove existing pipeline and install new pipeline, and reinstating	No.	3		
TOTAL CARRIED FORWARD TO NEXT PAGE						
ITEM NO	**PAYMENT CLAUSE**	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
4,12	PSL 8.2.24	Supply and install pipeline markers	No.	22		
4,13	PSL 8.2.25	Supply and install, test and make good 10 mm diameter ball valves	No.	12		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 5				
	SANS 1200LB	**BEDDING (PIPES)**				
5,1	PSLB 8.2.1	Provision of Bedding from Trench Excavations				
5.1.1	PSLB 8.2.1.1	Without the need for screening or other treatments:				
5.1.1.1		(a) Selected granular material	m^3	220		
5.1.1.2		(b) Selected fill material	m^3	66		
5,2	PSLB 8.2.1.3	Kaymat geotextile grade A6 or simillar approved. Surround to 19mm stone bedding	m^2	810		
5,3	8.2.2	Supply only of Bedding by Importation				
5.3.1	8.2.2.3	From commercial sources (Provisional)				
5.3.1.1		(a) Selected granular material	m^3	584		
5.3.1.2		(b) Selected fill material	m^3	183		
5,4	PSLB 8.2.4	Encasing of Pipes in Concrete				
5.4.1		a) Class 20Mpa/19mm concrete including reinforcement.	m^3	100		
5.4.2		b) Soilcrete encasement to pipes as directed by Employer's Agent	m^3	255		
5.4.3		c) Cellular concrete as directed by the Employer's Agent	m^3	637		
5,5	PSLB 8.2.2.3	**c) Special bedding materials**				
5.5.1		i) Supply and install 19 mm crushed stone	m^3	175		
5.5.2		ii) Supply and install geotextile filter blanket (Grade A4) to wrap item (i) above and as instructed by the Employer`s Agent	m^2	835		
TOTAL CARRIED TO SUMMARY PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 6				
	SANS 1200 G	**CONCRETE (STRUCTURAL)**				
6,1	8.3.1	Steel Bars				
6.1.1		Mild Steel	t	1		
6.1.2		High tensile steel	t	1		
6,2	8,4	SCHEDULED CONCRETE ITEMS				
6.2.1	8.4.2	Blinding Layer in 15/19 Concrete	m^3	1		
6.2.2	8.4.3	Strength Concrete, 35/19	m^3	1		
TOTAL CARRIED FORWARD TO SUMMARY PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 7				
7	**SANS 1200 LG**	**PIPE JACKING**				
7,1		**Jacking Establishment**				
7.1.1	8.2.1	(a) Fixed charges	Sum	1		
7.1.2	8.2.1	b) Time-related charges (period to be stated by the contractor): Period……..	Sum	1		
7,2	PSLG 8.2.6	**Supply and Install Pipes by Pipe Jacking Method, Complete with Excavations and grouting.** Supply and install 2400 mm OD diameter concrete pipes (Class 100D with external metal sleeve and butt joint) by pipe jacking method, complete with excavations in soft and intermediate material and grouting of external voids with a 1:2 cement and plasticiser mix, for the following road and railway crossings:				
7.2.1		i) Pipe Jacking No.2(Drawing No. JW14090R-AL-LAY11-W)	m	71		
7.2.2		ii) Pipe Jacking No.3(Drawing No. JW14090R-AL-LAY12-W)	m	18		
7.2.3		iii) Pipe Jacking No.4(Drawing No. JW14090R-AL-LAY13-W)	m	40		
7.2.4		iv) Pipe Jacking No.5(Drawing No. JW14090R-AL-LAY14-W)	m	79		
7.2.5		v) Pipe Jacking No.6(Drawing No. JW14090R-AL-LAY15-W)	m	20		
7.2.6		vi) Pipe Jacking No.7(Drawing No. JW14090R-AL-LAY16-W)	m	13		
7,3	8.2.8	Extra-Over 7.2 for Excavation in Rock				
7.3.1		a) Using pneumatic tools (where blasting is not used)	m^3	189		
7.3.2		b) Using explosives (where permitted)	m^3	100		
7,4	PSLG 8.2.13	Extra-Over 7.2 for Using Alternative Rectangular concrete section of 2100mm Wide x 2100mm Height internal dimensions AND 250mm wall thickness or similar approved.	m	1		Rate Only
7,5	PSLG 8.2.9	Grouting Voids				
		a) Grouting voids inside (annulus) pipe jacking sleeves with cement/sand grout (mix ratio 1:2 cement:sand with plasticiser)	m^3	60		
7,6	8.2.10	Standing Time for Pipe Jacking Gang and the Jacking Equipment Covered by 7.2.1	h	40		
7,7	PSLG 8.2.11	Brick Wall closures	No	14		
7,8	PSLG 8.2.12	Concrete pedestals complete with clamps as per detail (Drawing No. JW14090R-AL-LAY11-W to JW14090R-AL-LAY16-W, Section Through sleeve)	No	40		
		TOTAL CARRIED TO SUMMARY PAGE				

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	SECTION 8	**VALVE CHAMBERS**				
8	**SANS 1200DA**	**EARTHWORKS (SMALL WORKS)**				
8,1	8.3.1	**Excavation of top soil**				
8.1.1		(a) Remove top soil to nominal depth 150 mm, stockpile and maintain	m²	96		
8,2	8.3.2	**Restricted Excavation**				
8.2.1		(a) Excavate for restricted foundations, footings and trenches in all materials and use for backfill or embankment or dispose	m³	312		
8.2.2		b) Extra-over for				
8.2.2.1	8.3.2(b)	(2) Hard rock excavation	m³	12		
8,3	8.3.4	Importing of Materials from Commercial Sources	m³	73		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
		SECTION 8.3				
8,3	**SANS 1200DB**	**EARTHWORKS (PIPE TRENCHES)**				
8.3.1	PSDB 8.3.2(b)	(2) Non Explosive Breaking as per instruction of the Engineer	m^3	3		
8.3.2		Particular Items				
8.3.2.1	SANS 1200DB 8.3.4 a)	Shore trench opposite structure or service	m	160		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
		SECTION 8.4				
8,4	**SANS 1200G**	**CONCRETE (STRUCTURAL)**				
8.4.1	8,2	**Scheduled Formwork items**				
8.4.1.1	8.2.2	**Smooth**				
8.4.1.1.1		Horizontal, for chamber roof slab soffit				
8.4.1.1.1.1		(i) Scour Valves	m²	10		
8.4.1.1.1.2		(ii) Air Valves	m²	38		
8.4.1.1.1.3		(iii) Gate Valves	m²	39		
8.4.1.2		Vertical, for chamber walls including floor and roof slab;				
8.4.1.2.1		(i) Scour Valves	m²	110		
8.4.1.2.2		(ii) Air Valves	m²	110		
8.4.1.2.3		(iii) Gate Valves	m²	128		
8.4.1.3	8.2.5	Narrow widths up to 300mm wide:				
8.4.1.3.1		(i) Scour Valves	m²	33		
8.4.1.3.2		(ii) Air Valves	m²	90		
8.4.1.3.3		(iii) Gate Valves	m²	21		
8.4.1.4	8.2.6	Box Out Holes/Form Voids.				
8.4.1.4.1		d) Large, other than circular, of area over 0, l m² and up and including 0.5 m²				
8.4.1.4.1.1		(3) 1.0m to 1.5m deep	No.	2		
8.4.1.4.1.2		(4) 1.5m to 2.0m deep	No.	6		
8.4.1.4.1.3		(5) 2.0m to 5.0m deep	No.	16		
8.4.2	8,3	**Scheduled Reinforcement Items**				
8.4.2.1	8.3.1	(a) Steel Bars (High-tensile):				
8.4.2.1.1		(i) Scour valve chamber	kg	6679		
8.4.2.1.2		(ii) Air valve chambers	kg	44040		
8.4.2.1.3		(iii) Gate valve chambers	kg	13112		
8.4.2.1.4		(iv) Pressure reducing valve chamber	kg	6556		
8.4.2.2	8.3.2	(b) Welded Mesh (High - tensile)				
8.4.2.2.1		(i) Scour valve chamber	m²	20		
8.4.2.2.2		(ii) Air valve chambers	m²	80		
8.4.2.2.3		(iii) Gate valve chambers	m²	80		
8.4.2.2.4		(iv) Pressure reducing valve chamber	m²	80		
8.4.3	8,4	**Scheduled Concrete Items**				
8.4.3.1	8.4.2	75mm Blinding Layer concrete of grade 15/19 for:				
8.4.3.1.1		(i) Scour valve chamber	m³	1		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
8.4.3.1.2		(ii) Air valve chambers	m³	3		
8.4.3.1.3		(iii) Gate valve chambers	m³	3		
8.4.3.1.4		(iv) Pressure reducing valve chamber	m³	1		
8.4.3.2	8.4.3	**Structural concrete of grade 35/19 for:**				
8.4.3.2.1		(i) Scour valve chamber	m³	30		
8.4.3.2.2		(ii) Air valve chambers	m³	90		
8.4.3.2.3		(iii) Gate valve chambers	m³	30		
8.4.3.2.4		(iv) Pressure reducing valve chamber	m³	30		
8.4.3.3	8.4.4	**Unformed Surface Finishes**				
8.4.3.3.1		a) Wood-Float Finish for:				
8.4.3.3.1.1		(i) Scour valve chamber	m²	10		
8.4.3.3.1.2		(ii) Air valve chambers	m²	38		
8.4.3.3.1.3		(iii) Gate valve chambers	m²	39		
8.4.3.3.1.4		(iv) Pressure reducing valve chamber	m²	50		
TOTAL CARRIED FORWARD TO NEXT PAGE						
ITEM NO	**PAYMENT CLAUSE**	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
		SECTION 8.5				
8.5	PSHA	**STRUCTURAL STEELWORK (SUNDRY ITEMS)**				
8.5.1	PSHA 8.3.7	**Manhole cover**				
8.5.1.1		(a) Air valve chambers	No	5		
8.5.1.2		(b) Scour valve chambers	No	1		
8.5.1.3		(c) Gate valve chambers	No	2		
8.5.1.4		(d) Pressure reducing valve chamber	No	3		
8.5.2	PSHA 8.3.8	**Roof ventilators**				
8.5.2.1		(a) Air valve chambers	No	5		
8.5.2.2		(b) Scour valve chambers	No	1		
8.5.2.3		(c) Gate valve chambers	No	2		
8.5.2.4		(d) Pressure reducing valve chamber	No	3		
8.5.3	PSHA 8.3.9	**Internal Ladder**				
8.5.3.1		(a) Air valve chambers	No	5		
8.5.3.2		(b) Scour valve chambers	No	1		
8.5.3.3		(c) Gate valve chambers	No	2		
8.5.3.4		(d) Pressure reducing valve chamber	No	3		
TOTAL CARRIED FORWARD TO NEXT PAGE						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		TOTAL CARRIED FROM PREVIOUS PAGE				
		SECTION 8.6				
8.6	SANS 1200 DK	**GABIONS AND PITCHING**				
8.6.1	8.2.1	Surface preparation for bedding of gabions				
8.6.1.1		(a) Cavities filled with excavated material	m^2	40		
8.6.1.2	8.2.2	Gabions	m^3	8		
8.6.1.3	8.2.4	Geotextile	m^2	40		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		SECTION 9				
9,1	**SANS 1200C**	**SITE CLEARANCE**				
9.1.1	PSC 8.2.4	Reclear surfaces (only on instructtons from the Engineer)	m^2	200		
9,2	**PSC 8.2.14**	**Installing and reinstating palisade fencing**				
9.2.1		i) Supply and installation of concrete palisade fence 2400mm high of stacked pales, slid in between 3000mm high posts of 225mm x 140mm H-section post at 2000mm centres with 600mm bottom ends casts into and including 20MPa concrete footing in ground including excavation, ramming, removal of spoil and leaving clean and neat. Refer to Dwg JW14090R-AL-DET16-W	m	120		
9.2.2		**ii) Supply and installation of concrete palisade fence 2400mm high of stacked existing** pales, slid in between 3000mm high posts of 225mm x 140mm H-section post at 2000mm centres with 600mm bottom ends casts into and including 20MPa concrete footing in ground including excavation, ramming, removal of spoil and leaving clean and neat **(NB use existing pales on site).** Refer to Dwg No. JW14090R-AL-DET16-W	m	20		
9.2.3		iii) Supply and installation of a double swing gate. Refer to Dwg No. JW14090R-AL-DET16-W for gate details.	No.	2		
9,3	SANS 1200 ME	**SUBBASE**				
9.3.1	**PSME 8.3.11**	Rip and compact in-situ material on the drive way to 93% MOD AASHTO density 300 mm thick layer	m^3	77		
9.3.2	8.3.5	Construct the subbase course with material from commercial sources or designated horrow areas				
9.3.2.1		150mm thick layer subbase G6 selected gravel compacted to 95% MOD AASHTO	m^3	38		
9.3.2.2		150mm thick layer selected G6 selected gravel compacted to 93% MOD AASHTO	m^3	38		
9,4	SANS 1200 MJ	**SEGMENTED PAVING**				
9.4.1	8.2.1	Provision of Edge Restraints				
9.4.1.1		300mm x 300mm concrete (Class 25/19) edge beam	m	1		
9.4.2	8.2.2	Construction of paving complete				
9.4.2.1		Herringbone interlocking paving blocks type S-A (80 mm thick)	m²	256		
9.4.2.2	8.2.3	Cutting units to fit edge restaints	m	16		
9,5	SANS 1200 MK	**KERBING AND CHANNELING**				
9.5.1	8.2.1	Concrete kerbing				
9.5.1.1		(a) Fig 8a mountable kerbs	m	160		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
Item	**Payment**	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
10		SECTION 2: EARTHWORKS				
10,1	**SANS 1200DA**	**EARTHWORKS (SMALL WORKS)**				
10.1.1	10.3.6	Topsoiling	m^3	81		
10.1.2	10.3.7	Grassing or other Vegetation Cover	m^2	900		
10,2	SANS1200 DB	**EARTHWORKS (PIPE TRENCHES)**				
10.2.1	PSDB 10.3.1	**Site Clearance and (if specified) Removal of topsoil**				
10.2.1.1		c) Removal, stockpiling and replacing of Topsoil (depth stated)	m^3	5 559		
10.2.1.2	10.3.2	(a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material for				
		Subsurface drain width 700mm for depths: Over and Up to (Measured from bottom of excavation)				
10.2.1.2.1		1.0m 2.0m	m^3	350		
10.2.1.2.2		2.0m 3.0m	m^3	100		
10.2.1.2.3		3.0m 4.0m	m^3	10		
10.2.1.3		(b) Extra over Item (a) for:				
10.2.1.3.1		1) Intermediate excavation	m^3	40		
10.2.1.3.2		2) Hard rock excavation	m^3	40		
10.2.1.4	10.3.5	Existing Services-that Intersect or Adjoin a Pipe Trench				
10.2.1.4.1		b) Services that adjoin a trench	m	450		
10.2.1.5		Particular Items.				
10.2.1.5.1	PSDB 10.3.4(a)	Shore trench opposite structure or service for depths	m	450		
10.2.1.5.1.1		over 1.0m to 2.0m	m	50		
10.2.1.5.1.2		over 2.0m to 3.0m	m	240		
10.2.1.5.1.3		over 3.0m to 4.0m	m	150		
10.2.1.5.1.4		Over 4 m	m	10		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
Item	**Payment**	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
10,3		**SECTION 3: PIPEWORK**				
10.3.1	**SANS 1200L**	**MEDIUM-PRESSURE PIPELINES**				
10.3.1.1	PSL 10.2.25	Supply and installation of Kaypipe geopipe or similar approved for the seepage drain complete with all necessary fittings for the various pipe diameters				
10.3.1.1.1		ii) 160mm ID	m	350		
10.3.2	**SANS 1200LB**	**BEDDING (PIPE)**				
10.3.2.1	10.2.1	Provision of bedding from trench excavation				
10.3.2.1.1		b) Selected fill material	m³	700		
10.3.2.2	10.2.2	Supply only of Bedding by Importation				
10.3.2.2.1	10.2.2.3	From commercial sources				
10.3.2.2.1.1		a) Selected granular material	m³	240		
10.3.2.3		SUBSOIL DRAINS				
10.3.2.3.1	PSLB 10.2.1.4	Supply and installation of up to 2m deep flownet drainage core with bidum filter jacket and all necessary fittings	m	1000		
10.3.3	**SANS 1200LD**	**SEWERS**				
10.3.1	PS4.2.26.1	Supply and Installation of pipe through Horizontal Direction Drilling (HDD)				
10.3.1.1		160mm dia class 16 HDPE pipe	m	100		
10.3.3.2	PSLD 10.2.3	Manholes				
10.3.3.2.1		Construct leachate manhole complete as shown on drawings	No.	1		
10.3.3.3	PSLD 10.2.11	Connection to existing sewer	No.	1		
TOTAL CARRIED FORWARD TO SUMMARY						

Contract JW14090R
Replacement of 600 mm Diameter Bulk Steel Water Pipeline from Linbro Reservoir to Alexandra Township

ITEM NO	PAYMENT CLAUSE	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT

SUMMARY OF SCHEDULE OF QUANTITIES		
PART	**DESCRIPTION**	**AMOUNT (RAND)**
SECTION 1	GENERAL	
SECTION 2	SITE CLEARANCE	
SECTION 3	EARTHWORKS (PIPE TRENCHES)	
SECTION 4	MEDIUM-PRESSURE PIPELINES	
SECTION 5	BEDDING (PIPES)	
SECTION 6	CONCRETE (STRUCTURAL)	
SECTION 7	PIPE JACKING	
SECTION 8	VALVE CHAMBERS	
SECTION 9	PAVING & FENCING	
SECTION 10	LEACHATE DRAIN	
COST SUMMARY		
	TOTAL PROJECT COST	
	CONTRACT PRICE ADJUSTMENT	
	SUBTOTAL	
	CONTINGENCIES (10%)	
	SUBTOTAL	
	ADD 15% VAT	
	GRAND TOTAL INCLUSIVE OF 15 % VAT	

Johannesburg Water SOC Ltd

REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 2

CONTRACT

PART 3:

SCOPE OF WORK

Employer:		**Contractor:**	
Witness:		**Witness:**	

C3 PREAMBLE TO SCOPE OF WORK

GENERAL

The Standard Specification for all associated civil work shall be the SANS 1200 – Standardized Specification for Civil Engineering Construction.

The Standardized Specifications applicable to this Contract are listed in the Project Specification.

These Specifications are not issued with this volume but are available at the Contractor's expense from: SA Bureau of Standards, Private Bag X191, Pretoria, 0001.

SCOPE

This Project Specification is set out in three portions:

Portion 1: PROJECT SPECIFICATION covers a general description of the project, the facilities available and the requirements to be met.

Portion 2: VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS covers variations to the standardized specifications and particular specifications which are applicable to the contract.

Portion 3: PARTICULAR SPECIFICATIONS.

STATUS

Should any requirement of the Project Specification conflict with any requirement of the standardized or particular specifications, the requirements of the Project Specifications shall prevail.

ABBREVIATIONS AND DEFINITIONS

For the purpose of this Contract the following abbreviations shall have the associated meaning:

BEE	Black Economic Empowerment
BS	British Standard
CE	Civil Engineering
CESA	Shall mean the Consulting Engineers South African
CETA	Shall mean the Construction Education and Training Authority
CIDB	Construction Industry Development Board
CLO	Shall mean Community Liaison Officer
CoJ	City of Johannesburg
CONTRACT	
HDI and HDC	Shall mean historically disadvantage individuals and companies
CONTRACT AREA	shall mean the area within the boundary of the Project Area with suburbs listed under the contract scope
COP	Code of Practice for Work within the Road Reserve
ECSA	Engineering Council of South Africa
EDA	Enterprise Declaration Affidavit
ERF Connection	Shall mean a water connection from the secondary mains to property boundary
EMP	Environmental Management Plan
EPWP	Expanded Public Works Programme
Ext	Extension
GCC	General Conditions of Contract
GIS	Geographic Information System
JRA	Johannesburg Road Agency
JW	Johannesburg Water (SOC) Ltd
KL	Kilolitres
L	Litres
LOCAL	Shall mean within firstly the suburb/s
LOS	Level of Service
ML	Megalitres
Mod AASHTO	Modified American Association of State Highway and Transportation Officials
PROJECT AREA	Shall mean the area within the boundary of Soweto in Johannesburg, South Africa
PROPERTY	Shall mean a stand or sub-division thereof resulting in the separate issue of water and /or other service accounts to owner or occupier
PROPERTY CONNECTION	Shall mean a pipe which connects a property drain to a collector sewer or manhole or the meter to the secondary supply mains. In addition to

	straight pipes, it includes a junction on the collector sewer or saddle on the secondary supply mains
PRV	Pressure Reducing Valve
QAS	Shall mean quality assurance system
QCF	Quality Control Foreman
SABS	South African Bureau of Standards
SANS	South African National Standard
SERVICE PROVIDER	Shall mean either a consultant or contractor appointed to provide a particular service, i.e. investigations, design, labour provision and/or construction.
SMME	Shall mean small, medium and micro enterprises
SOP	Standard Operating Procedure
STAND	Shall mean a demarked portion of property as per drawing/s provided by JW and shall exclude many stands designated for purposes other than human occupancy business trade etc
uPVC	Unplasticised Polyvinyl Chloride
WISA	Shall mean Water Institution of South Africa
VAT	Shall mean Value Added Tax in terms of the Value Added Tax Act 89 of 1991 as amended
YARD CONNECTION	Shall mean on property connection on any point

For the purpose of this Contract the following shall have the associated meaning: a) Unless inconsistent with the context, an expression which denotes:

i) any gender includes the other genders;
ii) a natural person includes a juristic person and vice versa; and
iii) the singular includes the plural and vice versa.

TABLE OF CONTENTS

ABBREVIATIONS AND DEFINITIONS

PORTION 1 PROJECT SPECIFICATION

PS1 DESCRIPTION OF THE WORKS
PS1.1 EMPLOYER'S OBJECTIVES
PS1.2 OVERVIEW OF THE WORKS
PS1.3 EXTENT OF THE WORKS
PS1.4 LOCATION OF THE WORKS
PS1.5 TEMPORARY WORKS

PS2 ENGINEERING
PS2.1 EMPLOYER'S DESIGN
PS2.2 DRAWINGS

PS3 PROCUREMENT
PS3.1 PREFERENTIAL PROCUREMENT PROCEDURES
PS3.2 SUBCONTRACTING

PS4 CONSTRUCTION
PS4.1 APPLICABLE STANDARDS
PS4.2 PARTICULAR GENERIC SPECIFICATIONS
PS4.3 ELECTRICAL EARTHING AND BONDING
PS4.4 CONSTRUCTION EQUIPMENT
PS4.5 PLANT AND MATERIALS
PS4.6 EXISTING SERVICES
PS4.7 SITE ESTABLISHMENT
PS4.8 SITE USAGE
PS4.9 PERMITS AND WAYLEAVES
PS4.10 INSPECTION OF ADJOINING PROPERTIES
PS4.11 WATER, SANITATION AND ELECTRICITY FOR CONSTRUCTION PURPOSES
PS4.12 ALTERATIONS, ADDITIONS, EXTENSIONS AND MODIFICATIONS TO EXISTING WORKS
PS4.13 SURVEY CONTROL AND SETTING OUT OF THE WORKS

PS5 MANAGEMENT OF THE WORKS
PS5.1 APPLICABLE SANS 1921 STANDARDS
PS5.2 PLANNING AND PROGRAMMING
PS5.3 SEQUENCE OF THE WORKS
PS5.4 SOFTWARE APPLICATION FOR PROGRAMMING
PS5.5 METHODS AND PROCEDURES
PS5.6 QUALITY PLANS AND CONTROL
PS5.7 ACCOMMODATION OF TRAFFIC ON PUBLIC ROADS OCCUPIED BY THE CONTRACTOR

PS5.8 OTHER CONTRACTORS ON SITE
PS5.9 TESTING, COMPLETION, COMMISSIONING AND CORRECTION OF DEFECTS
PS5.10 RECORDING OF WEATHER AND ABNORMAL RAINFALL
PS5.11 FORMAT OF COMMUNICATIONS
PS5.12 KEY PERSONNEL
PS5.13 MANAGEMENT MEETINGS
PS5.14 FORMS FOR CONTRACT ADMINISTRATION
PS5.15 DAILY RECORDS
PS5.16 BONDS AND GUARANTEES
PS5.17 PAYMENT CERTIFICATES
PS5.18 INSURANCES PROVIDED BY THE EMPLOYER

PS6 FEATURES REQUIRING SPECIAL ATTENTION
PS6.1 PROJECT PARTICIPATION STRUCTURE
PS6.2 PRACTICAL COMPLETION
PS6.3 PROVISION AND GENERAL ITEMS FOR THE SMMES
PS6.4 PROVISION OF A STANDBY PLUMBING TEAM (SPT)
PS6.5 QUALITY CONTROL FOREMEN
PS6.6 ON-PROPERTY INTERVENTION SURVEY AND REPAIRS
PS6.7 SKILLED PLUMBERS
PS6.8 NEGOTIATIONS WITH PROPERTY OCCUPANTS
PS6.9 SECURITY
PS6.10 OPERATION OF VALVES
PS6.11 WORK OUTSIDE NORMAL WORKING HOURS
PS6.12 COMMUNITY LIAISON AND COMMUNITY RELATIONS
PS6.13 NOTICES AND WARNING TO CONSUMERS
PS6.14 CONTINUITY OF SERVICE SUPPLY TO CUSTOMERS
PS6.15 REINSTATEMENT OF ASPHALT BY JRA
PS6.16 LABOUR INTENSIVE CONSTRUCTION
PS6.17 ADDITIONAL PROTECTION ON ROAD WAYS
PS6.18 POLITICAL AND COMMUNITY UNREST
PS6.19 INDEMNITY CERTIFICATE
PS6.20 RETURN OF MATERIALS
PS6.21 SUSPENSION OF CERTAIN ACTIVITIES
PS6.22 PROTECTION AGAINST WATER AND STORMS
PS6.23 NOTICES, SIGNS AND BARRICADES
PS6.24 FINISHING-OFF AND TRIMMING
PS6.25 INFORMATION SUPPLIED BY THE EMPLOYER`S AGENT
PS6.26 PROTECTION OF FURNITURE AND EQUIPMENT
PS6.27 SITE MAINTENANCE
PS6.28 IDENTITY CARD FOR ACCESS TO PROPERTIES
PS6.29 CHANGES IN THE WORKS SCOPE
PS6.30 GENERAL TECHNICAL REQUIREMENTS

PS7 HEALTH AND SAFETY FOR CONSTRUCTION WORK

PS7.1 PROJECT-RELATED OCCUPATIONAL HEALTH AND SAFETY RISKS
PS7.2 GUIDE TO RISK ASSESSMENTS

PORTION 2 VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS

PORTION 3 PARTICULAR SPECIFICATIONS

PA Small diameter pipework and ancillary work within erven (yard connections)

PD Employment and training of labour

PORTION 1: PROJECT SPECIFICATION

PS1 DESCRIPTION OF THE WORKS

PS1.1 EMPLOYER'S OBJECTIVES

The Employer's objectives, as a water and sanitation service provider for the City of Johannesburg (CoJ), are to:

a) To replace a section of the 600 mm nominal diameter (ND) pipeline which is 1 380 m in length. The full length of the pipeline of 2 460 m starts at Linbro Park Reservoir and ends at Bhekilanga PRV Station in Alexandra Township.
b) To decommission, remove and transport the recovered existing pipeline pipes, valves and other fittings and transport them to Zandfontein North Johannesburg Water Depot.
c) To install cathodic protection for the entire length of the 600 mm ND pipeline in a manner that seamlessly integrates the system with all existing mains running parallel to or connected to the 600 mm ND pipeline.
d) To not disturb the water supply or any other services to customers in Alexandra during the implementation of the 600 mm ND pipeline.
e) To reduce shutdown period to a minimum during pipe interconnections or connection to reservoirs and to adhere fully to the Johannesburg Water's and other stakeholders' shutdown protocol.
f) To reduce the Alexandra Water Infrastructure's Non-Revenue Water (NRW) percentage as a result of severe water leaks and losses emanating from the existing 600 mm ND bulk steel pipeline from the Linbro Park Reservoir to Alexandra
g) To use this construction project to address social and economic deliverables by:
    i. Targeting local labour through the application of the EPWP principles in the contract, and
    ii. Targeting SMME (contractors and suppliers) to benefit through the supply of some of the project materials and implementation of some of the project components.
h) To undertake the project in a safe and healthy environment for JW employees, the service providers employees and the general public.
i) To undertake the project in compliance with all legislative requirements.
j) To successfully procure the construction/installation of the infrastructure covered in this document in a fair and unbiased manner.

PS1.2 OVERVIEW OF THE WORKS

This contract comprises:

a. The decommissioning of the existing 600 ND pipeline from Linbro Park Reservoir to Bhekilanga PRV Station.
b. Removal of old pipes and associated fittings and transporting them for storage at JW Zandfontein North Depot in line with JW stores protocol.
c. The implementation of a replacement of a section of the 600 mm ND steel bulk pipeline, associated gate, scour and air valves including valve chambers
d. The execution of pipe-jackings across roads belonging to Johannesburg Roads Agency and SANRAL in a manner that meets requirements of the respective road agencies, the City of Johannesburg as well as JW.

e. Tying in the newly replaced pipeline section into the remaining portion of the 600 mm ND steel pipeline connecting Linbro Park Reservoir and the Alexandra water network, meeting all prescribed JW requisite acceptance criteria.
f. Implementing cathodic protection system to the pipeline.
g. Reinstatement of the project site
h. Leachate drainage works

PS1.3 EXTENT OF THE WORKS

The Works to be completed under this Contract are as follows:

a. Contractor site establishment.
b. Setting out of the route of the pipeline to be replaced.
c. Detection and or location of existing services along the pipeline route.
d. Pipeline route clearance.
e. Removal of top soil
f. Recovery of existing pipeline pipes, valves etc.
g. Trench excavation.
h. Supply pipe bedding.
i. Supply and installation of 1 380 m long 600 mm ND, 8mm thick Grade X42 steel pipes, cement-mortar lined internally and coated externally with fusion bonded medium density polyethylene.
j. Supply and install isolating and air valves.
k. Construct and/or install valve chambers and all associated steel pipe work required within the chambers,
l. Backfill the trench and all other excavations with fill material according to specification.
m. Dispose of surplus material and reinstate the topsoil and surface area.
n. Installation of pipe through pipe jacking on five road crossings.
o. Installation of cathodic protection for the entire pipeline length from the reservoir at the Linbro Park precinct to Bhekilanga PRV Station.
p. Training of targeted individuals from the contractor labour force in line with JW contractual requirements.
q. Testing and commissioning of completed works
r. Rehabilitation of project Site.
s. De-establishment of site establishment.
t. Submit all required documentation with handover (internal and external) of the pipeline.
u. The Contractor's obligations shall also include strict compliance with any Environmental requirements and/or reports deemed to form part of this Contract as well as any Occupational Health and Safety requirements.

This description of the works is not necessarily complete and shall not limit the work to be carried out by the Contractor under the Contract. Approximate quantities of each type of work are given in the Schedule of Quantities.

Other requirements of the Contractor:

i. Establishes the risk associated with the implementation of the works,
ii. Procurement of the required labour, services, plant and material,
iii. Deliver and install all required plant and material to site,

iv. The Contractor shall ensure that it and its subcontractors meet the Quality Control Plan (QCP) requirements.
v. The Contractor shall procure subcontractors in line with PS3.2.

PS1.4 LOCATION OF THE WORKS

Below are the estimate start and end coordinates for the pipeline section to be replaced as shown in Figure 1.

Start Coordinates:	26° 6'13.00"S	28° 7'32.00"E
End Coordinates:	26° 6'2.09"S	28° 6'59.88"E



Figure 1: Locality Map - 600 mm ND pipeline to be replaced.

PS1.5 TEMPORARY WORKS

The Contractor shall, as relevant:

a) construct and maintain haulage, temporary access and construction roads, subject to the approval of the Employer, and permit the Employer, other Contractors, statutory bodies or any other person who might require legitimate access to or through the site

for the purpose of executing legitimate business, free and unhindered usage of such roads.

b) provide temporary water connections, Site offices, storage sheds, latrines.
c) barricade the Works and the Works shall be located in an approved position, subject to the approval of all authorities concerned.
d) provide safety and security of the Contractors' temporary works at the Contractors' discretion, but always in accordance with stipulated Occupational Health and Safety requirements.
e) provide a camp that is adequately guarded during or outside working hours.
f) include the works required to locate, verify and protect existing services within the Works area;
g) ensure no or limited interruption to vehicular and pedestrian traffic and be such that existing stormwater flow shall not be impeded during survey and construction activities.
h) provide hoarding, temporary drainage works, temporary pumps and other equipment as might be necessary for the protection, draining and dewatering of the works.
i) include the works required to locate, verify and protect existing services within the project area.
j) Ensure activities do not endanger the safety and or security of other establishments adjoining or along the project route.
k) provide stormwater and river flow control to allow excavation.
l) provide any other works necessary for the smooth operation of construction plant, personnel, materials and equipment.
m) provide temporary access structures and work platforms

Further the Contractor shall note that no stockpiling of materials, plant, excavated material or any other construction related infrastructure shall be allowed in locations that may interfere with the operations of the Employer and the public in general.

PS2 ENGINEERING

PS2.1 EMPLOYER'S DESIGN

The Contractor undertakes only construction based on designs issued by the Employer. The Contractor is to follow the specification, the design and construction drawings as laid out by the Employer.

PS2.2 DRAWINGS

PS2.2.1 Volume 4: Tender drawings

Drawings are included in Volume 4 of this Contract Document based on current available information. Such drawing may be updated (based on actual site situation uncovered during execution of the works) and re-issued during the Contract Period as required.

Drawings include:

a) Layout drawings

b) Typical construction details.

Drawing No.	Description
JW14090R-AL-LAY00-W	LOCALITY PLAN & LIST OF DRAWINGS
JW14090R-AL-LAY01-W	SITE PLAN
JW14090R-AL-LAY02-W	PLAN & LONGSECTION, CH 0+000.00 - CH 2+460.00
JW14090R-AL-LAY11-W	PIPE JACKING 2 - N3 ON & OFF RAMPS SOUTH (REV.A)
JW14090R-AL-LAY12-W	PIPE JACKING No. 3 N3 ON RAMP SOUTH
JW14090R-AL-LAY13-W	PIPE JACKING No. 4 N3 OFF RAMP SOUTH
JW14090R-AL-LAY14-W	PIPE JACKING No. 5 N3 DUAL CARRIAGEWAY
JW14090R-AL-LAY15-W	PIPE JACKING No. 6 SOUTH AFRICAN BOULEVARD
JW14090R-AL-LAY16-W	PIPE JACKING No. 7 LENIN DRIVE
JW100-DET02-W01	STANDARD DETAIL WATER BEDDING DETAILS
JW100-DET05-W01	STANDARD DETAIL TYPICAL THRUST BLOCK DETAILS
JW100-DET12-W01	DETAILS OF SERVICE MARKERS
JW100-DET10.2-W01	TYPICAL 150 Ø PRESSURE REDUCING VALVE CHAMBER
JW100-DET01-SC01	STANDARD DETAIL FOR SITE CAMP
JW14090R-AL-DET01-W	STANDARD NAME BOARD DETAIL SHEET 1 OF 2
JW14090R-AL-DET02-W	STANDARD NAME BOARD DETAIL SHEET 2 OF 2
JW14090R-AL-DET03-W	ISOLATING VALVE
JW14090R-AL-DET04-W	AIR VALVE
JW14090R-AL-DET05-W	SCOUR VALVE
JW14090R-AL-DET06-W	450mm BULK WATER METER CHAMBER
JW14090R-AL-DET07-W	TIE-IN CONNECTION DETAILS - SKEEN
JW14090R-AL-DET09-W	TIE-IN CONNECTION DETAILS – LENIN DRIVE
JW14090R-AL-DET10-W	300Ø PRESSURE REDUCING VALVE CHAMBER
JW14090R-AL-DET11-W	300Ø PRESSURE REDUCING VALVE CHAMBER – PIPE SCHEDULE
JW14090R-AL-DET12-W	200mmØ PRV CHAMBER (17th AVENUE & VINCENT TSHABALALA ROAD)
JW14090R-AL-DET13-W	200mmØ PRV CHAMBER (17th AVENUE & VINCENT TSHABALALA ROAD) – PIPE FITTING SCHEDULE
JW14090R-AL-DET14-W	SKEEN PRV CHAMBER FENCING AND ACCESS ROAD PLAN
JW14090R-AL-DET15-W	BHEKILANGA PRV CHAMBER - PALISADE FENCE
JW14090R-AL-DET16-W	PALISADE FENCING AND INTERLOCKING

PS2.2.2 Construction drawings

Upon receiving the instruction to commence with construction, the Contractor shall receive 3 sets of construction drawings, of which 1 set shall be designated for as-built records and updated by the Contractor daily. The latter shall be:

a) made available to the Employer's Agent or his duly authorised representative within 24hours on request;

b) submitted to the Employer's Agent with the Contractor's request for issue of the Practical Completion Certificate. Practical Completion shall only be granted upon satisfactory receipt of all as-built data.

PS3 PROCUREMENT

PS3.1 PREFERENTIAL PROCUREMENT PROCEDURES

PS3.1.1 Requirements

The Contractor's attention is drawn to the following returnable schedules contained in Part T2:

a) Empowerment and Preferential procurement (JW10);and
b) Enterprise Declaration Affidavit (to be endorsed by a commissioner of oaths) (JW11) These schedules contain all requirements with regard to preferential procurement.

No additional points shall be awarded for targeted construction procurement as stated below.

PS3.1.2 Resource standards pertaining to targeted procurement

The following SANS Construction Procurement Standards are applicable:

SANS 294 2004 : Construction procurement processes, methods and procedures
SANS 1914-1 2002 : Targeted construction procurement – Part 1: Participation of targeted enterprises
SANS 1914-2 2002 : Targeted construction procurement – Part 2: Participation of targeted partners in joint ventures
SANS 1914-3 2002 : Targeted construction procurement – Part 3: Participation of targeted enterprises and targeted partners in joint ventures
SANS 1914-4 2002 : Targeted construction procurement – Part 4: Participation of targeted enterprises and targeted labour (local resources)
SANS 1914-5 2002 : Targeted construction procurement – Part 5: Participation of targeted labour
SANS 1914-6 2002 : Targeted construction procurement – Part 6: Participation of targeted enterprises in concession contracts
SANS 10396 2003 : Implementing preferential construction procurement policies using targeted procurement procedures
SANS 10403 2003 : Formatting and compilation of construction procurement documents

The Contractor shall deliver the following deliverables as described in the October 2007 edition of the CIDB Specification for Social and Economic Deliverables in the Construction Contracts (SSED) (www.cidb.org.za) and the following associated specification data:

CLAUSE NUMBER	SPECIFICATION DATA
Deliverable C1: Provide business opportunities for targeted enterprises	
The specification data associated with SANS 1914–1 is as follows:	
2.7	The name of the Employer's Agent is Lidwala Consulting Engineers (SA) Pty Ltd
2.17	A targeted enterprise is: a) a qualified plumber or contractor with a CIDB contractor grading of up to 3CE acting in a capacity of a subcontractor and b) a supplier of building materials or any other services (such as fuel, etc.) required for the execution of the contract. Such targeted enterprises must be located within the target area as defined in the Contract.
	The contract participation goal is 30% (minimum)
	The contract participation goal may only be achieved by: a) Subcontracting work to one or more targeted enterprises to perform commercially useful functions in the performance of the contract, and b) Purchasing materials and other services required for the execution of the contract from one or more targeted enterprises.
	The targeted enterprise declaration and letters of undertakings are to be submitted 3 months of the commencement of the contract.
Deliverable C2: Procure subcontractors for defined portions of the contract in terms of the specified procedures	
4.5.1	Refer to PS3.2. below
4.5.2	Refer to PS3.2. below

PS3.2 SUBCONTRACTING

This tender is subject to the subcontracting condition as described in item 3.11.1 of the Tendering Procedures and must be adhered to by the main contractor. It is also the obligation of the main contractor to impart skills to the subcontractor/s on the project during implementation. Although a minimum of 30% of the contract value has been identified for this project, the contractor may increase this percentage at their discretion.

An assessment to determine whether it is feasible to subcontract 30% of the contract was conducted and the activities listed below were identified as activities that will be subcontracted on the project:

- Security services
- Site clearance and earthworks.
- The recovery of the existing pipeline which is to be replaced.
- Construction of valve chambers
- Training
- Leachate drain works
- Reinstatements

The target area for this Contract is Alexandra Township in Johannesburg.

The budget for the work to be subcontracted in terms of Regulation 9 of the Preferential Procurement Policy Framework Act can be allowed for by the bidder under the following schedules:

- SMME Contractor Package 1 Valve Chambers (Part 4: Bill of Quantities)
- SMME Contractor Package 2 Earthworks (Part 5: Bill of Quantities)
- SMME Contractor Package 3 Training And Corporate Social Responsibility (Part 6: Bill of Quantities)
- SMME Contractor Package 4 Paving & Fencing (Part 7: Bill of Quantities)
- SMME Contractor Package 5 Leachate Drain (Part 8: Bill of Quantities)

NB: all subcontractors appointed on this contract must comply with the Central Supplier Database (CSD) requirements, i.e they must be registered on the CSD.

PS4 CONSTRUCTION

PS4.1 APPLICABLE STANDARDS

NATIONAL STANDARDS

The Standard Specifications for all associated civil work applicable to this Contract shall be:

SANS **Description**

28 : Metal ties for cavity walls (1986)
227 : Burnt clay masonry units (2007)
282 : Bending dimensions and scheduling of steel reinforcement for concrete (2004)
523 : Limes for use in building (2007)
558 : Cast iron surface boxes and manhole and inspection covers and frames (1973)
674 : 2008
920 : Steel bars for concrete reinforcement (2005)
1024 : Welded steel fabric for reinforcement of concrete (2006)
1083 : Aggregates from natural sources - Aggregates for concrete (2006)
1090 : Aggregates from natural sources - Fine aggregates for plaster and mortar (2002)
62-1 & 719 : PIPES
1200 A : General (1986)

1200 AB : Engineer`s office (1986)
1200 C : Site clearance (1980)
1200 D : Earthworks (1988)
1200 DB : Earthworks (Pipe trenches) (1989)
1200 DK : Gabions and Pitching (1996)
1200 G : Concrete (Structural) (1982)
1200 GA : Concrete (Small works) (1982)
1200 GE : Precast Concrete (1984)
1200 L : Medium-pressure pipe lines (1983)
1200 LB : Bedding (Pipes) (1983)
1200 LC : Cable ducts (1981)
1200 LF : Erf connection (water) (1983)
1200 LG : Pipe jacking (1983)
1200 DM : Earthworks (Roads,Subgrade) (1981)
1200 LD : Sewers (1982)
1491-1 : Portland cement extenders Part 1: Ground granulated blast-furnace slag (2005)
1491-2 : Portland cement extenders Part 2: Fly ash (2005)
1491-3 : Portland cement extenders Part 3: Silica fume (2005)
1882 : Polymer concrete surface boxes, manhole and inspection covers, gully gratings and frames (2003)
50197-1/ : Cement - Part 1: Composition, specifications and conformity criteria for common
EN 197-1 cement
5831 : Presence of chlorides in aggregates
5861-2 : Concrete tests - Sampling of freshly mixed concrete (2006)
5862-1 : Concrete tests - Consistence of freshly mixed concrete - Slump test (2006)
5863 : Concrete tests - Compressive strength of hardened concrete (2006)
5864 : Concrete tests - Compressive strength of hardened concrete (2006)
5865 : Concrete tests - The drilling, preparation, and testing for compressive strength of
cores taken from hardened concrete (1994)
0268-1 : Welding of thermoplastics – Welding Processes
1476:2009: Fabricated flanged steel pipework

Reference is made to certain provisions of:

SANS 1921-5 Construction and management requirements for works contracts: Earthworks activities which are to be performed by hand
SANS 1914-5 Targeted construction procurement: Participation of targeted labour

These Specifications are not issued with this volume but are available at the Contractor's expense from Standards South Africa:

Physical	Postal	Telephone	Fax No.	Email Address

Address	Address	No.		
1 Dr Lategan Road, Groenkloof PRETORIA	Private Bag X191 PRETORIA 0001	012 428 7911	012 344 1568	sales@sabs.co.za

For "Workmen's Compensation Act" read "Compensation for Occupational Injuries and Diseases Act, 1993 (Act No.130 of 1993)" wherever it appears. For "Machinery and Occupational Safety Act" and "Mines and Works Act" read "Occupational Health and Safety Act, 1993 (Act 85 of 1993)" wherever they appear. For "maintenance period" read "Defects Liability Period in terms of Clause 1.1.1.13 of the General Conditions of Contract, 2015" wherever it appears

OTHER STANDARDS
Other Standard Specifications for applicable to this Contract shall be:

a) ASTM C.309 Type 1 (Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete)
b) WRC MSCC
c) City of Johannesburg Metropolitan Municipality, Public Road and Miscellaneous By-laws, Code of Practice for work in the road reserve (COP), Latest Version. ***NOTA BENE****: Should any requirement of this COP conflict with any requirement of the standardised or particular specifications the requirements of the COP shall prevail.* The COP is available at Johannesburg Roads Agency Offices, Wayleaves Department, Contact number: (011) 298 5000

PS4.2 PARTICULAR GENERIC SPECIFICATIONS

PS4.2.1 Particular specifications

The following generic particular specifications are included in portion 3 of this document:

a) PD: Employment and training of labour

PS4.2.2 Horizontal directional drilling

This section shall cover the installation of pipes using horizontal directional drilling method, also referred to as directional boring or guided horizontal boring. It includes, at a minimum, requirements for design, materials and equipment used, pipe requirements and accessories.

During this drilling process a device shall mechanically be driven through the various types of soils, at a designed route and grade creating a pilot hole, followed by various activities to stabilize and enlarge the bore, before the new pipe is inserted.

PS4.2.2.1 **Materials**

All materials used for the construction of localised replacement or repair, shall, where such mark has been awarded for a specific type of material, bear the SABS mark. Additionally all materials installed and supplied by the Contractor shall be guaranteed to be free from defects

which may result from the manufacture, transportation, installation or any other process or factors. In this regard the Contractor shall take necessary precautions to ensure the integrity of materials is not compromised during handling or installation.

For pipes materials, jointing materials and corrosion protection, refer to SANS 1200L (Medium pressure pipelines) and SANS 1200LD (Sewers), as and if amended for this Contract.

PS4.2.2.2 **Drilling equipment** a)

Drilling equipment:

The drilling equipment shall include a hydraulically power system to rotate, push and pull hollow drill pipe into the ground at variable angles, while delivering a pressurized fluid mixture to guide the drill head. The equipment shall:

i) have adequate capacity to execute the drilling and pipe installation forces. Have a hydraulic powered system that shall be:

ii) self-sufficient with adequate pressure and volume to power required drilling operations be leak free, have a system which allows for the monitoring of the maximum pull-back pressure during pull-back operations and be securely anchored during pull-back operations have systems that:

- have adequate safety features to protect operators and public, including guarding against electrocution; and
- alarm system on the drilling equipment capable of detecting electrical current as the equipment approaches electric lines iii) have a steerable type drill head and have the required cutting surfaces and drilling fluid jets.

iv) have mud motors that have sufficient power to turn the required drilling tools.

b) Guidance system:

The system shall:

i) be capable of tracking at depths as required for the execution of the Works and in any soil conditions, inclusive of rock.

ii) allow the operator to guide the drill head by providing immediate information at an interface.

iii) be of a proven type and shall ONLY be operated by experienced and trained personnel. The operator is to be aware of any geo-magnetic variance and shall take into account the influences thereof in the operation of the guidance system, if magnetic system is being used.

c) Drilling fluid system:

The system shall:

i) be self-contained, closed and of a sufficient size to mix and deliver the drilling fluid composed of bentonite clay, potable water and appropriate additives (***NOTA BENE***: Additives are to have no adverse effects on the environment);

ii) ensure that the mixture is adequately mixed and no clumping occurs; and

iii) continually disturb and/or mix the drilling fluid during the drilling operations

d) Pipe rollers:

Rollers shall be of a sufficient size that shall fully support the weight of various types of specified pipes during pull-back operations. Sufficient numbers of rollers shall be provided in order to prevent any excess sagging of the pipe. Rollers are to be used as required to assist in pull-back operations and jointing of piping.

e) Hydraulic or pneumatic pipe rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the prior authorization of the Employer`s Agent.

f) Other devices:

Other devices or pipe placement systems for providing horizontal thrust other than those defined above shall not be used unless approved by the Employer`s Agent prior to the commencement of the work. Consideration for approval shall be made for each individual case. The proposed device or system shall be evaluated before approval is granted, on its ability to complete the works in a satisfactory manner, maintaining the prescribed route and grade for this Contract.

PS4.2.2.3 **Personnel**

Drilling and pipe installation shall be performed only by experienced Contractor personnel specializing in directional drilling and who has at least 5 years experience, in particular, pilot hole steering and position monitoring.

PS4.2.2.4 **Drilling and pipe installation**

a) Notification:

The Contractor is required to notify the Employer`s Agent 48 hours in advance before commencement of ANY drilling work.

b) Route and grade control:

The Contractor shall:

i) determine and confirm that the correct drilling length and equipment pull strength required for the type of soil encountered is utilized;

ii) provide and maintain instrumentation that accurately locates pilot holes;

iii) drill a pilot hole along the route as indicated on construction drawings or agreed by the Employer`s Agent to the tolerances of maximum 150mm over a 100mm length in the vertical direction and 300mm over a 100mm length in the horizontal direction, WHILST not affecting the proper conveyance to the actual fluids;

iv) ensure continuous electronic monitoring of the drilling head location, horizontally and vertically.

Additionally he shall provide position readings at a maximum intervals of 3m;

v) obtain a final accuracy of within 25mm of the design pipe position; and

vi) provide the Employer`s Agent with measurements indicating the horizontal and vertical alignment at the completion of the pilot hole drilling, prior to commencing with the subsequent operations.

c) Drilling operation:

i) The entire drill route shall be accurately surveyed and entry and exit pegs shall be placed.

ii) Drilling fluids shall be:

- adequately maintained in the drilled (bore) hole ensuring the stability of the surrounding soil and to reducing drag pipe.
- disposed of and other spoils in an appropriate location to be identified by the Contractor.

- minimized at locations other than the drill entry and exit points. removed where unintentionally spilled on surrounding surfaces.

iii) Drilling and reaming:

- The entry drill hole shall be angled so that the curvature of the pilot hole does not exceed allowable bending radius of the applicable pipe.
- In the event that forward motion, along the designed route and grade, of the operation is hindered or prohibited completely by any obstruction, the Employer`s Agent is to be notified. Upon the Employer`s Agent's approval, a second attempt at installation shall be made at an approved alternative location, or alternatively the section of difficulty shall be installed by means of conventional open trench excavations.
- Number of boring pits to be kept at a minimum, ideally located at new associated structure locations, unless otherwise instructed by the Employer`s Agent.
- Upon completion of the pilot hole, the Contractor shall ream the drilled (bore) hole to (at a minimum) 25% greater than the outside diameter of the pipe for straight pull sections. In the event that the route being curved or at a radius, the drilled (bore) hole is to be reamed (at a minimum) 50% greater than the diameter of the pipe. He may, at his discretion, pre-ream or ream and pull back the pipe in one operation if conditions allow for. The Contractor shall not attempt to ream at one time more than the drilling equipment and mud system are designed for.

iv) Installation of pipe: The Contractor shall:

- provide a swivel to the reaming assembly and pull section of pipe to minimize torsional stress on pull section after drilling pilot hole.
- after successfully reaming drilled (bore) hole to the required diameter, pull the pipe through the hole, with the swivel. Once pull-back operations have commenced, operations shall continue without interruption until pipe is completely pulled into drilled (bore) hole. During pull-back operations Contractor shall not apply more than the maximum safe pipe pull force at any time. In the event that pipe becomes stuck, Contractor shall notify Employer`s Agent. Employer`s Agent, Contractor, and/or the maintaining agency shall discuss options and then work shall proceed accordingly.
- protect pull section as it proceeds during pull back so that it moves freely and is not damaged.
- when connecting to adjacent pulled or non-pulled sections of pipe, allow pull section of pipe to extend past termination point, and make tie-ins the next day after pull-back of pipe.
- provide a test pit pipe installation to verify horizontal and vertical alignment, one test pit for every 150m along length of pipe route. The Employer`s Agent may order additional test pit for each test pit that reveals the pipe installation is not in compliance with the design, at no additional cost to the Employer.
- be required to make the necessary repairs at no additional cost to the Employer, if portions of the pipe is found not to comply with the Employer`s Agent's positioning requirements. v) Annular gap grouting

The annular space between the pipe and hole shall be filled with an approved material (Bentonite or similar approved) to support and stabilize the pipe. If pressure grouting is used, caution should be exercised to insure that excess grout pressure does not distort or collapse the pipe.

PS4.2.2.5 **Record keeping**

Contractor shall maintain a daily record of the drilling operations and a guidance system log with a copy submitted to the Employer`s Agent's authorized representative at completion of each boring section. Record drawing shall be certified by the Contractor, for accuracy.

PS4.2.3 Traffic control

a) A traffic control plan shall include detailed diagrams showing the location of all traffic control devices and the length of time for all lane closures, as well as location of any flaggers, as necessary.
b) One lane of traffic in each direction must be maintained at all times and local streets may only be closed with prior approval of the Employer's Agent.
c) A written method of handling traffic for each different phase of the project shall be submitted and include both vehicular and pedestrian traffic.
d) The name and number of the Contractor representative responsible for traffic control shall be made available to solve traffic problems at each job site location.

PS4.2.4 Metric measurement

All survey recorded dimensions of infrastructure shall be in metric units, including for conduits, chambers and manholes.

PS4.2.5 Site preparation

Prior to any Works commencement the Contractor shall photograph or video tape entire work area. One copy of which shall be given to the Employer's Agent's authorized representative and one copy shall remain with the Contractor for a period of 12 months following the issue of a Completion Certificate. This record shall be used to establish accountability for damages during the execution of the Contract.

No alterations beyond what is required for Works are to be made. Contractor shall confine all activities to designated work areas, to the absolute minimum required.

PS4.2.6 Pipe handling and storage

Pipe shall be handled and stored in accordance with safe lifting practice. The lifting capacity of the equipment shall not be exceeded.

Where slings are used for lifting

a) timber, timber wedges or sand bags. Pipes shall be placed on timber bearers not more than 1.5m apart. Where pipes are stacked, timber bearers shall be placed between each layer of pipes.
b) Plastic pipes shall be stored away from contact with chemicals or ground contaminated with chemicals.
c) Care shall be taken to prevent scoring and scratching of plastic pipes.

PS4.2.7 Inspection of pipes and fittings

Pipeline rehabilitation components shall be checked for damage and flaws immediately before installation, where:

a) plastic pipes and fittings shall be checked for gouges, cracks, holes, flattening and indentations.

Damaged or flawed pipes and fittings can only be used if approved by the Employer's Agent. Pipes and fittings considered unsuitable for use by the Employer's Agent shall be removed from the site at the Contractor's expense. The Employer's Agent may approve the repair of any damage where the pipe or joint may be repaired without affecting its performance.

PS4.2.8 Cutting of pipes

Pipes shall at all times be cut square to the barrel of the pipe. For:

a) rubber ring and solvent cement jointed pipe, the deviation from square shall not be in excess of 5mm.

b) butt or electro-fusion jointed PE pipes the deviation from square shall not be in excess of 1mm.

Jagged edges shall be removed from pipe ends. Cut edges of rubber ring or solvent cemented plastic pipes shall be beveled in accordance with the manufacturer's instructions.

PS4.2.9 Acceptability of damaged pipe

Cuts or gouges that reduce the pipe wall thickness in excess of 10% is not acceptable and shall be cut out and discarded.

PS4.2.10 Pipe joining

PS4.2.10.1 Fusion butt-welding

a) Interpretation

This section shall cover the butt-welding plastic pipes, which shall involve the heating of two pipe ends to fusion temperature and then subsequently joining the two ends by the application of force.

b) Equipment

The basic parts of the equipment shall be:

i) Planning Tool: used to face pipe ends.

ii) Heating Plate: used to melt pipe ends

iii) Frame: holds on to the pipes to be joined. It has hydraulic cylinders which apply pressure to the pipe joints.

iv) Hydraulic unit: has the hydraulic pump, tank, pressure gauges, directional valves, pressure regulation valves.

v) Data logger: records pertinent process data such as time, pressure and temperature. The data logger ensures that every joint is made properly.

c) Site preparation

The technician shall ensure that the machine is situated in a dry area, before welding is commenced. The equipment shall not be exposed to rain.

No welding shall be executed during rain, unless an outdoor roofing structure is provided to protect the equipment and process from rain. The technician shall ensure that the equipment does not sit on wet ground.

d) Pipe preparation

Pipe ends to be joined shall be dry and free from foreign particles.

PS4.2.10.2 Restrained joint couplings

a) Pipe may be joined using nonmetallic restrained type couplings. Pipe and couplings shall be designed as an integral system and shall be provided by a single manufacturer for maximum reliability and interchangeability. No external pipe-to-pipe restraining devices that clamp onto or otherwise damage the pipe surface as a result of point-loading shall be permitted.

b) Couplings shall be designed as minimum for use at the rated pressures of the pipe with which they are utilized.

PS4.2.10.3 Electrofusion belt jointing

a) The appearance of electrofusion belt shall meet the following requirements:

(i) The surface of the electrofusion belt shall be smooth and free from cavity, impurity or other defects that may have adverse effect on its function.
(ii) The heating wire shall be well embedded into the polyethylene and shall be free from breakage and short circuit
(iii) Electrofusion belt side shall be cut properly
(iv) The electrofusion belt shall be normally black, other color is allowed when agreed upon by the Client and supplier.

b) The dimension and tolerance on dimension of the electrofusion belt shall comply with Table below

ID	Minimum Length L(mm)	Width W (mm)	Tolerance on width (mm)	Thickness (mm)	Tolerance on thickness (mm)	Width of heating wire mesh W1 (mm)	Tolerance on width of heating wire mesh (mm)

800	2712	300	+/-10	7	+/-2	100	+/-8
900	3026	300	+/-10	7	+/-2	100	+/-8
1000	3340	300	+/-10	7	+/-2	100	+/-8

c) Pipe jointing procedure (Electrofusion belt)

(i) Place two pipes butt to butt and align them to make the axes of the two pipes as close as possible.

(ii) Put the electrofusion belt into the pipes at the jointing position and use electrofusion belt holder to push the electrofusion belt onto the inner wall of the pipes. The overlapping edge and the heating wire terminals shall be positioned at pipe top. The belt shall be equally shared by the two pipes in terms of length.

(iii) Fill in the space at the overlapping part of the belt with profile modeling PE wedge.

(iv) Use the electrofusion belt holder to push the electrofusion belt against the pipe wall and make spacing between electrofusion belt and the pipe as less as possible. All pressing shoes of the belt holder shall press and the belt uniformly and soundly.

(v) Connect the welding control box to the heating element terminal of the electrofusion belt and apply current according to pipe manufacture's technical manual. The specification for current value and the voltage applying time shall be strictly followed. During welding, the current is allowed to decrease continuously and steadily; abrupt decrease or increase of electrical current is not allowed. The surface temperature of the welding zone of the belt shall be uniform along circumference. Careful inspection shall be conducted on the joint when abnormal phenomenon take place, and then proper measures shall be taken accordingly.

(vi) After welding, cool the joint down in the air for not less than 40 minutes. During cooling process the Electrofusion belt holder shall not be taken away and the joint shall not be subject to any external action. After cooling process is finished, disconnect the welding control box and move the specialty machine away.

Hand or reciprocating saw may be used to cut the pipe off at site. The exposed steel shall be sealed off with hand held extruder or EVA welding lance after pipe cutting.

PS4.2.11 Launch and reception pits

The required launch and receipt pits for pipe jacking shall be excavated and maintained to minimum dimensions. Said excavations shall be adequately barricaded, shored, braced and dewatered, as required, in accordance with the applicable portions of these specifications, including:

a) Excavation adjacent to the road pavement shall be performed in a manner to adequately support these facilities.

b) Pipe entry and receiving areas to provide a gradual entry of the pipe without stress to the pipe or joints and to allow free movement into the hole at an acceptable depth.
c) Where possible, with regard to size and structural integrity, associated structures are to be utilised for pits for pipe jacking equipment. Alternatively, pits are to be located where possible at property connections OR branch connections OR identified localised repairs positions.
d) Where approved by the Employer's Agent, channeling and walls of existing associated structures may be altered by the Contractor to insert and receive pipes during operations. Where a continuous length of pipe is to be towed in, such as pipe lengths welded together or a coiled pipe, the launch pit shall be of a size to permit insertion of the continuous pipe length without bending to a smaller radius of curvature than permissible by the manufacturer.
e) Where a continuous pipe length is to be used, the top of the pipe length to be inserted shall be protected from damage at the entry. The Employer's Agent shall approve the method of protection.
f) Pits shall be reinstated and cleared of all plant, material and debris prior to moving to other sites.

PS4.2.12 No surface disturbance

Pipes installed by means of pipe jacking shall be in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

Contractor to maintain close observation to detect any settlement or displacement of surface and/or adjacent facilities: In the event of settlement or displacement the Contractor is to notify the Employer's Agent immediately, whilst maintaining safe conditions and prevent any further damage from occurring.

PS4.2.13 Damage to services or structures

The Contractor shall satisfy the Employer's Agent that pipe jacking operations shall not have a detrimental effect on adjacent services or structures.

Where the Employer's Agent determines that services adjacent to the existing pipe shall be damaged by pipe jacking, such services shall be exposed and protected.

Services or structures identified by the Employer's Agent, as being damaged by pipe jacking operations shall be repaired at the Contractor's expense.

PS4.2.14 Encountering of water during operations

The Contractor is to provide and maintain a water removal system that has sufficient capacity to remove all encountered water, during operation, in particular during pipe jacking. Such system(s) shall ensure that soil particle removal is kept at a minimum.

PS4.2.15 Site restoration

Following all Works completion, the Contractor shall disassemble all equipment and restore the

+repaired by the Contractor.

All excavations shall be backfilled and compacted to minimum density of 95% MOD ASSHTO, unless otherwise instructed by the Employer's Agent.

PS4.2.15.1 Water Chambers step irons

Manhole step irons shall conform to the applicable standard SANS requirements, but shall be:

a) spaced at 300mm centres;
b) distanced not exceed 600mm between the top of casting and the first step; and
c) plastic or similar approved.

PS4.2.16 Chamber bedding

a) Precast chamber: Precast chambers bases shall be bedded on granular material or acceptable undisturbed foundation material.
b) Cast-in-place chambers: Concrete bases shall be poured on granular material or acceptable undisturbed foundation material.

PS4.2.17 Watertight testing

Water chambers shall be watertight structures, including any repair or rehabilitation portions. On completion of all chamber repairs and/or rehabilitations and proper elapsed curing time for the waterproofing materials, the manholes shall be visually inspected. The inspection shall be performed at the discretion of the Employer's Agent or his duly authorised representative during the warranty period following a rainfall sufficient to increase the flow in super-imposed stormwater drainage and raise the ground water table above the problem areas. All leakage problems determined by this inspection shall be corrected by the Contractor within an agreed upon time, to the satisfaction of the Employer's Agent or his duly authorised representative, at no additional cost.

PS4.2.17.1 Testing

All sampling and testing of material in accordance with manufacturers specifications.

PS4.2.17.2 Jointing of pipes and fittings

Jointing of the replacement pipe, existing and new fittings shall be:

a) in accordance to manufacturer's recommendations to provide a leak proof joint;
b) sufficiently strong to undergo the loading of the installation process; and
c) subject to acceptance by the Employer's Agent prior to insertion.

PS4.2.17.3 Property or branch connection excavation

a) Property or branch connections shall be exposed and disconnected from the existing pipe prior to commencement of bursting. Property or branch connections to be redirected to temporary water line.
b) All excavations for property or branch reconnections shall be the minimum necessary to execute the operations. Care shall be taken to prevent material entering the live existing system when performing the disconnection and/or connection.

PS4.2.17.4 Reconnection of property and branch connections

Property connections shall not to be out of service for more than 8 hours, unless otherwise agreed in writing with the property owner or occupier. If this is not possible, temporary connections are to be made at convenient locations as approved by the Employer's Agent.

All connections shall be by means of approved fittings, in accordance with the manufacturer's instructions, for:

a) PVC pipes and fittings, using either, solvent-cement joints, push-on joints, threaded joints, clamps or flanged joints.

b) HDPE pipe and fittings, using fusion jointing techniques, clamps or flange joints (either installing flange ended fittings, HDPE flange adapters and mechanical couplings)

All polyethylene electro-fusion fittings shall be made in accordance with an appropriate and approved specification. If applicable, the grade of polyethylene of the fitting shall be the same as the replacement pipe

NOTA BENE: The replacement pipe shall be left for the manufacturer's recommended time, but normally not less than 4 hours, prior to service reconnections. This period shall allow for pipe shrinkage due to cooling and pipe relaxation due to the tensile stresses induced in the pipe during installation.

PS4.2.17.5 Annular gap sealing for burst pipes

All annular gaps between the replacement pipe and the bore or existing pipe, in excess of 10mm, shall be grouted. This compound shall be as approved by the Employer's Agent, but not have such rapid setting characteristics.

PS4.2.18 Localized pipe replacement or repair

PS4.2.18.1 Coupling clay and PVC or PE pipes

The Contractor shall ensure couplings between clay and PVC or PE pipes are durable and watertight SABS approved. All metal components of couplings shall be denso (or similar approved) wrapped to prevent corrosion.

PS4.2.19 Concrete, formwork and reinforcement

NOTA BENE: All in situ concrete work (mass and reinforced) shall comply with SANS 1200G (”8.Measurement and Payment" is not applicable) supplemented by the clauses in this section. Where:

- SANS 1200G and the clauses in this section are in conflict, the clauses in this section shall take precedence.
- the term "plain concrete" appears in SANS 1200G it shall be read as "mass concrete".

PS4.2.19.1 Cement

Cement shall be Portland cement (or similar approved) complying with the requirements of SANS 50197-1/EN 197-1 or SANS 5831.

Samples of cement from any one, or from every consignment, may be required by the Employer's Agent or his duly authorized representative for test purposes. Cement in any consignment from which a sample may have been taken for testing shall not be used until it has been approved. Allowance shall be made for possible delay in that tests may take 10 days to carry out.

Bags of cement shall be stacked in a waterproof, solidly constructed shed with a central door and a floor rendered damp-proof with a tarpaulin. The bags of cement shall be closely stacked (but not against walls) in order to reduce air circulation in such a manner that the cement is used in the order in which it was received, i.e. first in first out.

Unless otherwise specified in the these documents the use of ordinary Portland cement blended with ground granulated blast furnace slag complying with SANS 1491, or ordinary Portland Cement blended with Pulverised Fly Ash complying with SANS 50197-1/EN 197-1 will be allowed in certain instances as an alternative, after acceptance of tender offer, but only with the approval of and at the sole discretion of Employer's Agent. If not so specified in the documents the Contractor must demonstrate a saving in favour of the Employer together with this alternative.

PS4.2.19.2 Sand (Fine aggregate)

The fine aggregate shall comply with the requirements of SANS 1083. Other aggregates may be approved if they have a satisfactory history and/or test results.

No aggregate may be used until it has been approved. Samples having a mass of 25kg (16,5l) of the aggregate proposed to be used may be required by the Employer's Agent or his duly authorized representative for test purposes. Samples having a mass of 25kg shall be forwarded every 3 months during concreting work and also if the source of supply is changed. Allowance must be made for possible delay in that the tests may take 14 days to carry out.

PS4.2.19.3 Stone (Coarse aggregate)

a) The coarse aggregate shall comply with the requirements of SANS 1083. No aggregate may be used until it has been approved. Samples having a mass of 25kg (16,5l) of the aggregate it is proposed to use may be required by the Employer's Agent or his duly authorized representative for test purposes. Samples shall be forwarded every 3 months during concreting work and also if the source of supply is changed. Allowance must be made for possible delay in that the tests may take 14 days to carry out.

NOTA BENE: Certain fine grained sand and stone originating from the Beaufort Series and Karoo Systems which are known by reputation, local experience or tests, to exhibit excessive shrinkage when used in concrete, may be deemed unacceptable by the Employer's Agent or his duly authorized representative.

b) A certificate of proof is required from the Contractor that the aggregates are not alkali-reactive. The cost of testing and certification are to be borne by the Contractor.

PS4.2.19.4 Concrete

Concrete shall be of the classes given in the following table. The proportions of the ingredients and the nominal size of the coarse aggregate for each class shall be as laid down therein:

Class	Cement	Aggregate			Strength (MPa)
	Part	Fine	Coarse	Size	
		Part	Part		
A	1	4	8	50	10
B	1	3	6	38	15
C	1	3	6	19	15
D	1	2	4	38	25
E	1	2	4	19	25
F	1	1 1/2	3	19	30
G	1	1	2	19	40

The strength given in the above table shall be the minimum required at 28 days. Unless otherwise specified Class B concrete shall be used for mass concrete and Class E concrete for reinforced concrete.

Maximum concrete slumps acceptable for different types of construction concrete are as follows:

a) Vibrated reinforced concrete = 50mm
b) Un-vibrated reinforced concrete = 75mm
c) Mass concrete = 75mm

When so required by the Employer's Agent or his duly authorized representative, and whilst concreting is in progress, the consistency of the mixture shall be ascertained by means of the slump test as later described herein.

PS4.2.19.5 Volume batching

The coarse and fine aggregate shall be measured by volume and, unless otherwise directed, cement shall be measured by mass: the volume of a 50 kg bag of cement shall be taken as 33l. Suitable measuring boxes for the coarse and fine aggregates shall be provided to the approval of the Employer's Agent or his duly authorized representative.

The proportions given above are approximate only, and should the Employer's Agent or his duly authorized representative consider that the voids in the coarse aggregate require more or less matrix than is formed by the proportions specified, he may vary the quantities of coarse and fine aggregates to obtain the required density and workability of

the concrete, provided that the proportion of cement to the total volume of the aggregate shall not be less than that specified.

When the sand is not completely dry, allowance must be made for bulking due to the moisture content. The amount of bulking shall be determined by the Contractor in the presence of the Employer's Agent or his duly authorized representative.

The amount of water shall never exceed 34l to every bag of cement used, including the water contained in the sand.

Effective screens shall be provided to protect the mixing of concrete during windy weather.

PS4.2.19.6 Weigh batching

The proportioning of the coarse and fine aggregates by mass shall be permitted, providing the method used is approved by the Employer's Agent or his duly authorized representative.

a) All requests received by the Employer's Agent or his duly authorized representative to make use of weigh batching shall be submitted to the Employer's Agent for approval.

b) If the weigh batching process is preferred to volume batching, the proposed mix proportions are to be equivalent to the relevant volumetric mixes as documented previously herein and be based on a minimum cement content.

c) The following procedures must be complied with:

i) The Contractor must timeously obtain written approval for the use of weigh batching and submit all information as set out below, with his application.

ii) The mix transformation from volume to weigh batching shall be carried out at an approved laboratory.

iii) Weigh batching equipment must be calibrated and a certificate of accuracy must be submitted before such equipment may be used. On contracts of long duration and/or requiring large quantities of concrete, new calibration certificates may be required every four months.

iv) The cement to aggregate ratio by volume for the following mixes will apply:

- Class C (15 MPa) - c/a = 1:9
- Class E (25 MPa) - c/a = 1:6
- Class F (30 MPa) - c/a = 1:4.5
- Class G (40 MPa) - c/a = 1:3

v) The following cement/water ratios by mass must also be complied with:

- Class C (15 MPa) - c/w = 1.30 to 1.35
- Class E (25 MPa) - c/w = 1.65 to 1.80
- Class F (30 MPa) - c/w = 1.90 to 2.05
- Class G (40 MPa) - c/w = 2.30 to 2.50

PS4.2.19.7 Ready mixed concrete

Any application to use ready mixed concrete shall be submitted by the Contractor at an early stage for approval by the Employer's Agent. Only suppliers on the Employer's approved list will be considered.

New applications must be submitted to the Employer, well in advance.

PS4.2.19.8 Strength concrete

The Contractor shall be responsible for the design of strength concrete and for the measurement of the constituent materials to produce concrete that complies with the specified requirements.

a) Trial mixes

The Contractor shall ensure that samples of the constituent materials of the concrete, together with evidence that they comply with the provisions, are supplied for approval in good time and provide the Employer's Agent or his duly authorized representative with:

i) a statement from an approved independent laboratory of the results of tests; or

ii) an authoritative and acceptable report, or record of the previous use of and experience with, the material concerned.

The cement, types of aggregate and their origins shall not be changed throughout the duration of the Contract without giving prior notification to the Employer's Agent who shall verify that the above requirements are complied with and that the important qualities of the concrete shall not be impaired.

b) Consistency

Unless otherwise indicated by the general workability of the concrete, method of transportation, conditions of placement or otherwise specified by the Employer's Agent, the suggested slump values, for different mixes of concrete shall be as specified in this document.

c) Workability

Ensure that the concrete is of such workability that it can be readily compacted into the corners of the formwork and around reinforcement without segregation of the materials and without excessive "bleeding" of free water at the surface.

PS4.2.19.9 Expansion alkali-aggregate reaction

The use of some local aggregates may lead to an expansive alkali-aggregate reaction if the concrete in the structure will be exposed to continual dampness, or will be subject to alternate wetting and drying.

Alkali reactive aggregates, i.e. certain granites, quartzites and Malmesbury hornfels (shale), shall not be used in conjunction with high alkali cement for concrete in any part of the works. Where a high alkali cement shall be one in which the equivalent alkali content exceeds 0,60% by mass of the cement.

If the Contractor chooses to use one of the aggregates stated above in lieu of stone as described in this document he shall:

a) ensure that no high alkali cement is delivered to the site. Any such high alkali cement shall be rejected and the cost of its removal and replacement with cement having an acceptable alkali content shall be borne by him.

b) provide certificates stating the alkali content of each delivery of cement to the site, 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 him.

c) be entitled to use an approved brand of cement as a means of ensuring that the permissible alkali content is not exceeded. Where he shall make allowance for the higher price of such approved brand, if he chooses to use this method.

PS4.2.19.10 Pumping of concrete

The placing of concrete by pumping in any section of the works shall be subject to the written approval of the Employer's Agent or his duly authorized representative. The Contractor shall furnish full details regarding the mix proportions of the concrete that he intends to place by pumping.

PS4.2.19.11 Admixtures to concrete

The use of admixtures in concrete shall only be considered should special circumstances warrant this and only with the prior written approval of the Employer's Agent. The Contractor shall provide the following information:

a) the trade name of the mixture, its source and the manufacturer's recommended method of use;

b) typical dosage rates and possible detrimental effects of both under and over dosage; and

c) the expected average air content of freshly mixed concrete containing an admixture which causes air to be entrained when used at the manufacturer's recommended rate of dosage.

PS4.2.19.12 Slump test

The apparatus and the method of determination of the slump of freshly mixed concrete shall comply with SANS 5862-1.

a) Apparatus

A mould in the form of a frustum of a cone and having the following nominal internal dimensions:

- Bottom diameter : 200mm
- Top diameter : 100mm
- Height : 300mm

The mould shall:

- be of a metal (other than brass or aluminum) of side thickness at least 1.6 mm and shall have a smooth internal surface.
- have suitable base plate and handles to facilitate lifting it from the test specimen in a vertical direction.

ii) The tamping bar shall have a nominal diameter of 16mm, a length of 600mm and with sharp corner rounded off at one end.

b) Procedure:

The test shall be carried out in an area that is free from vibration and shocks. Ensure that the internal surfaces of the mould are free from set concrete and are clean and dry.

Place the mould with the bottom on a smooth, horizontal, rigid, non-absorbent surface and hold the mould firmly in place while it is being filled as follows:

i) in four layers, each thickness approximately one-quarter of the height of the mould. Tamp each layer with 25 strokes uniformly spaced over the cross-section of the mould. Tamp the bottom layer throughout its depth and ensure that when tamping the second and subsequent layers the strokes penetrate into the underlying layer.

ii) after the top layer has been tamped, strike off the concrete level so that the mould is exactly filled. Clean off any concrete that may have leaked out between the mould and the supporting base-plate surface. Remove the mould from the concrete immediately by slowly and carefully raising it in a vertical direction. This will allow the concrete to subside.

Immediately measure the slump, to the nearest 5mm, by determining the difference between the height of the mould and the height of the specimen.

Regard the test as invalid, if a slump specimen collapses or shears off laterally, discard the result and repeat the test.

PS4.2.19.13 Concrete cubes

The apparatus for making and testing of concrete cubes shall comply with SANS 5863.

a) Apparatus

Cubic metal moulds shall:

- be steel;
- be machined and adequately strengthened to resist distortion;
- have an internal distance between faces of 150mm;
- be constructed so as to facilitate the easy removal without damage of the moulded specimen; and
- have a metal base plate which shall be attached to the mould by springs or screws.

When assembling the mould for use, the joints between the sections of the mould, the contact surfaces between the bottom of the mould and the base plate, and the internal faces of the assembled mould shall be thinly coated with a grease or oil that will prevent leakage of water through the joints and adhesion of the concrete to the mould.

The tamper must be a steel bar of length 400mm and mass 1.8kg, and having a 25mm square ramming face.

b) Sampling and making cubes

Sampling shall comply with SANS 5861-2.

One set of 3 cubes shall be required for every 40m3, or part thereof, of concrete cast. The sample taken from a batch of concrete and sufficient to make 3cubes shall be placed in a tray or on a platform and mixed thoroughly.

The moulds shall each be filled in 3 layers of approximately 50mm thick concrete. Each layer shall be compacted with the tamping rod, with at least 35 blows to give full compaction of the concrete.

After the top layer has been compacted, strike off the surface of the concrete with a trowel, level with the top of the mould.

Any small hollows shall be filled in with additional concrete. Cement/sand slurry shall not be worked into the surface.

At this stage, the identity of each sample shall be placed on the moulded cube, by means of a label of absorbent material and not by scouring of the surface of the concrete.

c) Curing cubes on site

Cover the test cubes in their moulds with an impervious sheet or wet sacking and store indoors in a place that is free from vibration, excessive draughts, cold and direct sunlight.

After 24 hours the cubes shall be demoulded, remarked with a waterproof crayon or marker and placed in a curing tank for 7 days before being transported to the laboratory.

The Contractor shall supply the curing tank which shall incorporate a thermostat to control the water temperature at 22 to 25°C and shall be kept within a building.

d) Testing of cubes

The testing of all concrete cubes shall be done in accordance with SANS 5863 by a laboratory approved by the Employer's Agent.

A suitable testing machine of sufficient capacity having an accuracy and repeatability that comply with the requirements for Grade A machines of BS 1610 "Method for the load verification of testing machines" shall be used to test the compressive strength of each cube.

The Contractor is responsible for the provision of the cube moulds and for timeous delivery of the cubes to the laboratory.

PS4.2.19.14 Concrete quality

Should the Contractor dispute any results obtained from concrete test cubes, the concrete represented by the cubes shall be considered acceptable if the Contractor, at his own cost, proves to the satisfaction of the Employer's Agent that the estimated actual strength of cores taken from the structure (by an approved independent testing laboratory and determined in accordance with SANS 5865 is not less than the specified

strength. If the concrete fails to meet the strength criteria stipulated, the Employer's Agent may at his sole discretion and in addition to the options listed in SANS 1200G:

a) accept the concrete subject to approved remedial measures being undertaken by the Contractor at his own cost; or
b) permit the concrete to remain, subject to reduced payment for lower strength concrete.
c)

PS4.2.19.15 Concreting

It is essential that the Contractor representative who has charge of the construction of all concrete work, whether reinforced or not, shall be skilled in this class of work, and shall personally supervise the whole construction, paying special regard to:

a) the quality, testing and mixing of the materials;
b) the laying of the material in place and the thorough compaction of the concrete to ensure solidity and freedom from voids;
c) the construction and removal of formwork; and
d) the sizes and positions of the reinforcement.

Particular care shall be taken to work concrete against formwork and around reinforcement. Internal vibrators may be used with the approval of the Employer's Agent or his duly authorized representative but external vibrators which act only on the formwork WILL NOT be permitted.

Concrete to be reinforced shall be deposited in such quantities as will permit of it being properly compacted around the reinforcement.

The placing of concrete shall be completed within ½ hour after mixing or within ½ hour after agitating and within 2,5 hours after mixing in the case of ready mixed concrete. Under no circumstances shall concrete be incorporated into the work after it has attained its initial set.

Care shall be taken to prevent, as far as possible, the formation of laitance or scum. Laitance is to be understood to mean the scum of strengthless and inert material which forms on the surface of concrete.

Concrete shall not be dropped into position from a height greater than 2.5m unless prior approval is obtained from the Employer's Agent.

If an inclined chute is used for transporting concrete, it shall be of such slope as will ensure a continuous flow of concrete without the use of an excessive quantity of water and without segregation of the aggregates. The chute must be flushed out and properly cleaned before and after each working period. All waste from flushing shall be discharged outside the formwork.

In beams, each portion of a successive layer shall be placed as soon as the concrete below has been properly worked around reinforcement and against formwork.

Concreting shall be carried forward in irregular steps, that is to say, one layer shall not be completed over the whole section before the succeeding layer is commenced. Concreting of slabs and beams shall, as far as possible, be carried forward in one operation. When concreting has to be interrupted the concrete shall be left with a level, rough top surface with ends vertical. The concrete shall not be merely sloped down.

On resuming concreting, the old surface shall be roughened and all laitance thoroughly and carefully removed before any new concrete is deposited. This must be carried out by brushing the surface of the concrete while it is still green. Great care must be taken to avoid any weakness at the junction of old and new concrete and the old surface shall be coated with a thin layer of cement and sand mortar, in the same proportions as that of the adjoining concrete.

While the concrete is setting it shall not be disturbed or shaken by traffic, either on the concrete itself or upon adjoining formwork.

No holes in concrete elements shall be patched or filled in without inspection, instruction and approval of the Employer's Agent or his duly authorized representative.

No concreting shall be carried out when the air temperature is below 4°C when it is rising and 8°C when it is falling.

Before concreting is commenced the Contractor shall give the Employer's Agent or his duly authorized representative 24 hours notice of his intention to do so. On sites further than 200km from the Employer's Agent or his duly authorized representative, 48 hours notice must be given.

Concrete surface beds, excluding heavy industrial floors etc. shall be Class C concrete and shall be laid in suitable size panels not exceeding 20m2 in area and with the length of any panel not exceeding 4.5m.

Where concrete beams are supported on concrete columns, the columns are to be concreted up to the underside of such concrete beams and then concreted up to the top of the beams, integral with the beams.

NOTA BENE: Any finish applied to the surface of concrete floors, is to be understood as being additional to the thickness of the concrete described or shown on the drawings.

PS4.2.19.16 Curing of concrete

After the concrete has been placed, all exposed surfaces shall be kept continuously damp for at least
10 days by methods as may be approved by the Employer's Agent or his duly authorized representative, such as covering with approved building paper, or by means of wet canvas, wet sacks, wet sand, by continuous hosing or ponding with water.

PS4.2.19.17 Concrete lintels (cast in-situ)

Concrete lintels cast in-situ shall be of Class E concrete, reinforced with steel reinforcement as well as of depths specified in the table hereunder. Each lintel shall be

the full thickness of walls into which they are cast and 450mm longer than width of openings.

Clear or daylight span	Depth in brick courses	Reinforcement
< 1m	3	Nil
≥ 1m ≤ 1.5m	3	One 12mm diameter mild steel rod, 40mm up from bottom, for each half brick width of soffit.
> 1.5m ≤ 2m	4	One 16mm diameter mild steel rod, 40mm up from bottom, for each half brick width of soffit.
> 2m	To detail	To detail.

PS4.2.19.18 Building on concrete footings and beams

No brickwork, stone walling or other structure shall be built on concrete footings until at least 3 days after placement of the concrete in the case of mass concrete footings and after 7 days in the case of reinforced concrete footings or as may otherwise be directed by the Employer's Agent or his duly authorized representative.

No brickwork, stone walling or other structure shall be built on reinforced concrete beams or similar members until the formwork and all propping or supports have been removed.

PS4.2.19.19 Slip joints between concrete and brickwork

Slip joints shall be provided between brickwork and concrete slabs and beams by levelling up and trowelling smooth the bearing surfaces of brickwork with 3:1 cement mortar and covering the bearings before the concrete is cast, with two layers of one side smooth tempered hardboard, with the smooth sides in contact.

The ends and sides of beams and edges of concrete slabs shall be separated from the brickwork with 13 mm thick bitumen impregnated softboard or expanded polyethylene strips placed vertically against the brickwork before the concrete is cast.

Similar slip joints shall be provided between brickwork and concrete lintels cast in situ, but without softboard or expanded polyethylene strips at ends.

PS4.2.19.20 Movement joints

All movement joints are to be filled in with approved bitumen impregnated softboard or expanded polyethylene strip unless otherwise specified or detailed on drawings. Form similar movement joints where pathways adjoin structures externally.

PS4.2.19.21 Cutting, punching or hacking concrete

No reinforced concrete shall be cut or hacked without the approval of the Employer's Agent or his duly authorized representative.

PS4.2.19.22 Forming key to concrete for plaster and other finishes

Where rough formwork has been used, surfaces of concrete to receive plaster and other finishes, shall, immediately after the formwork has been removed, be well wetted and wire brushed whilst the concrete is still green and then slushed over with 2:1 cement grout to form a key for the finish, all to the approval of the Employer's Agent or his duly authorized representative. The slushing is to be allowed to set hard before the finish is applied.

Where smooth formwork is used, surfaces of the concrete to receive plaster and other finishes shall be hacked, on the distinct understanding that hacking of concrete shall be at no extra cost.

Surfaces of concrete receiving plaster or other finishes shall not be plastered or finished until the Employer's Agent or his duly authorized representative has signified his opinion that the surfaces are suitable to receive plaster or other finishes.

PS4.2.19.23 Sleeves pieces

Where it is necessary to leave plugs or holes in beams, slabs or any other reinforced concrete, all such plugs or holes must be situated in positions approved by the Employer's Agent or his duly authorized representative before concreting. Where it is necessary to carry pipes, bolts, wires or any other fittings through reinforced concrete members, approved pipe sleeves must be provided and placed in position before concreting.

All necessary bolts, plugs, brackets, cramps, etc. shall be cast into the concrete as the work proceeds.

PS4.2.19.24 Ties

Where brickwork abuts against concrete, the brickwork is to be tied to the concrete with galvanized hoop-iron ties 1.6mm thick by 3mm wide and approximately 600mm long to every third course of brickwork with one end of each tie cast approximately 150mm deep into the concrete. Where such fixing is impossible, i.e. where steel formwork is used, the ties are to be gun-nailed against concrete with steel nails not less than 38mm long.

PS4.2.19.25 Bagged finish to concrete

Concrete surfaces to receive bagged finish shall be prepared by removing sharp projections and making good defects with 3:1 cement mortar. Finish by rubbing over the whole area with wet rough sacking and cement grout to obtain an even surface.

PS4.2.19.26 Power floated finish

Power floated finish to floors or slabs means that surfaces shall be floated mechanically to a smooth and even finish before the concrete has set. Small areas inaccessible to the machine are to be floated by hand. Under no circumstances is cement mortar to be added while floating the concrete.

PS4.2.19.27 "No-fines" concrete

"No-fines" concrete, for grading flat concrete roofs and the like to falls, shall be in the proportion of
12 parts 19 iron cubical stone to 1 part cement mixed with 20l water per bag of cement and be
laid to falls of not less than 15mm per linear metre for mastic asphalt and not less than 20mm per linear metre for sheet roof covering. For heavy load applications special mix designs may be required.

a) Fillets against upstands
   - Form triangular fillets, size 75 x 75mm, in corners with walls, kerbs, etc. neatly mitred at angles, stopped where necessary and finished smooth ready to receive waterproofing.

b) To raised floors, bases and other

"No-fines" concrete for raised floors, bases, etc. shall be in the proportions specified. Finish smooth with 3:1 sand/cement screed to receive waterproofing.

PS4.2.19.28 Cellular concrete

Cellular concrete, for grading flat concrete roofs and the like to falls, shall be laid in situ in required layers; the bottom layer having a density of 400kg/m3, dressed to falls by varying the thickness, and a 20mm thick top layer having a density of 960kg/m3.

Cellular concrete for backfill of pipeline where specified, shall have lowest density of 1200kg/m3 and shall have no course aggregate. Air entraining admixture to be submitted to Employer's Agent for approval.

PS4.2.19.29 Formwork

Formwork shall include all shuttering, casing and centering of material required for the laying and forming of concrete floors, slabs, beams, lintels, walls, steps, columns, piers, pilasters and any other concrete work requiring moulds or forms and shall embrace all cleats, battens, fillets, wedges, struts, trestles, braces, props, shores and other requirements of material for keeping all in correct position. All materials used for formwork must be suitable and substantial and all joints must be tight enough to prevent leakage of liquid matrix.

All formwork must be designed by the Contractor and if requested to do so, he must submit fully detailed and dimensioned working drawings to the Employer's Agent or his duly authorized representative for checking purposes. Acceptance of the proposals shall not relieve the Contractor of his responsibility for the safety and stability thereof nor for any loss or damage arising out of defective design, materials and/or workmanship.

The formwork must be so constructed that its partial removal can be carried out to the satisfaction of the Employer's Agent or his duly authorized representative and in such

stages as are required by the working conditions. As far as possible, wedges and clamps must be used in preference to nails. All formwork in its various sections for floors, beams, etc. must be so arranged that the whole may be raised or lowered either independently or together with other sections by means of wedges or other approved methods.

Immediately before concreting is begun, the formwork in contact with the concrete must be thoroughly cleaned, wetted and kept damp whilst the concrete is being placed.

Great care must be taken to keep the formwork wedged up to its correct height and this must be checked by taking levels immediately before concreting is commenced and immediately after it has been completed.

All beams shall have a camber of 6mm to every 3m of length.
The minimum periods that the formwork to the various parts of the structure is to remain in position after concreting shall be as stated in the following table:

Description	**Normal cement**		**Rapid hardening cement**	
	Weather		**Weather**	
	Normal	**Cold**	**Normal**	**Cold**
Beam sides, walls, unloaded columns	2 days	4 days	1 days	2 days
Slabs with props left under	4 days	7 days	2 days	4 days
Beam soffits with props left under including ribbed slabs	7 days	12 days	3 days	5 days
Removal of slab props	10 days	17 days	5 days	9 days
Removal of beam props	14 days	28 days	7 days	12 days

When determining the stripping time for formwork the weather shall be considered to be "normal" when the temperature is above 18°C and "cold" when the temperature is between 5°C and 10 °C, these being the average daily temperatures of the atmosphere adjacent to the concrete. When the average daily temperature lies between the above values for "normal" and "cold" weather the minimum period for stripping of formwork shall be determined by the Employer's Agent or his duly authorized representative.

Notwithstanding the above minimum periods, formwork may be struck immediately, once the concrete in the various parts of the concrete work has attained the crushing strengths required by the Employer's Agent or his duly authorized representative. The crushing strengths must be determined by proper tests, which shall be carried out by the Contractor.

No formwork of any nature shall be struck, either after the elapse of the minimum periods stated in the above table or on the attainment of the required crushing strengths of the concrete, without the prior consent of the Employer's Agent or his duly authorized representative. Such consent shall not absolve the Contractor of his responsibility for the safety of the works.

In structures having either in whole or in part, two or more reinforced concrete floors, props shall be provided under the soffits of any beam or slab of any floor which is being

used to support the formwork and wet concrete of the floor above, all to the approval of the Employer's Agent or his duly authorized representative. The props shall not be removed until the formwork supporting the concrete of the floor above has been struck.

Under no circumstances shall steel formwork be oiled where concrete is to receive plaster.

PS4.2.19.30 Smooth formwork

Smooth formwork shall be any material approved by the Employer's Agent or his duly authorized representative which is to be used to leave concrete surfaces smooth when removed and where no other finish is to be applied.

PS4.2.19.31 Reinforcement rods

a) Mild steel

Mild steel shall comply with the requirements of SANS 920, Type A or B.

b) High tensile steel

High tensile steel shall comply with the requirements of SANS 920, Type C or D.

PS4.2.19.32 Concrete reinforcement

a) Rod reinforcement

Bending and hooking of rods shall be done in accordance with SANS 282. Rods shall be bent cold in an effective bending machine, or properly designed rod-bender using a steady pressure and not by hammering.

Diameters, lengths and positions of rods as shown on the drawings must be strictly adhered to. Joints in rods in beams, stairs, etc. will be permitted only where shown on drawings.

Before being placed in position, the rods shall be thoroughly cleaned of all grease, dirt, bituminous material, scale and loose rust.

All distribution rods shall be straight and shall extend at least 150mm into beams or other support. Unless otherwise shown on the drawings, all joints in reinforcing rods shall be lapped 40 times the diameter of the rod. The laps shall be securely tied with 1.25mm diameter annealed mild steel binding wire.

Reinforcement for piles, column footings, columns and walls shall be tied at every intersection, or as directed or shown on drawings, with similar binding wire. Reinforcement in beams shall be tied at alternate intersections in a diamond pattern, unless circumstances demand every intersection.

Great care must be taken to retain the reinforcement in its correct position during the entire period of concreting. Blocks of fine concrete, size approximately 40 x 40mm, or plastic spacers, shall be provided on the formwork to soffits of beams to ensure than the

rods are retained in position and that the correct concrete covering to the main reinforcing rods is provided. The blocks shall be of thickness required and shall be placed under the main reinforcing rods at approximately 600mm centres.
Reinforcement in the top of slabs and the like shall be retained in position by means of cradles (stools), formed of steel reinforcing rod as follows:

- R10 for height range 100-300mm and maximum width of 300mm.
- R12 for height range 310-500mm and maximum width of 45 mm.

Recommended spacing of supports for horizontal bars in slabs:

- not further than 600mm apart (cradles ±1000 mm c/c in both directions) for bar diameters up to 12mm.
- not further than 1,000mm apart (cradles ±1 500 mm c/c in both directions) for bar diameters of 16mm and over.

Stools are to be placed on the bottom layer of reinforcement, securely retained in position and with correct concrete cover as specified. Cradles are to be securely wired to the slab reinforcement with binding wire. Beam rods in different layers shall be separated by means of steel spacer bars of suitable diameters and lengths.

Double mats in concrete walls shall be kept in their respective positions by means of suitable steel clips.

Recommended spacing of supports for vertical bars in walls:

- 1,000mm centres in both directions for bars up to 12mm diameter; and
- 1,500mm centres in both directions for bars of 16mm diameter and over.

Supports can be spaced more closely by the Employer's Agent, depending upon the circumstances.
All stirrups shall be properly fastened to the rods so as to retain their relative positions during the entire period of concreting.

Welding of main rods will not be permitted unless approval has been given by the Employer's Agent or his duly authorized representative. Spot welding in lieu of wiring may be used to secure rods and stirrups in position.

The concrete covering the main reinforcement, unless otherwise specified, shall not be less than that stated in the following table:

Position	**Amount of cover**
Soffit of slabs	**The diameter of the main rods, but never less than 15mm (mm)**
End of beams	40
Soffits of beams	40
Sides of beams	40
Sides of columns	40
Slab underground	40
Concrete walls	25
Walls exposed to ground	40

Ground beams	40
Foundations	75
Water retaining structures and within 1 km from coast	50

In cases not included in the above table the cover shall be not less than 25mm. Depending on the condition of exposure and fire resistance requirements, concrete cover can be varied by the Employer's Agent but in no case shall the concrete cover be less than the diameter of the rod to be covered.

The cover shall be measured from the face of the concrete to the outside of main reinforcement nearest the face of the concrete, and shall exclude plaster and similar finishing materials.

Three samples of each diameter of reinforcing rods, each approximately 600mm long, must be taken from each consignment of rods of similar diameter, for testing. If any sample is found unsatisfactory, the whole consignment of rods from which the samples were taken shall be rejected.

Top reinforcement in cantilever slabs to be kept in position with a first row of stools or chairs
300mm from the beam or support, and thereafter at a maximum of 40 bar diameters under each bar.

The cover blocks, spacers, bars and stools or chairs are to be placed and/or wired in position by the steel fixer.

b) Welded steel fabric reinforcement

All welded steel fabric reinforcement shall comply with the requirements of SANS 1024. The preferred dimensions are as follows:

1	**2**	**3**	**4**	**5**	**6**
Fabric Reference number	**Nominal pitch of wires**	**Nominal diameter of wires**		**Nominal mass***	
	Longitudinal (mm)	**Cross (mm)**	**Longitudinal (mm)**	**Cross (mm)**	**kg/m2**
617	200	200	10.0	10.0	6.17
500	200	200	9.0	9.0	5.00
395	200	200	8.0	8.0.	3.95
311	200	200	7.1	7.1	3.11
245	200	200	6.3	6.3	2.45
193	200	200	5.6	5.6	1.93
100	200	200	4.0	4.0	1.00
772	100	200	10.0	7.1	7.72
655	100	200	9.0	7.1	6.55
517	100	200	8.0	6.3	5.17
433	100	200	7.1	6.3	4.33
341	100	200	6.3	5.6	3.41

289	100	200	5.6	5.6	2.89
278	100	300	6.3	4.0	2.78
226	100	300	5.6	4.0	2.26
133	100	300	4.0	4.0	1.33

*These mass values are based on the wires having mass of 0,00785 kg/mm2 per metre of length.

The actual mass of the fabric should not differ from the nominal value by more than 6%.

PS4.2.20 Precast concrete

PS4.2.20.1 Materials

Cement, water, aggregates and reinforcement shall be as described under the concrete section.

PS4.2.20.2 Concrete, formwork and reinforcement

PS4.2.20.3 Concrete

Concrete shall be as described under the applicable concrete section(s). Unless otherwise specified a Class E concrete shall be used but with coarse aggregate of an appropriate size.

PS4.2.20.4 Mould units

The whole of this work is to be carried out by a specialist, who has appropriately skilled workers in this class of work.

All materials and finishes are to be to the approval of the Employer's Agent or his duly authorized representative.

The moulds are to be properly constructed in the best and most up to date practice, made up in suitable sections with all necessary reinforcement, cramps, bands, bolts, etc. for fastening together and are to be constructed so that castings can be easily removed and the moulds re-used without distorting.

Those sections of the moulds which will produce the finished faces of the units are to be specially prepared, perfectly smooth, except where the finish is of exposed aggregate, true to shape and coated with a suitable solution which will prevent units adhering to the moulds, while not in any way discolouring the finished surfaces.

All cast units are to be properly cured and no units are to be fixed or built in until 28 days after casting.
Units are to be properly protected from the elements while curing and are to be kept wet for at least 10 days after casting by frequent spraying with clean water.

Form all necessary checkings, mortices, lugs, etc. for cramps and dowels when casting.

PS4.2.20.5 Terrazzo blocks

Precast terrazzo work shall be generally as prescribed for precast concrete above. The coarse aggregate of the mix of which blocks are to be formed shall be of 10mm stone. The finish to exposed faces shall be 10mm thick.

PS4.2.20.6 Smooth finish

Where described as "finished smooth from the mould" such surfaces shall have a layer composed of 1 part (volume) cement and 4 parts (volume) clean fine sand, packed against the faces of the mould before placing the concrete backing. The concrete backing shall be deposited into the moulds in a wet state (not dry pressed) whilst the facing is still wet.

Projections shall be rubbed off and faces shall be of even colour and free from blemishes, cracks and other imperfections. Salient angles shall be arris rounded.

PS4.2.20.7 Sizes

Sizes given are approximate; the Contractor shall be responsible for ascertaining the exact sizes based on actual measurements.

PS4.2.20.8 Reinforcement

Unspecified reinforcement required for manufacturing, handling and erection purposes and for reinforcing projecting and other unwieldy portions of blocks shall be provided by the Contractor at his discretion, but such action shall be highlighted to the Employer's Agent.

PS4.2.20.9 Bedding, joint and pointing

Blocks shall be bedded and jointed solidly in cement mortar composed of 3 parts (volume) of sand and 1 part (volume) of cement and shall be pointed with slightly keyed joints.

PS4.2.21 Masonry

(Including brickwork and stone masonry)

NOTA BENE: Where sizes in descriptions are given in brick units, "one brick" shall represent the length and "half brick" the width of a brick.

PS4.2.21.1 Lime

Lime shall be hydrated bedding mortar lime in accordance with the requirements of SANS 523.

PS4.2.21.2 Cement

Cement shall be as specified in the concrete section.

PS4.2.21.3 Sand

Sand shall comply with the requirements of SANS 1090, unless specialist advice is obtained. A sample of 25kg must be delivered to an approved laboratory for testing purposes.

PS4.2.21.4 Burnt clay bricks

a) Burnt clay bricks shall comply with the requirements of SANS 227, and shall be equal in all respects to the selected samples.
b) Clay bricks for foundations shall be as described in (a) above, but extra hard burnt.
c) Where bricks with holes are used, the holes in such bricks must only be filled in solid with mortar where specifically specified.
d) All bricks that do not carry the SABS Mark, must be tested by an approved laboratory.

PS4.2.21.5 Firebricks

Firebricks shall be of well burnt refractory fireclay, resistant to spalling and cracking and of same size as ordinary bricks.

PS4.2.21.6 Local stone

Local stone shall be from an approved quarry, free from defects and to the satisfaction of the Employer's Agent or his duly authorised representative.

PS4.2.21.7 Freestone

All freestone shall be the best and most durable of its kind, free from vents, loose beds, oxide veins and other imperfections to the satisfaction of the Employer's Agent or his duly authorised representative and shall be set on its natural quarry bed.

PS4.2.21.8 Mortar tests

a) Sampling

The frequency of sampling will be decided by the Representative/Agent. Sufficient mortar shall be taken from each of the points of laying to prepare a composite sample to make a set of three mortar cubes.

b) Moulding

Cube moulds with a nominal size of 100mm, that comply with SANS 5863 must be used.

Fill each mould with mortar in three equal layers and compact each layer by means of a tamper. The tamper must be made of hard wood with a flat tamping surface with nominal dimensions of 50 x 25mm and shaped to provide a round stem of approximately 25mm diameter and long enough to afford sufficient hand grip. Immerse the tamper in water for 15 minutes before use.

Each layer of mortar must be compacted by means of 8 evenly spaced pressing strokes of the tamper. After the final layer has been tamped, the excess mortar must be struck off level with the top edges of the moulds.

c) Curing

Cover the test cubes (in their moulds) with an impervious sheet followed by wet matting, sacks or similar material, and store them in a place free from vibration, excessive draughts and direct sunlight.

After 24 hours mark each cube so that it can be identified. After 48 hours the cubes shall be removed from their moulds and placed into water in a curing tank at 22 to 25 °C for a minimum period of 7 days before they are transferred to the approved testing laboratory. Ensure that loss of moisture is prevented during transportation and that they are well protected against damage.

d) Testing of cubes

The testing of all mortar cubes will be done by a laboratory approved by the Employer's Agent and in accordance with SANS 5863.

PS4.2.21.9 Cement mortar

Cement mortar shall be composed of 6 parts (by volume) of sand and 1 part (by volume) of cement. The material shall be mixed dry until of uniform colour and then water added and the mixture turned over until the ingredients are thoroughly incorporated. Cement mortar shall be produced in such quantities as can be used before commencing to set as no cement mortar that has once commenced to set shall be used in any way.

Care shall be taken in mixing cement mortar to remove from the mixing machine or platform any old mortar that has already set as such mortar may not be incorporated into any new batch.

Mortar should achieve the minimum required strength (in MPa) for the classes of mortar as set out in the National Building Regulations.

PS4.2.21.10 Compo mortar

Compo mortar shall be composed of 6 parts (by volume) of sand — depending on the quality of the sand available, 1 part of lime and 1 part of cement (by volume). The lime and sand shall be mixed dry, then mixed wet, before the cement is added, approximately ½ hour before using and the adding of the necessary additional water as required.

Compo mortar shall be produced in such quantities as can be used before commencing to set, as no compo mortar that has once commenced to set shall be used in any way.

Mortar should achieve the minimum required strength (in MPa) for the classes of mortar as set out in the National Building Regulations.

PS4.2.21.11 Brickwork

Brickwork shall be:

a) wherever practicable, built in English bond. No false headers shall be used and none but whole bricks employed, except where legitimately required to form bond.
b) built level and plumb with mortar as specified.
c) laid on a solid bed of mortar and all joints thoroughly grouted up solid throughout the whole width of each course.
d) carried up in a uniform manner, no one portion being raised more than 1.2m above another at any one time.

Clay bricks shall be well saturated with water, in the stack or dump, approximately 2 hours before being used. The tops of walls left unfinished shall be well wetted before work recommences.

NOTA BENE: Cement or concrete bricks shall not be wetted.

All rough and fair cutting, cutting of splays, skewbacks, chamfers, etc. shall be properly performed.
Form or leave all necessary openings for pipes etc. and make good after pipes etc. are fixed in position.

PS4.2.21.12 Brickwork in cement mortar

a) All brickwork below damp course level, all isolated piers three bricks wide and under, half brick thick walls and chimney stacks above ceiling level, shall be built in cement mortar as specified.
b) Brick arches and brick lintels shall be built in cement mortar as specified, but in the proportion of 3:1.

NOTA BENE: This clause is essential where compo mortar has been specified.

PS4.2.21.13 Mortar joints

Mortar joints to brickwork generally shall be 10mm in thickness with level bedding joints.
The joints in brickwork:
a) receiving plaster, tiling or similar finishes shall be raked out whilst the mortar is soft to form key for the plaster or mortar backing. The depth of the raking out shall depend on the condition of the bricks; i.e. the rougher the bricks on face the shallower the raking out and the smoother the bricks the deeper the raking out.
b) shall be flushed off where walls are to be bagged, in readiness for the bagging.

PS4.2.21.14 Grout in joints in brick foundation walls

All joints in brick foundation walls shall be grouted in solid with 3:1 liquid cement mortar to obviate any crevices for ant (termite) tracks.

PS4.2.21.15 Brickwork thicknesses

Walls built in two or three half brick thicknesses shall only be built where bonded brickwork (as specified) proves impractical or where required due to the prescribed bond of faced brickwork, all tied together with metal ties in accordance with SANS 28, of the Butterfly Types only, of sufficient length to allow not less than 75mm of each end to be built into brickwork. Ties shall be evenly spaced at not more than 1m apart to every third course and staggered.

PS4.2.21.16 Brickwork in linings

Brick linings to concrete shall be tied thereto with 4mm diameter galvanized crimped wire ties bent at ends and of necessary length to allow 75mm to be cast into concrete and 75mm of the other end to be built into brickwork and evenly spaced at not more than 1m apart to every third course and staggered.

PS4.2.21.17 Half brick thick walls

Half brick thick walls shall be built in cement mortar (as specified) and reinforced with 75mm wide brick reinforcement (as specified), 1 row to every 8 course in height, and built 100mm into main connecting walls. The reinforcement shall be lapped 150mm at end joints, where these are necessary, and 75mm at angles.

Brickwork shall be built level and plumb.

PS4.2.21.18 Beam filling

Beam filling shall be half brick thick, built up in mortar as used in the walls below, cut in between roof timbers and carried hard up to underside of roof covering and flushed up with mortar.

PS4.2.21.19 Reinforced brick lintels

Reinforced brick lintels shall be built with sound machine made bricks in 3:1 cement mortar with all vertical and horizontal joints filled solid with mortar throughout the required number of courses and to a distance of at least 330mm on either side of the clear opening.

The number of courses in lintels over the various size openings shall be as specified in the table hereunder and reinforcing steel wires or rods shall be built into the first horizontal joint over the bottom course to the number specified in the following table:

Clear or daylight span	Number of courses	Reinforcement
< 1m	4	One row 75mm wide brick reinforcement as described below, for each brick width of soffit.
≥ 1m ≥ 1.5m	6	Ditto
> 1.5m ≤ 2m	7	Three 6.3mm diameter mild steel rods for each half brick width of soffit.
> 2m ≤ 3m	8	Ditto

Brick reinforcement shall be of hard drawn mild steel comprising two 2.8mm diameter main wires spaced 75mm apart and 2.5mm diameter cross wires spaced at not exceeding 300mm apart, welded to main wires.

The reinforcing wires and rods shall be of length at least equal to the width of the clear opening plus 330mm at each end. The reinforcement shall be evenly spaced in the brick joints with the outer wires or rods having at least 20mm cover from face of brickwork.

Brick lintels in 270mm thick cavity walls shall be built with inner face of outer thickness, for a depth of three courses above soffit, covered with sheeting as for damp course, the full length of lintels, and space between the two thicknesses for the depth of the sheeting filled in solid with Class E concrete.
Where cavities continue above lintels, the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall above the concrete filling in lintels. The sheeting is not required in lintels protected from the weather.

The lintels, except where built over pressed steel door frames and the like, shall be supported on temporary turning pieces of suitable and substantial construction left in position for at least 14 days for long spans (1 to 3m).

PS4.2.21.20 Hollow tile lintels

Hollow tile lintels shall be formed with approved 300 x 220 x 110mm burnt clay hollow tiles each having not more than 3 cavities. The tiles shall be set end to end and the cavities filled up solid with Class E concrete.

Lintels shall have bearings of not less than 220mm on walls at ends.

The lintels over the various size openings shall be reinforced as specified in the following table:

Clear or daylight span	Reinforcement
≤ 1m	One12mm diameter mild steel rod in upper and lower cavities
> 1m ≥ 1.5m	One16mm diameter mild steel rod in upper and lower cavities

The reinforcing rods shall be placed 12mm from top and bottom edges of concrete filling to upper and lower cavities respectively.

Lintels over openings not exceeding 1m wide in 1 brick thick walls shall be on flat and in all other cases shall be on edge using 2 or more lintels in walls 1 brick thick and over, built side by side, to make up the thickness of walls.

Lintels in 270mm thick cavity walls shall be in two 110mm thicknesses with inner face of outer thickness covered with sheeting as for damp-course, the full length and depth of lintel, and the space between the two thicknesses filled in solid with Class E concrete. Where cavities continue above lintels the sheeting in lintels shall be taken up and turned on to top of first course of brickwork to inner thickness of wall.

Lintels shall be made not less than 21 days before building in and shall be cured for at least 14 days by being kept damp in a shaded position.

The lintels shall be hoisted into position and bedded and grouted in solid in cement mortar.

PS4.2.21.21 Pre-stressed lintels

Pre-stressed lintels shall be vibrated concrete reinforced with stressed high tensile steel wires, or of burnt clay blocks with similar reinforcing wires embedded in grooves in the blocks in 1:3, cement:sand mortar, or of other approved form of construction.

Concrete in lintels shall attain a crushing strength of at least 34MPa at 28 days for ordinary and at 7 days for rapid hardening cement.

The reinforcing wires shall be of ductile high tensile steel wire not less than 4mm diameter and of tensile strength of at least 1,350MPa and shall be stressed to not less than 850MPa.

The lintels may be in a single width to the thickness of wall or may be in two widths, placed side by side, and shall have a depth of not less than 60mm. Top surface of lintels shall be suitably roughened, indented or shaped to give a good bond between the lintels and the mortar for the first course of brickwork above,

Lintels shall have bearings of not less than 225mm on walls at each end.

The number of reinforcing wires in lintels for the various wall thicknesses and spans shall be not less than specified in the table hereunder, and brick courses over lintels of the number indicated in the table and for the full length of lintels shall be built in 3:1 cement mortar with all joints filled solid with mortar:

Nominal wall thickness (mm)	Clear or daylight span	Number of wires (in total number of lintels used)	Number of brick courses over lintel
90 - 110	≤ 1.8m	2	3
90 - 110	> 1.8m ≤ 3m	3	4
180 - 230	≤ 1.8m	6	4
180 - 230	> 1.8m ≤ 3m	6	5
270	≤ 1.8m	7	4
270	> 1.8m ≤ 3m	7	5

340	As described for 1 of 230mm plus 1 of 110 mm, or 3 of 110 mm		

Lintels in 270mm thick cavity walls shall be in 2 widths with joint between the two arranged directly over the window or frame below, and the brickwork above shall be built in 2 x ½ brick thickness with inner face of the outer thickness covered with sheeting as for damp-course, the full length and depth of lintels, and taken down between the 2 widths of pre-stressed lintels. The cavity to height of lintel courses shall be filled with Class E concrete, and where cavities continue above the lintel courses the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall above the lintel course. The sheeting is not required in lintels protected from the weather.

PS4.2.21.22 Bagged finish to brickwork

Bagging to walls is to be carried out after the mortar in joints has set. The wall surfaces shall be rubbed over with wet rough sacking until all joints and crevices are filled up and an even surface is obtained. Cement grout shall be added if necessary to fill up the joints and crevices.

PS4.2.21.23 Raking out for and pointing flashings

Brick joints shall be raked out where required for fixing cover flashings and flashings, which shall be pointed in 3:1 cement mortar.

PS4.2.21.24 Mastic pointings

Where steel door and window frames are specified to be pointed with mastic compound they shall be pointed all round externally with an approved waterproofing compound of such composition that it will not stain surrounding surfaces and that it will adhere steadfastly, remain plastic without sagging or running, be capable of accommodating any normal movement of the joint sealed, and will receive paint without "bleeding". The pointing material shall be forced into the joints, which shall have been previously prepared to receive same, by means of a pressure gun or by other suitable method, all in accordance with the manufacturer's instructions.

PS4.2.21.25 Building in

Ends of timbers, holdfasts, cramps, gratings, air bricks, dowels, etc. shall be built-in in cement mortar.

Door and window frames, lift door frames and the like shall be set up in position for building in and securely strutted to prevent distortion whilst the brickwork, lintels, etc. are being built.

Pressed steel door frames and lift door frames shall be grouted in solid at back with cement mortar as the work proceeds. Wood slips, fixing bricks, hoop iron roof ties, etc. shall be built in as the work proceeds.

PS4.2.21.26 Securing of roofs

Roof trusses shall be fixed at each support to walls with ties of 1.6mm thick galvanised hoop iron, 32mm wide, built 750mm deep into brickwork or embedded 300mm deep into concrete or wrapped around bottom layer of reinforcing in a reinforced concrete beam and wrapped over truss and fixed with four galvanised nails, 40mm long

PS4.2.21.27 Bedding

All door, window and similar frames shall be bedded and pointed in 1:3 (cement:sand) cement mortar. All wall and floor plates shall be set true and level and bedded in 1:6 (cement:sand) cement mortar.

PS4.2.21.28 Pointing of brickwork

Clean and point at the end of each working day all exposed masonry work including nail holes, existing brickwork shall be pointed, thus Pointing, repairing eroded and cracked mortar joints, shall be executed on existing and new brick where and when shown by the Employer's Agent or his duly authorized representative. All disintegrated joints (erosions and/or cracks) shall be cleaned of all existing mortar for the full depth of the deterioration but not less than to a depth of 25mm. All joints shall be:

a) brushed and washed (under pressure) clean prior pointing;
b) kept wet during pointing; and
c) pointed to the full depth of the cut, tooled to match existing.

Steel door and window frames shall be carefully pointed all round and made perfectly watertight.

Joints greater than 25mm shall be stage-pointed.

PS4.2.21.29 Faced brickwork

Faced brickwork shall be built fair and pointed with a keyed or recessed joint as specified. Keyed joint shall mean that the joints are to be pointed with a round jointing tool, well pressed into the joints as the work proceeds.

"Recessed joint" shall mean that the joints are to be square recessed to a depth of approximately 6mm formed with a rectangular jointing tool well pressed into the joints as the work proceeds.

Facing bricks shall be sorted by the brick manufacturer at his yard or by the Contractor on the site to ensure that proper mixing of the bricks within the colour range of each type of facing brick being used is obtained. Sudden changes in the general colour of face work in any 1 type of facing brick shall not be acceptable.

PS4.2.21.30 Fibre cement sills

Sills shall where in any way possible be in single lengths, cut between reveals, fitted with fixing lugs and solidly bedded in 1:3 (cement:sand) cement mortar with a slight projection beyond the finished wall face below.

Internal sills shall be level. External sills shall be set sloping on cut brickwork.

PS4.2.21.31 Installation of electrical service

The installation of electrical services, where such service is being provided, the Contractor shall embed in the concrete, as the work proceeds, all conduits, boxes, etc., which will be fixed in position by the electricians, and must reduce all required chases and holes in walls for conduits and form recesses in walls for distribution boards, all in the positions directed. Alternatively, distribution boards may be built into walls as the work proceeds, providing prior approval are obtained from the Employer's Agent.

The Contractor shall afford every facility and shall render reasonable assistance to the electricians in carrying out their work and shall make good where necessary, in all trades, after installation has been completed.

Chases, holes and recesses required in walls shall be cut and formed as follows:

- vertical chase for single conduit.
- vertical chase for two conduits.
- vertical chase 150mm wide and 110mm deep for conduits.
- vertical chase 250mm wide and 110mm deep for conduits.
- vertical chase 380mm wide and 110mm deep for conduits.
- vertical chase 560mm wide and 110mm deep for conduits.
- horizontal chase for single conduit.
- Holes 25mm diameter, or knocking out bricks and filling space and making good after a pipe has been fixed through a wall.

Recesses for distribution boards shall be:

Width (mm)	Height (mm)	Depth (mm)
330	330	110
455	330	110
635	330	110
610	660	110
610	910	110

PS4.2.21.32 Cable sleeves

Provide under buildings where required 100mm diameter vitrified clay, pitch fibre or plastic pipes as sleeves for electric cable taken up to floor level in cable duct or switch cupboard with easy bends. The pipes shall be as specified for drainage including laying and jointing.

PS4.2.21.33 Patching brickwork

Patching of existing walls and closing of openings shall be as shown. All brick shall be keyed to the existing or stepped every course with all surfaces flush with the existing surface and all joints kept on line.

PS4.2.21.34 Protect face brickwork

All face brickwork, stonework, tiling, etc. liable to damage shall be covered up and protected during the progress of the remaining work and any damage done shall be made good to the satisfaction of the Employer's Agent or his duly authorized representative.

All face brickwork, stonework, tiling, etc. shall be cleaned down as the work proceeds and shall be covered up with paper, pasted on, or by other approved means where necessary to prevent soiling of the surfaces during the progress of the remaining work. At completion of the works the coverings shall be removed and the surfaces again cleaned down to the satisfaction of the Employer's Agent or his duly authorized representative.

PS4.2.21.35 Cleaning

On completion of the work all masonry must be carefully cleaned down, removing all large particles of mortar with a putty knife or chisel. If acid is required for the removal of mortar stains (see note below), it shall be hydrochloric (muriatic) and not stronger than one volume of the commercial acid to nine volumes of water. Before the acid solution is applied, the surface should be thoroughly soaked with clear water; otherwise the mortar stain may be drawn into the pores causing a permanent dulling of the rich natural masonry colors. The acid solution should be applied with a long-handled stiff fiber brush, with proper precautions as to covering of clothing, hands and arms to prevent burns. It should not be placed over an area greater than 1.5 to 2.0m2 before the wall is again thoroughly washed down, or preferably hosed, with clear water immediately after cleaning. It is important to remove all trace of the acid before it attacks the mortar joint. All frames, trim, sills, or other installations adjacent to the masonry must be carefully protected against contact with the acid solution.

All paving shall be thoroughly cleaned off after laying to remove all traces of mortar and other substances, covered up and protected from damage during the progress of the works and again
cleaned off at completion.

Any detergent or other materials used in the cleaning down of face brickwork etc. shall be of such nature that it will not harm adjoining paint and other finishings in any way.

NOTA BENE: Whenever possible, smooth, light colored units should be scrubbed with warm water and soap powder in lieu of acid cleaning.

PS4.2.22 Plastering

PS4.2.224.1 Lime

Lime shall be hydrated plaster lime complying with the requirements of SANS 523.

PS4.2.22.2 Cement

Cement shall be as specified.

PS4.2.22.3 Sand

Sand for plaster shall be as specified.

PS4.2.22.4 Form key to concrete for plaster finish

All surfaces of concrete receiving plaster or similar finishes shall be well wetted and wire brushed immediately after the formwork has been removed and slushed over with 2:1 cement grout to form key for the finish, all to the approval of the Employer's Agent or his duly authorized representative. The slushing shall be allowed to set hard before any finish is applied

Where smooth formwork has been used, particular care shall be taken in forming the key for plaster as described in applicable concrete specifications.

PS4.2.22.5 Lime plaster

a) One coat work on walls

Lime plaster for 1 coat work on walls shall be composed of 4 parts (volume) of sand and 1 part (volume) of lime. The material shall be mixed dry until of uniform colour, water shall then be added and the mixture turned over until the ingredients are thoroughly mixed.

Lime plaster not used on the day it is mixed, shall be kept moist until required for use by covering with wet sacks or by other approved means.

b) Two coat work on walls

The rendering coat shall be of compo plaster well scratched over to form key for the setting coat. The setting coat shall be composed of 1 part hydrated putty plaster lime, complying with the requirements of SANS 523 and 1 part fine washed sand, to which retarded hemi-hydrate hardwall finishing gypsum plaster shall be added in the proportion of 1 part of gypsum plaster to 4 parts of sand, all proportioned by volume.

The gypsum plaster shall not be added to the mixture until the setting coat is to be applied and shall then be thoroughly incorporated into the mixture and used immediately.

c) Two coat work on metal lathing

The rendering coat shall be of compo plaster to which sisal shall be added in the proportion of 4kg of sisal to 1m3 of plaster. The rendering coat shall be well scratched over to form a key for the setting coat.

PS4.2.22.6 Compo plaster

Compo plaster shall be composed of 10 parts (volume) of sand, depending on the quality of the sand available, 1 part (volume) lime and 1 part (volume) cement.
The lime and sand shall be mixed dry until of uniform colour and then mixed wet. Approximately ½ hour before use, add the cement and any additional water as may be required and remix until thoroughly mixed.

Compo plaster shall be produced in such quantities as can be used whilst remaining workable as no compo plaster that has become unworkable shall be used in any way.

PS4.2.22.7 Cement plaster, one coat work on brickwork:

Cement plaster for 1 coat work on brickwork shall be composed of 4 parts of sand to 1 part of cement for internal work and 5 parts of sand to 1 part of cement for external work, all measured by volume, and mixed as described for cement mortar in sub-clause 4.2.19.9 (Cement mortar).

PS4.2.22.8 Thickness of plaster

Plaster on walls shall be not less than 12mm or more than 20mm in thickness and plaster on concrete ceilings and beams shall not be less than 9mm or more than 16mm in thickness.

PS4.2.22.9 Application of plaster

Walls shall be well wetted before plastering is commenced.

The surfaces of plastered walls internally shall be steel trowelled to a smooth, even and true finish, unless otherwise specified.

All external plaster shall be finished to a true and even surface with a wood float, unless otherwise specified. All plaster surfaces shall be free from blemish.

Plaster shall be returned into reveals and soffits of openings and all angles shall be true and straight with salient angles slightly rounded.

The rendering coat of plaster in two coat work shall be approved by the Employer's Agent or his duly authorized representative before the setting coat is applied and notice shall be given to him when the plaster is ready for inspection.

All cracks, blisters and other defects shall be cut out, made good and the whole left perfect at completion.

PS4.2.22.10 Granolithic finish

Granolithic finish to floors, treads of steps, thresholds and similar horizontal surfaces shall be not less than 25mm thick, composed of 2 parts (volume) granite, or other approved hard stone chippings, or approved hard coarse sharp washed granitic or

quartzitic river sand, graded up to a maximum size of 5mm, 1/6 part clean pit sand screened through a 2.4mm mesh sieve and 1 part (volume) of cement, and hand or mechanically steel trowelled to a true and smooth surface.

The material must test between 30 and 35MPa. No dry cement powder or grout shall be applied to the surface.

The granolithic shall be laid before the concrete subfloor has matured otherwise the exposed surface of the concrete shall be thoroughly cleaned with a wire brush and a coat of neat cement grout applied immediately before the granolithic is laid.

The granolithic shall be laid in panels not exceeding 20m2 in area and joined to lines of panels with
V-joints as directed. The length of any panel shall not exceed 4.5m and wherever possible the joints between the panels shall coincide with any joints in the concrete sub-floor.
Where granolithic is to be tinted, it shall be laid in two thicknesses in one operation, the lower thickness being brought up to within 6mm of the finished level and the upper thickness, into which the requisite quantity of approved colouring material has been mixed, shall be laid. NO DUSTING OF COLOURING MATERIAL SHALL BE ALLOWED.

Granolithic finish to stair risers, sides of kerbs and other vertical surfaces shall be not less than 12mm thick.

Exposed salient angles of granolithic shall be neatly rounded to approximately 20mm radius.
All granolithic work shall be carried out by experienced workmen and shall be protected from injury caused by rain or other extremes of weather for 12 hours after being laid, and against drying out too rapidly whilst hardening by covering with wet sacks or other suitable material and shall be protected from other injury and discoloration during the progress of the remaining work.

Edges of granolithic floors adjoining other floor finishes, edges of margins, etc. shall be true and sharp, all protected by fixing temporary wood strips which shall remain in position until laying of the adjoining flooring material is commenced.

PS4.2.22.11 Reedings to steps and upper surfaces

The treads of steps and upper surfaces of external thresholds finished with granolithic or sand-cement finish shall be rendered non-slip by reeding same near front edge for a width of 100mm and stopped 100mm from ends.

PS4.2.22.12 Polishing of granolithic

All tinted granolithic finishes to floors, steps, thresholds, skirting, etc. shall at completion of all other work be twice polished with wax floor polish of an approved type.

PS4.2.22.13 Screeding to floors

Concrete sub-floors finished with wood mosaic, semi-flexible tiles and fully flexible vinyl sheeting and tiles and similar finishes shall be screeded with 1:3 (cement:sand) cement plaster of thickness required, but in no case less than 12mm, all steel trowelled to true and smooth surfaces. The sand used in the plaster shall be of such fineness as will allow for the screed being trowelled to a surface suitable to receive the finishes.

The screeding shall be laid before the concrete sub-floors have matured, otherwise the exposed surfaces of the concrete shall be thoroughly cleaned with a wire brush and a coat of neat cement grout applied immediately before the screeding is laid.

The screeding shall be laid in good time, but no finishes are to be laid if the screed exceeds 70% moisture content when measured with a hygrometer.

No traffic shall pass over nor shall any building operations take place on the screeding unless a proper protective covering is first provided.

NOTA BENE: A similar process shall be applicable where manholes or chambers are screeded.

PS4.2.22.14 Sand-cement finish

Sand-cement finish to treads of steps, thresholds, etc. shall be of 1:2 (cement:sand) cement plaster not less than 20mm thick and steel trowelled to true and smooth surfaces. Finishes to risers of steps, sides of kerbs and other vertical surfaces shall be not less than 12mm thick. Exposed salient angles shall be neatly rounded to approximately 20mm radius.

PS4.2.22.15 Natural aggregate concrete floor hardener

a) Definition

All natural aggregate hardeners for concrete floors shall consist of a factory prepared blend of clean, properly graded and oven dried natural aggregate, Portland cement and chemical aids, all suitable for monolithic application to the surface of newly placed concrete. Where required the hardener may contain certain compatible pigments for tinted floors.

b) Quality testing

i) Sampling:

A minimum of 1% of every 5 tons of production shall be sampled and factory tested for water demand, compressive strength and proportioning.

ii) Compressive strength and water demand

Mix with sufficient water to give a slump of 20 to 25mm in a 35 x 90 x 75mm high slump cone filled in three layers; tamping each layer with 15 strokes of a 16mm diameter rod, shall give the following minimum compressive strengths when tested in a 70mm mortar cube vibrated for 3mm on a vibrating table and stored in a curing room or tank at 22 to 25°C and not less than 90% humidity:

- at 7 days : 50 MPa
- at 28 days : 70 MPa

iii) Test records:

Each quality test record shall be so referenced that the batch numbers on bags of the product may be traced back to the relevant quality control report. Such reports shall be available for inspection by the Employer's Agent or his duly authorized representative for up to 1 year after manufacture.

c) Curing

As an integral part of this hardener, a membrane curing compound, which must be both compatible with the floor hardener offered and comply with the ASTM C.309 Type 1 specification for moisture retention, shall be used.

PS4.2.22.16 Ferrous aggregate concrete floor hardener

The ferrous aggregate hardener for concrete floors shall be a factory prepared blend of clean, properly graded ferrous metal aggregate, Portland cement and chemical aids for application and hardening, ready to apply as a dry shake to the surface of newly placed concrete before finishing.

The ferrous aggregate shall be guaranteed to be free of matter deleterious to concrete, such as oil and non-ferrous particles and shall be treated for rust inhibition. Where required it may contain compatible pigments for tinted floors.

PS4.2.23 General product requirements

PS4.2.23.1 Local content

Preference shall be given to materials fully manufactured in South Africa with South African raw materials.

PS4.2.23.2 Site service

The manufacturer shall be expected to supply samples free of any other additional charge, and the services of a qualified technical representative on all of the building sites pertaining to the particular contract in order to train the placing team in the correct application methods of the product during initial placing upon 1 week's notice.

Circumstances may necessitate follow-up inspections.

PS4.2.23.3 Shelf life

The shelf life of the offered product shall be stated and the expiry date displayed on each bag. The Contractor shall ensure that the product supplied will survive the Contract Period, or replace the product at his cost.

PS4.2.23.4 References

The Contractor shall submit names and locations of projects in South Africa where the offered product has been in successful use for a period of at least 5 years under similar conditions and at similar rates. The Contractor shall:

i) make arrangements with the project owners for access for such visits, if the Employer's Agent or his duly authorized representative wish to inspect such reference project sites.

ii) provide an acceptable alternative at the same accepted financial rate of the original proposed product, should the Employer's Agent or his duly authorized representative find the product unacceptable.

PS4.2.23.5 Approved products

Only products that have been tested and which have been approved by the SABS shall qualify.

PS4.2.23.6 Application rates

As specified by the manufacturer.

PS4.2.23.7 Control testing

The Contractor shall be required to conduct control testing as and when requested by the Employer's Agent or his duly authorized representative, proving the quality of the product used.

PS4.2.24 Specific work-related instructions

PS4.2.24.1 Contractor's responsibility

The Contractor shall be held responsible for damage to street or road surfaces, kerbing, stormwater drainage channels (gutters), existing utilities, etc. that result from his negligence during any survey. The Contractor shall repair, at his cost, any damage resulting there from, which shall be subject to approval by the owner of such asset and the Employer's Agent or his duly authorized representative.

PS4.2.24.2 No disturbance

The Contractor shall be required to perform Works at all conduits with limited and approved disturbance to the existing service provision. Should the Contractor decide to use a stringing method to survey the conduit, the stringing lines shall not be left in the conduit for more than 5 days or without consent of the Employer's Agent or his duly authorized representative.

PS4.2.24.3 Immediate danger

All obstructions, cracks, irregularities must be fully surveyed and documented. The Contractor must inform the Employer's Agent immediately of any obstruction encountered, locations of hazardous atmosphere, or conduits that are in immediate danger of structural failure. Where possible:

a) the survey shall be done from the opposite side, whilst appropriate health and safety measures are adhered to, so that the extent of the danger can be assessed.
b) the position shall be clearly and accurately marked, to allow operations and maintenance to easily locate the position.

PS4.2.25 Removal of damaged pipes

All pipes that have been removed from the excavations are spoiled within 48 hours of excavation failing which the Employer's Agent shall be entitled to suspend work under the Contract.

The rate shall include the complete (labour, plant and equipment) cost for the removal of such material. Unit: m

PS4.2.26 Trenchless technology

PS4.2.26.1 (HDD) Supply and Installation of pipe through Horizontal Direction Drilling Unit: m

The rate shall include the complete (labour, qualified operators, material, plant and equipment) cost for the successful drilling of the pipe, installation and supply of pipes of various diameters, jointing of pipe, testing of pipe, launching and reception pits. The rate shall also Include the provision and operation of all equipment and accessories, provision and application of all materials, safety equipment (including that required for the Employer's Agent or his duly authorised representative's sole use), traffic accommodation and testing and reporting.

PS4.3 ELECTRICAL EARTHING AND BONDING

All erven where the galvanized pipes are replaced, as part of this Contract, shall be properly earthed and an earth leakage test shall be performed by the Contractor.

PS4.3.1 **Electrical earthing**

In South Africa in terms of SANS 10142 (2003 The Wiring of Premises: Part 1: Low-voltage installations, Edition 1.1), clause 6.13.2.2 all hot and cold water systems must be bonded together and also bonded to the earth continuity conductor system. It is thus imperative that during the installation of new HDPE yard connections, where new secondary mains are installed in the road reserve or an existing steel yard connection is being replaced with new HDPE yard connections, that the Contractor re-instate disturbed electrical earthing as per Typical Detail 1, on drawing no J4092-W-P(G)-005 (Revision 0).

PS4.3.2 **Electrical bonding**

In South Africa in terms of SANS 10142 (2003 The Wiring of Premises: Part 1: Low-voltage installations,

Edition 1.1), clause 6.13.2.2 all hot and cold water systems must be bonded together and also bonded to the earth continuity conductor system. It is thus imperative that during the installation of new HDPE yard connections, where new secondary mains are installed in the road reserve or an existing steel yard connection is being replaced with new HDPE yard connections, that the Contractor re-instate disturbed electrical bonding as per Typical Detail 2, on drawing no J4092-W-P(G)-005 (Revision 0).

PS4.3.3 **Carrying out electrical earthing test**
The Contractor shall be required to perform an electrical earthing test on individual households to ensure that the earthing of each property comply with the standard electrical regulations. If the test reveals that the earthing on any property is not done according to these regulations, the Contractor shall be obliged to inform, in writing, the owner of the property, as well as the Employer`s Agent.

PS4.3.4 Metric measurement
The metric system of weights and measures shall be used in all instances.

PS4.3.5 Site preparation
Prior to any Works commencement the Contractor shall photograph or video tape entire work area. One copy of which shall be given to the Employer`s Agent's authorized representative and one copy shall remain with Contractor for a period of 12 months following the issue of a Completion Certificate. This record shall be used to establish accountability for damages during the execution of the Contract.

No alterations beyond what is required for Works are to be made. Contractor shall confine all activities to designated work areas, to the absolute minimum required.

PS4.3.6 Watching and lighting
The Contractor shall in connection with the ordered Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required for the protection of the Works and the materials and equipment utilized therefore or for the safety and convenience of the public or others.

PS4.4 CONSTRUCTION EQUIPMENT

The Contractor is required to provide all equipment necessary to carry out the works as required. No additional allowances other than those already specified in the schedule of quantities shall be allowed for with respect to equipment.

PS4.5 PLANT AND MATERIALS

PS4.5.1 Plant and materials supplied by the Employer
The Contractor shall provide all construction materials as per the specifications and no additional allowances other than those already specified in the schedule of quantities shall be allowed for with respect to plant and materials.

PS4.5.2 Materials, samples and shop drawings
Only materials that that have been tested and which have been approved by the SANS shall be used in the permanent Works.

PS4.6 EXISTING SERVICES

PS4.6.1 Treatment of existing services

The Contractor must liaise with all relevant local authorities to satisfy himself that all relevant services have been located. At the commencement of the contract, the Contractor must hand excavate a distance 0,5 metre on each side of the located service to expose it. The exposed service shall be identified and recorded on a drawing.

A copy of the drawing with all known services shall be submitted to the Employer`s Agent before construction can commence in any road reserve. Once the exposed service is identified and recorded the excavation must immediately be backfilled. Re-excavation by hand at construction stage will not be measured in addition to normal trench excavation.

The Contractor shall retain full responsibility for establishing the exact positions of the various services in advance of any construction work. No allowance for delays or disruption shall be entertained unless the Contractor complies fully with the provisions of this clause regarding the establishment of the exact positions of the various services in advance of any construction work.

PS4.6.2 Use of detection equipment for the location of underground services

The Contractor:

a) is responsible to provide his own equipment in order to determine the location of existing services, and
b) shall locate and expose existing services by hand.

PS4.6.3 Damage to existing services

The Contractor:

a) must make provision for the possible existence of numerous services within and in close proximity to the work areas;
b) shall take necessary steps to protect any existing services whatsoever against damage which may arise as a result his operations on site. Adequacy in terms of protection of existing services shall be at the discretion of the Employer`s Agent. The Contractor is to make good the protection of and any breakages to existing services;
c) must inform the relevant service provider immediately (within 2 hours of the incident) such that procedures for the re-instatement of the service can be effected, should he damage or break an existing service
(whether known or unknown);
d) shall bear the cost of the repair of damages to any service, the possible existence of which could reasonably have been ascertained by him in good time.

Contractor shall contact the following persons should there be any disruption, damage or co-ordination required with the relevant services agencies:

□	EGOLI GAS	Joice / Seloi	(011) 718 7133
□	ESKOM	Mr Christo Louw	(011) 711 2941
□	CITY POWER	Mr D Oliver	(011) 490 7000
□	CITY PARKS	Mr Mike Griffits	(011) 407 3722
□	JOBURG WATER	Thula / Nkala	(011) 688 1400

□	JRA	Mr Theo Molamu	(011) 866 8697
□	RAND WATER	Mr Job Kubheka	(011) 682 0911/0433
□	NEOTEL	Mr Shane Cannon	(011) 359 1105
□	TELKOM	Mr L Ramolobela	(011) 309 9186
□	SASOL	Mr B van der Heuvel	(011) 865 8563
□	MTN	Shasha le Grange	(011) 912 3289
□	DFA / VODACOM	Ms Nadia Verhoog	(012) 345 7520

The Contractor's attention is drawn to Clause PSA 5.4.

PS4.7 SITE ESTABLISHMENT

PS4.7.1 General

In order to facilitate compliance with the General Conditions of Contract and Conditions of Contract the Contractor shall be required to set-up an individual construction camp. The size and functionality of the site camp shall be in relation to the individual extension. It is, however, expected that the Contractor would have made themselves aware on whether one or multiple site camps are required for the execution of the complete Contract Works.

The Contractor shall price accordingly and state so in their proposal. For the camp/s, the following shall apply: a) The Contractor shall make arrangements with the relevant authority for a suitable site to establish a construction camp, storage, works offices, workshop/s, kitchen, and shelters for security personnel.

b) The Contractor shall note that only security personnel shall be permitted to remain in the campsite overnight.

c) Ablution facilities shall be provided for men and women separately. One toilet per twenty workers shall be provided. Such facilities shall at all times be maintained in a clean and hygienic condition. Toilets shall be screened from public view and their use shall be enforced.

d) Covered accommodation shall be provided for perishable or corrodible materials, fittings and the like and shall be adequate and suitable for their purpose. In the case of cement stores, they shall be well ventilated, weatherproof and waterproof with appropriate floors to keep the materials dry and freely aerated.

e) All such accommodation shall be subject to the approval of the Employer`s Agent who shall have free access thereto at all times.

f) Temporary buildings and fencing are to be safe, neat and presentable and the surrounding areas must at all times be kept in a neat, clean and orderly condition for the duration of the Works.

g) It shall be the Contractor’s responsibility to ensure that they are in compliance with all relevant laws and regulations as well as tribal requirements.

PS4.7.2 Site facilities required for Employer`s Agent

a)Source of water supply: It will be the responsibility of the Contractor to make his own arrangements for the supply of water. Potable water is available in the area and the Contractor is to make the necessary arrangements for the provision of a metered point of supply with the Employer. The sum entered by the Contractor in the Bill of Quantities for provision of water shall be deemed to include full compensation for the procurement, transport, storage (where necessary), supply and application of water and for all the work necessary and incidental thereto for the various items of work where water is required for the

purposes of the contract. The Employer does not guarantee the availability, sufficiency or continuity of any supply and no claims in this regard will be considered.

The Contractor is to be aware of the fact that this Contract is to be carried close to a built up environment and that, as such, excessive dust creation will be considered unacceptable by the local residents. The Contractor is to make provision for regular watering of the works in order to alleviate dust creation. During dry weather, or during periods when dust is created by the construction process, the Contractor will be required to water the works a minimum of twice a day, or as specified by the Employer`s Agent. This is a requirement over and above the normal requirement for watering of the works.

a) Source of power supply: It will be the responsibility of the Contractor to make his own arrangements for the supply of electricity. The sum entered by the Contractor in the Bill of Quantities for the provision of power shall be deemed to include full compensation for the procurement and supply of powers to the works. The Employer does not guarantee the availability, sufficiency or continuity of any supply and no claims in this regard will be considered.

b) Contractor's camp: A suitable site for the Contractors camp will be identified prior to commencement by the Employer. The Contractor is to make the necessary arrangements for the payment of services to the Municipality where applicable. The camp site shall be kept clean and tidy, and at the completion of the contract shall be restored to its original condition at the Contractor's own cost, and to the satisfaction of the Employer`s Agent. In order to facilitate compliance with the Conditions of Contract and the Specification, the Contractor may establish storage accommodation, works offices, workshops, messrooms, kitchens, shelters for watchmen, latrines, ablutions and the like in such positions and under such conditions as may be agreed by the Employer`s Agent and indicated in the Addendum to the EMP.

Temporary buildings and fencing are to be neat and presentable and the surrounding areas must at all times be kept in a neat, clean and orderly condition.

The Contractor shall not make any excavation without written permission of the Employer`s Agent.

Covered accommodation for perishable or corrodible materials, fittings and the like shall be adequate and suitable for their purpose, and, particularly in the case of cement stores, shall be well ventilated, weatherproof and waterproof with floors raised off the ground, so as to keep the materials perfectly dry and freely aerated. All such accommodation shall be subject to the approval of the Employer`s Agent who shall have free access there at all times.

In addition to the above, the Contractor shall provide one toilet per 20 workmen. Portable toilet facilities shall be made available to workers of both male and female genders, the number provided to be in proportion to the ratio of the sexes. The toilets shall be located in the vicinity of the work site, shall be screened from public view and the use thereof shall be enforced. The Contractor shall, where applicable, make the necessary arrangements for the regular removal of night soil.

The Contractor may not house members of his permanent staff except for a security guard at the site and is to make the necessary arrangements for the transport of his staff members to and from the site on a daily basis. As the Contractor's Camp may be located in close

proximity to a residential area, attention to noise levels, particularly after hours, will be essential.

d) Site facilities required for Employer`s Agent and others: The requirements of the Employer`s Agent's Site Establishment are detailed in Project Specification PSA and PSAB.

The Contractor shall provide the following office facilities at his main site camp for the Employer`s Agent and others:

- One (1) office for the Employer`s Agents Representative, the JW ISD Team, (1) one office for the CLOs and one (1) to be shared by the Quality Control Foremen.
- Temporary office accommodation to suit his own requirements.
- Covered parking facilities for four (4) cars for the Employer`s Agents Representative, the JW ISD Team, ITQS staff

A telephone will not be required for the sole use of the Employer`s Agent. However, the Contractor shall be responsible for the payment of calls related to the Contract made by the Employer`s Agent's Representative, on his own mobile phone, during the course of the Contract. However, internet facilities shall be provided on site subject to approval by the Employer`s Agent and be available for the sole use of the Employer`s Agent at all times.

PS4.8 SITE USAGE

PS4.8.1 Work on private or state property

The Contractor is to confine his activities strictly to the working area defined as being within 10 m on either side of the pipelines, spoil sites and the direct access roads to these. He shall not encroach upon any roadway except with the prior approval of the Employer, in writing. The Contractor shall, throughout the Contract, take adequate precautions to protect all existing services from damage whether or not they have been pointed out to him.

Shallow sewer connections are to be found at the rear of the mid-block latrines. Particular care shall be exercised when excavating behind these structures. Underground electric cables are to be found on all erven at depths of between 75 and 1000 mm. Typically, these cables are at a distance of up to 1200 mm parallel to the erf boundaries and perpendicular to the common boundaries where they connect to the houses. Cables may also be encountered along the boundary behind the latrines. Particular care should be exercised when excavating in the vicinity of these cables.

The Contractor shall, as soon as is practically possible, inform the Employer`s Agent of any damages to services and shall not repair any such damage unless instructed to do so. The Contractor shall be responsible for making good, at his own cost and to the satisfaction of the Employer`s Agent, all damage caused by him to buildings and other improvements to properties.

Should the Contractor consider that damage to buildings and structures is unavoidable in the execution of any portion of the Works, he shall obtain the approval of the Employer`s Agent before proceeding with the work. Where damage is noticed before commencement of work on that erf, this should be reported to the Employer`s Agent in order to prevent a possible liability claim from the owner.

PS4.8.2 Site safety and precautions against nuisance

The Works are to be conducted in an urban area where high volumes of pedestrian and vehicular traffic may prevail. The watching, barricading, lighting and traffic control on site shall be carried out in strict compliance with these specifications. The Contractor shall ensure that all safety measures are strictly adhered to. The Contractor shall ensure that excavations on sidewalks within the road reserves or within the erven, do not at any time present a safety hazard to pedestrians. All excavations that remain open overnight are to be adequately protected.

The Contractor shall provide all safety materials and equipment necessary for barricading and safeguarding the excavations. The safety of staff and labour involved with the Works and the security of installations, plant and equipment is of major concern and need special attention during the execution of the Works.

Plant used on the Works shall be as efficiently silenced as possible and noisy operations will be permitted only between the hours of 07:00 and 17:00. Any work outside normal hours will be permitted only on the written authority of the Employer`s Agent. Wherever excavations or loading of material is liable to form dust, an effective method of spraying water over the excavated area and loaded material shall be instilled. Any rock or debris falling from trucks on the roads shall be removed immediately. Precautions shall be taken to prevent fouling of public roads or private surfaces. The Employer`s Agent may order the Contractor to broom off and clean roads or surfaces where debris may constitute a danger to the public or a nuisance to the owners.

PS4.8.3 Work on live water mains

Every effort will be made by the Employer to furnish the Contractor with all available information regarding existing reticulation systems. Such information is given in good faith. Actual conditions in the field may, however, vary from the records upon which information is based. The Contractor must allow in his programme for delays when working on live mains and, as far as possible, such work should not be on the critical path of any programme and every effort must be made to have alternative work available.

PS4.8.4 Work outside normal working hours

In accordance with General Conditions of Contract Clause 5.8.1, certain work may only be done outside normal working hours. Such work shall be undertaken solely at the discretion of the Employer`s Agent who shall, from time to time, issue advance orders in writing to the Contractor detailing the work to be undertaken. Work undertaken, as ordered, outside normal working hours shall be measured and paid for at the rates applicable to each and every item carried out as scheduled.

Normal working hours shall be defined as between 07:00 and 17:30 Mondays to Fridays and also 07:00 to 13:00 on Saturdays.

Where the Works are conducted within the road reserve of major arterial roads, the contractor's operations will be restricted to out-of-peak traffic periods (typically 09:00 to 15:30) or as determined by the Traffic Department. The Contractor shall co-ordinate his activities in such a manner that only minor operations that are nondisruptive to traffic are carried out during peak traffic periods. Should the Contractor choose to work outside normal working hours without having been ordered to do so by the Employer`s Agent, permission will not be

unreasonably withheld but all additional costs arising out of such work shall be entirely to the Contractor's account.

PS4.9 PERMITS AND WAYLEAVES

The Contractor will be required to obtain permits and wayleaves from all the applicable service providers who may have services in the vicinity of the Works. These include the following: Rand Water, Sasol Gas, Egoli Gas, Telkom, Eskom, City Power, Johannesburg Roads Agency, Johannesburg City Parks, Johannesburg Water, Neotel and the like.

The Employer will assist the Contractor to obtain clearance from the various authorities with services that are likely to be affected by the Contract. It is, however, the Contractor's responsibility to obtain final permit and wayleave approval according to applicable procedures and specifications. In the case of Johannesburg Roads Agency, this will be as per the City of Johannesburg Code of Practice for Work within the Road Reserve. Further, a processing fee of R400,00 per wayleave per project per suburb will be payable to cover the cost of processing and approval of the Johannesburg Roads Agency wayleave applications.

Permits and way leave associated costs shall be deemed to have been included in the scheduled rates for excavation and location of existing services under the relevant section of SANS 1200A.

PS4.10 INSPECTION OF ADJOINING PROPERTIES

The Contractor shall carry out inspections and evidence collection, as he deems appropriate, of properties adjoining the works to ensure that, in the event of a claim arising from any of the owners of the adjoining properties for damage to property and the like, the Contractor has substantial evidence to support or refute such claims. The Contractor accepts full liability and responsibility for damage that he causes to adjoining properties as well as any costs involved in refuting or processing of such claims.

PS4.11 WATER, SANITATION AND ELECTRICITY FOR CONSTRUCTION PURPOSES

PS4.11.1 Water

The Contractor shall make his own arrangements with the Employer to obtain a potable water metered standpipe connection for which at least 14 days notice shall be given. The size of the connection provided will be as specified in the Water and Sanitation By-laws.

The Contractor may only draw water from fire hydrants through means of a legal, Employer owned, potable water metered standpipe. Failure to use such Employer owned potable water metered standpipes, or using illegal, non- the Employer owned equipment for purposes of drawing water from fire hydrants, will result in the Contractor having to pay an account to the Employer, for an amount determined by the Employer.

The potable water metered standpipe(s) must be made available to the Employer's water inspectors for purposes of reading and inspection, and failure to do so, will result in the immediate withdrawal of such potable water metered standpipe(s). The onus is on the Contractor to return such potable water metered standpipe(s) if they are found to be defective (not registering consumption). Failure to do so will result in an account being levied, payable to and determined by the Employer. Claims for delays caused where standpipe(s) are withdrawn and/or replaced will not be considered. The current water tariffs applicable to the Contract are available from the Employer. Compensation for these costs will be made under the rates and no separate compensation will be made.

PS4.11.2 Sanitation

The Contractor shall provide, maintain, move to positions as required and finally remove proper sanitary accommodation. Sanitary accommodation shall be properly screened and its use strictly enforced. The Contractor shall comply with the Johannesburg Water (SOC) Ltd's Sanitation General By-Laws Section 19(1) and 19(3). The Contractor shall bear all costs associated with the provision of sanitary accommodation. Compensation for these costs will be made under the rates and no separate compensation will be made.

PS4.11.3 Power supply

Power shall not necessarily be available at individual sites in the area of the Contract and the Contractor shall make their own arrangements with the relevant authority for the supply of power. The Contractor shall bear all costs associated with the provision of power.
Compensation for these costs will be made under the rates and no separate compensation will be made.

PS4.12 ALTERATIONS, ADDITIONS, EXTENSIONS AND MODIFICATIONS TO EXISTING WORKS SURVEY CONTROL AND SETTING OUT OF THE WORKS

The Contractor is required to verify the accuracy of all drawings and levels provided by the Employer`s Agent prior to commencing with any construction activities.

Where the Works require that alterations, additions, extensions and / or modifications be carried out to existing works or facilities, these shall be carried out strictly in accordance with the requirements of the relevant authorities.

PS4.13 SURVEY CONTROL AND SETTING OUT OF THE WORKS

The Contractor will be held responsible for the maintenance of all the cadastral beacons and bench mark pegs on the site that were recorded as existing at the commencement of construction, and for the replacement of any of these pegs that are found to be missing or disturbed upon the completion of the contract. A completion certificate will only be issued after the Contractor has submitted to the Employer`s Agent a certificate from a registered land surveyor stating that all pegs are in their correct position.

The Contractor shall, prior to the ordering of pipes or fittings, set out the works in accordance with the drawings / site instructions. The positions of chambers, pipe bends, road crossings and connections to existing mains shall be clearly marked. The Contractor shall protect and maintain all pegs and markings throughout the Contract. The Contractor shall record the setting out of the works in an approved format and order all materials accordingly. Where discrepancies are identified, these shall be raised with the Employer`s Agent and a ruling sought, prior to ordering of material related to the discrepancy.

PS5 MANAGEMENT OF THE WORKS

PS5.1 APPLICABLE SANS 1921 STANDARDS

The portion(s) of the scope of work is considered routine construction work. It is therefore expected that the Contractor shall make use of the services of small and micro enterprises for portion(s) of the works. These include site clearance, service location and protection, small scale excavation and small-scale concrete construction and precast concrete construction of chambers.

The Standards applicable to this Contract shall be:

SANS 1921-1	2004	Part 1:	General engineering and construction works
SANS 1921-2	2004	Part 2:	Accommodation of traffic on public roads occupied by the contractor
SANS 1921-5	2004	Part 5:	Earthworks activities which are to be performed by hand

PS5.2 PLANNING AND PROGRAMMING

PS5.2.1 Construction roll-out and programming

The Contractor shall provide the Employer`s Agent with a method statement indicating the manner and sequence in which he intends to construct the works, for each work area, with the program. In the method statement the Contractor must address at least the following items:

a) sequence of the works for the relevant works area;
b) target dates for the tasks identified in sequence of the works for the relevant works area;
c) materials requirements;
d) construction Plant to be used;
e) services affecting construction; and
f) any factors and approvals that could affect construction progress after commencement.

The method statement must be approved by the Employer`s Agent before commencement of construction. In order to minimize the impact on traffic, pedestrians and business the Contractor will be required to segment the works in such a manner that no portion of the works is more than one day ahead of the following position. These segments of the works shall be clearly defined in the Contractor's method statement for each work area.

If, during the progress of the work, the quantities of work performed per month fall below those shown on the program or if the sequence of operations is altered, or if the program is deviated from in any other way, the Contractor shall, within one week after being notified by the Employer`s Agent, submit a revised program.

If the program is to be revised by reason of the Contractor falling behind his program, he shall produce a revised program showing the modifications to the original program necessary to ensure completion of the Works or any part thereof within the time for completion. Any proposal to increase the rate of work must be accompanied by positive

steps to increase production by providing more labour and plant on the Site, or by using the available labour and plant in a more efficient manner.

Failure on the part of the Contractor to submit or to work according to the program or revised program shall be sufficient reason for the Employer to take steps as provided for in the GCC.

The approval by the Employer`s Agent of any program shall have no contractual significance other than that the Employer`s Agent would be satisfied if the work is carried out in accordance to such program and that the Contractor undertakes to carry out the work in accordance with the program. It shall not limit the right of the Employer`s Agent to instruct the Contractor to vary the program should circumstances make this necessary.

PS5.2.2 Work plan

Seven days prior to commencing with any part of the Works, the Contractor shall submit to the Employer`s Agent, for review and approval, a work plan detailing the procedure and schedule to be used to execute such works, detailing and substantiating any deviation from the originally proposed approach. Further, the work plan shall include a:

a) time frame;
b) description of all equipment and tools to be used;
c) list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable);
d) list of subcontractors, schedule of work activity;
e) safety plan (clearly highlighting any potentially hazardous substances to be used); f) traffic control plan (if applicable);
g) an environmental protection plan; and
h) contingency plans for possible problems.

The approval given by the Employer`s Agent shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as prescribed under this Contract

Work plan shall be comprehensive, realistic and based on actual working conditions. Further it shall form the various sub-sections of the overall Contract programme and plan

NOTA BENE: No works shall be allowed to commence without an approved work plan.

PS5.2.3 Planning

The Contractor shall ensure that he:

a) is well informed with regard to the Employer's overall maintenance programme and avail resources as required to efficiently complete this Contract; and
b) delivers goods and services timeously to meet the Employer's prevalent performance standards and where applicable to not unnecessarily delay any other contractors, service providers and suppliers.

PS5.2.4 Programming

In order to ensure a clear understanding, at the inception of the Contract, of the programming and documentation format requirements, the Contractor shall appoint a project programmer/ planner for liaison during the Contract. The Contractor shall for the Contract Period provide and regularly update (maximum monthly) a Contract Programme.

The programme shall at minimum contain: a) Time Scale (minimum):

i) Days, where the period does not exceed three months. Weeks, where the project period exceeds three months.
ii) Months, where the period does not exceed one year.
iii) Years, where the project period exceeds one year.

b) Tasks: Where phases or stages are anticipated, this shall be the highest level of division and all tasks related to the successful accomplishment of that phase of the area shall be grouped. Resources allocation and task dependency shall be indicated.

c) Start and Finish Dates: All tasks shall have specific start and finish dates.

d) Critical Path: All tasks forming the programme line that will establish any delays in the overall Contract Period shall be clearly indicated and an indication of their sensitivity characteristics shall be provided.

e) Progress Tracking: The Contractor shall be required to periodically indicate progress per task graphically and on a percentage basis.

f) Non-working Time: All South African public holidays, weekends and the local traditional annual builder's break shall be incorporated in the programme..

No deviation from the approved sequence of construction shall be accepted without prior written approval.

The programme shall not be in the form of a bar chart only, but shall show clearly the anticipated quantities of work to be performed each month, together with the manner in which the listed plant is to be used, as well as the anticipated earnings for the various sections of work.

***NOTA BENE*:** NOTA BENE: A Contract programme shall be submitted to the Employer's Agent no later than 28 days after Contract Commencement Date.

The Contractor shall provide the Employer`s Agent with a method statement indicating the manner and sequence in which he intends to construct the works, for each work area, with the program. In the method statement the Contractor must address at least the following items:

a) sequence of the works for the relevant works area;
b) target dates for the tasks identified in sequence of the works for the relevant works area; c) materials requirements;
d) construction Plant to be used;
e) services affecting construction; and
f) any factors that could affect construction progress after commencement.

The method statement must be approved by the Employer`s Agent before commencement of construction. In order to minimize the impact on traffic, pedestrians and business the Contractor will be required to segment the works in such a manner that no portion of the works is more than one day ahead of the following position. These segments of the works shall be clearly defined in the Contractor's method statement for each work area.

If, during the progress of the work, the quantities of work performed per month fall below those shown on the program or if the sequence of operations is altered, or if the program is deviated from in any other way, the Contractor shall, within one week after being notified by the Employer`s Agent, submit a revised program.

If the program is to be revised by reason of the Contractor falling behind his program, he shall produce a revised program showing the modifications to the original program necessary to ensure completion of the Works or any part thereof within the time for completion. Any proposal to increase the rate of work must be accompanied by positive steps to increase production by providing more labour and plant on the Site, or by using the available labour and plant in a more efficient manner.
Failure on the part of the Contractor to submit or to work according to the program or revised program shall be sufficient reason for the Employer to take steps as provided for in the GCC.

The approval by the Employer`s Agent of any programme shall have no contractual significance other than that the Employer`s Agent would be satisfied if the work is carried out in accordance to such program and that the Contractor undertakes to carry out the work in accordance with the program. It shall not limit the right of the Employer`s Agent to instruct the Contractor to vary the program should circumstances make this necessary.

PS5.3 Sequence of the Works

Not withstanding any changes that the Employer's Agent deems necessary the sequences should include the following:

- Mobilisation, project planning and control and communications to stakeholders
- Wayleaves
- Ordering of material
- Site clearance for the affected areas
- Site Fencing and security
- Traffic control and temporary signage during construction
- Exposing existing services and driveways
- Excavation, recovery of old pipelines, trench preparation and compaction
- Supply, bedding and laying of pipes
- Provision and installation of valves or the rehabilitation of valves as directed by the Employer's Agent,
- Backfilling (blanket layers and top layers including compaction)
- Clearing of the site including removal of spoil
- Site hand over

PS5.4 Software Application for Programming

The construction programme shall be completed in Microsoft ® Project Standard 2013 or compatible software. The construction programme and updated versions thereof shall be made electronically available to the Employer`s Agent.

PS5.5 Methods and Procedures

The Contractor shall submit to the Employer's Agent, within a period stated in the Contract Data, a detailed construction programme, detailing the date of commencement and completion of the work activities, dates, duration and extent of traffic accommodation interruption water supply to affected consumers. The detailed programme shall be based on the preliminary programme submitted with the tender and shall make an allowance for the following:

- Normal working hours shall be defined as between 07:00 and 17:30 Mondays to Fridays and also 07:00 to 13:00 on Saturdays.

- No work outside working hours will be allowed. Should the Contractor wish to work outside normal working hours written permission shall be obtained from the Employer's Agent and all additional costs arising out of such work shall be entirely to the Contractor's account.
- Only one side of the street may be affected by the construction at any one time.
- The Employer's Agent may require that the construction of certain road crossings be done outside normal working hours.

The Employer's Agent shall provide the Contractor with drawings and details of the Works that need to be done.

Once a detailed programme has been approved, the Contractor shall not deviate from the planned operations.

Pipeline and associated hydrants, valves and fittings

- The existing pipes will be left in place and remain operational until such time that it is switched over to the new pipeline.
- The connection of the new pipe will be done by the Contractor under strict monitoring by the Employer's Agent.
- Extreme care should be taken not to break or damage the existing pipelines. If this should happen and the existing pipe gets damaged during the course of installing the new line, then the relevant Depot Manager must to be notified. The trench will have to be drained by the Contractor after the Depot has turned the water supply off. All assistance must be given by the Contractor to the Depot in repairing the damaged pipe.
- The new pipelines will be laid as indicated on the drawings supplied.

All existing erf connections are to be disconnected from the existing reticulation and then reconnected to the new pipeline with minimum disruption to residents.

Fire hydrants and valves

- New fire hydrants, valves and fittings are to be supplied and installed on all the new pipelines.
- After the old mains have been disconnected from the reticulation system all existing valves and hydrants are to be handed to the Employer

General

- The Contractor will arrange for the warning of the public of any shutdown of supply necessary in his/her opinion for the proper execution of the Works.
- All disconnections and reconnections, connections to the existing mains, closing and opening of valves and the disruption of water supply must be liaised with the relevant Depot Manager at least 4 working days prior to the action.
- The disruption of supply and the duration of disruption of the supply to the consumers are to be kept to a minimum. Consumers are to be informed of any disruptions as described later in this specification.

- Any claims from the property owners and/or the community will be considered and evaluated by the Employer. Should The Employer's find a valid claim but found that the Contractor has neglected his/hers responsibilities and/or duties, which lead to the claim, the Contractor will be responsible for settling the claim.

PS5.6 Quality Plans and Control

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the specifications and drawings rests with the Contractor, and the Contractor shall, at his own expense, institute a quality-control system and provide experienced personnel, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the works at all times.

The cost of supervision and process control will be deemed to be included in the rates tendered for the related items of work.

On completion and submission of every part of the Works to the Employer`s Agent for examination, the Contractor shall furnish the Employer`s Agent with proof of quality in the form of a data pack containing measurements and levels to indicate compliance with the scope of work. Notwithstanding anything contained in this document, any tests that may have been carried out, any consent that may have been given, either directly or implied, and anything that may be construed to the contrary, the Contractor shall remain fully and solely accountable for the Works and for compliance with the specifications and the drawings.

The Contractor shall afford inspectors from the Local Authority reasonable access to all parts of the site. The Employer`s Agent in the presence of representatives of the Local Authority will generally undertake testing of the works. Accordingly the Contractor shall notify the Employer`s Agent at least 24 hours in advance as to when the various sections of work will be available for testing. The Employer`s Agent may require the Contractor to submit a weekly schedule of times, based on his programme, that he envisages work to be available for testing.

The tendered rates shall include the cost of all activities and tests that may be required in ensuring proper completion and commissioning of the Works, and no additional claims shall be entertained in this respect. This includes the supply of all necessary equipment required for such and / or for inspections by the Employer`s Agent and any other relevant authority. Any defect in the Works shall be corrected to the satisfaction of the Employer`s Agent.

PS5.7 ACCOMMODATION OF TRAFFIC ON PUBLIC ROADS OCCUPIED BY THE CONTRACTO

PS5.7.1 Accommodation of traffic

The Contractor shall ensure the safe accommodation of traffic at all areas where the work may impact traffic and shall provide all delineators, watching, lighting, signs and barricades required by the road authorities, and in accordance with the South African Road Traffic Signs Manual.

PS5.7.1.1 Road safety equipment

The Contractor shall provide each work unit or team with:

a) an amber-flashing beacon, which shall comply with and be operated in accordance with any governing road vehicle lighting regulations or similar.

b) appropriate sized and quantity of road signs, including delineators and cones which shall be displayed at the works area in accordance with the South African Road Traffic Signs Manual, Chapter 13.
c) bright coloured overalls, fluorescent over-jackets and belts for each team member for use at all working times during the day or night.

PS5.7.1.2 Traffic Control
The Contractor shall prepare a traffic quality control plan and submit it to the Employer`s Agent seven (7) days before commencing with construction on any portion of the Works.

a) A traffic control plan shall include detailed diagrams showing the location of all traffic control devices and the length of time for all lane closures, as well as location of any flaggers, as necessary.
b) One lane of traffic in each direction must be maintained at all times and local streets may only be closed with prior approval of the Employer`s Agent.
c) A written method of handling traffic for each different phase of the project shall be submitted and include both vehicular and pedestrian traffic.
d) The name and number of the Contractor representatives responsible for traffic control shall be made available to solve traffic problems at each job site location.

For the complete temporary closure of any road affected by the proposed works, the Contractor shall make allowance in his price, in addition to the minimum requirements specified under clause PS5.7.1.2, for the following safety equipment:

a) Two traffic information signs minimum per road informing the public of the road closure, *i.e. 'ROAD CLOSED' signs displayed on both sides of the closed*.
b) Two traffic warning signs minimum per road informing the public that the road has been closed, *i.e. 'NOENTRY' signs displayed on both sides of the closed road*.
c) One temporary traffic sign indicating a dead-end to the public trying to exit from by means of the closed road.
d) The provision of traffic barriers on either side of the close street for preventing the public from accessing the closed road at the construction site, *i.e. plastic 'new jersey' barriers positioned without any spacing and to totally close of the road from kerb to kerb edge.*
e) Two traffic information signs minimum per road indicating an alternative route or a detour, *i.e. 'DETOUR by **ALLAN ROAD**' signs displayed at visible positions.*
f) A combination of delineators shall be placed at 5m intervals along the works, as required, to successfully completing the works site isolation.

PS5.7.2 Access to properties

Adequate access shall at all times be maintained to public and private properties unless otherwise arranged and approved. Details of the proposed means of access shall be submitted before any such access is restricted. Claims arising from impeded access shall be the responsibility of the Contractor.

At least 7 days before commencing any work affecting access to a property, the Employer`s Agent and the occupier/owner of each such property shall be notified of the Contractor's intention to commence work, the date of commencement, expected duration and arrangements which will be made regarding maintenance of access.

PS5.7.3 Bridges across dangerous excavations

The Contractor shall provide a structurally sound and safe bridge with side rails across dangerous excavations crossing sidewalks to allow pedestrians safe access to such sidewalk.

Associated costs for the provision of pedestrian access to sidewalks shall be deemed to have been included under the various excavations or combined activity rates and/or prices in the pricing schedules.

PS5.8 OTHER CONTRACTORS ON SITE

There may be other contractors working within the same area. As such, the Contractor is required to make adequate allowances for such possibilities. No claims with respect to works being carried out by other contractors shall be entertained by the Employer.

PS5.9 TESTING, COMPLETION, COMMISSIONING AND CORRECTION OF DEFECTS

The onus is on the Contractor to produce goods and services which shall conform in quality and in accuracy of detail to the requirements hereinafter specified. The Contractor must clearly understand that it is not the duty of the Employer`s Agent or his representative to act as foreman or surveyor on the Works.

The Contractor shall, at his own expense, provide experienced engineers, foremen and surveyors together with all transport, instruments and equipment for supervising, checking and controlling the work.

The act of passing any completed work or accepting materials or goods for payment by the Employer`s Agent shall not be construed as signifying approval or acceptance thereof. Failure on the part of the Employer`s Agent to reject any defective work or material or goods shall not in any way relieve the Contractor of his obligations under the Contract, nor prevent later rejection when such work or material is discovered.

The Contractor shall, when submitting any work to the Employer`s Agent for examination, satisfy himself by testing, measurement and otherwise as may be necessary that the work does in fact meet with the requirements of the Specifications. This information shall be submitted with the Contractor's request for examination and the Employer`s Agent shall be authorised to decide on the number and type of tests, measurements, etc. required to enable him to judge the quality of the work. The submission of this information shall in no way diminish the authority of the Employer`s Agent to conduct such tests as he may consider necessary in order to determine the quality of the work performed by the Contractor, nor shall he be bound to take account of the Contractor's tests, measurements, etc. should he consider these to be either incorrect or not representative.

Quality control and completion tests shall be in accordance with the relevant standard and amended specifications and additional specifications.

PS5.10 RECORDING OF WEATHER AND ABNORMAL RAINFALL

If during the time for completion of the Works, or any extension thereof, should abnormal rainfall or wet conditions occur, then an extension of time in accordance with Clause 5.12.1 to 5.12.3 of the General Conditions of Contract shall be granted by the Employer, calculated on the critical path method. It shall be applied as follows:

A delay caused by inclement weather conditions will be regarded as a delay if, in the opinion of the Employer`s Agent, all progress on an item or items of work on the critical part of the working programme of the Contractor has been brought to halt. Delays on working days only (based on a five day working week) will be taken into account for the extension of time, but the Contractor shall make provision in his programme of work for an expected delay of **10**

(ten) working days caused by normal rainy weather, for which he will not receive any extension of time.

Daily records of rainfall and activities within the critical parts affected shall be kept by the Contractor and signed by the Employer`s Agent's representative on the site. For this, accurate rain gauging shall be taken at a suitable point on the site, and the Contractor shall, at his own expense, take all necessary precautions to ensure that unauthorised persons do not interfere with the rain gauges. Failure to produce signed copies of the above records on a daily basis to the Employer`s Agent's representative on the site after the event having occurred will be deemed to be in breach of this Clause and will not be admissible for purposes of seeking an extension of time.

If during the time for completion of the works or any extension thereof abnormal rainfall or wet conditions shall occur then an extension of time in accordance with Clause 5.12.2.2 of the General Conditions of Contract for Construction Works Third Edition 2015 hereof shall be granted by the Employer calculated in accordance with the formula given below for each calendar month or part thereof.

V = (Nw - Nn)+ ((Rw - Rn)/X) Extension of time in calendar days in respect of the calendar month under consideration.
Nw - Actual number of days during the calendar month on which a rainfall of Y mm or more has been recorded.
Nn- Average number of days, as derived from existing rainfall records, on which a rainfall of Y mm or more has been recorded for the calendar month.
Rw - Actual rainfall in mm recorded for the calendar month under consideration.
Rn - Average rainfall in mm for the calendar month as derived from existing rainfall records

The Contractor shall be permitted to take his own rainfall measurements on site subject to the Employer`s Agent's approval, but access to the measuring gauge(s) shall be under the Employer`s Agent's control.

The Contractor is to provide and install all the necessary equipment for accurately measuring the rainfall as well as to provide, erect and maintain a security fence plus gate, padlock and keys at each measuring station, all at his own cost.

The values of Nn Rn, x and y for use in Clause 5.12.2. of the Special Conditions of Contract shall be as follows:

Source of Information : Weather Bureau, Department of Environment
Rainfall Station : Goudkoppies O475736A2, Lat 2616, Long 2755
Period : 1990 to 1999

Month	Nn	Rn	Month	Nn	Rn
January	10,9	116,1	July	0,2	0,7
February	6,8	84,9	August	0,9	3,9
March	8,5	112,8	September	2,7	16,5
April	2,8	24.9	October	7,2	92,5

May	1,5	18,3	November	9,8	88,0
June	0,5	1,6	December	11,6	130,9

Average Annual Rainfall
691,0 x = 20 mm y
= 10 mm

PS5.11 FORMAT OF COMMUNICATIONS

All communication shall be in writing and any verbal agreements shall only be binding once confirmed and agreed to in writing. Communication via, registered post, email or facsimile is acceptable.

The Contractor shall report on a fortnightly basis for the duration of the Contract to the Employer`s Agent on the progress of the Works, the local resource participation and other Project related matters in a prescribed format (3 hard copies and a soft copy).

Progress reporting shall contain tables and graphics (acrobat PDF format) and shall include, but not be limited to;

a) Pipe laying
- Works commencement date
- Works completion date
- Variations (detail, time and cost implications)
- Site agent, foremen, quality manager and safety officer details
- SMMEs allocated
- Length of pipework installed
- System testing performed and approved
- Quality certification
- Final cost and time implication
- Take-over certificate requested (date)
- Record information submitted (person and date)
- Record information approved (person and date)
- Take-over certificate issued (date)

Local resources reporting shall include but not be limited to; a) Number (labourers, SMMEs and suppliers),

b) Labour:
- Process of recruitment, selection and appointment
- Name and surname
- Gender and age
- Contact details (address, telephone numbers and ward number)
- Contract signed
- Duration of appointment
  - Commencement date
- Termination date
- Activity performed
- Classification (Skilled, semi-skilled or unskilled (labourer))
- Time or task rate
- Allocated Supervisor/foreman

- Health and Safety induction undergone
- Training provided
    i. Trainer details
    ii. Type of training
    iii. Duration of training
    iv. Cost of training
- Performance rating (good, fair, poor)
    i. For training
    ii. Work execution
    iii. Health and safety awareness
- Additional training or supervision to be provided
- Monthly and cumulative payments

c) SMMEs

- Process of recruitment, selection and appointment
- Company name
- Company contact details (address, telephone numbers and ward number)
- Company registration (also VAT and TAX)
- Company age (months or years)
- Type of company
- Company size (number of permanent employees)
- Name and surname of owner
- Owner contact details (address and telephone numbers and ward number)
- Gender, age and PDI status
- Contract signed
- Duration of appointment
    i. Commencement date ii. Termination date

Resources provided (labour and/or plant and/or materials)
Activity performed
Classification Time or task rate
Allocated Contractor Supervisor/foreman

- Health and Safety induction undergone
- Training provided
    i. Trainer details
    ii. Type of training
    iii. Duration of training
    iv. Cost of training
- Performance rating (good, fair, poor)
    i. For training
    ii. Work execution
    iii. Health and safety awareness
- Additional training or supervision to be provided
- Monthly and cumulative payments

d) Suppliers

- Process of recruitment, selection and appointment
- Company name
- Company contact details (address, telephone numbers and ward number)
- Company registration (also VAT and TAX)
- Company age (months or years)

- Type of company
- Company size (number of permanent employees)
- Name and surname of owner
- Owner contact details (address and telephone numbers and ward number)
- Gender, age and PDI status
- Contract signed
- Duration of appointment
    i. Commencement date
    ii. Termination date
- Resources provided (plant and/or materials)
- Activity performed
- Allocated liaison
- Health and Safety induction undergone
- Performance rating (good, fair, poor)
- Monthly and cumulative payments

The report format may be amended from time to time by the Employer`s Agent. However the initial format shall be finalised by the Employer`s Agent in association with the Contractor.

PS5.12 KEY PERSONNEL

The Contractor is to provide the Curriculum Vitae's of key personnel to be employed on the project as well as the person's position and responsibilities within the project team. The Contractor shall provide the following minimum key staff:

a) Contract manager;
b) Site Agent;
c) Quality Manager/Auditor/Controller;
d) Health and Safety Officer/s;
e) Environmental Officer
f) Foremen; and
g) Qualified plumbers.

The Contractor shall ensure that at least one sufficiently experienced pipe jacking supervisor is on-site full time while pipe jacking operations are performed.

Please note that the Contractor will be required to provide key personnel similar to or of higher qualifications and experience as those the Contractor provided for at tender stage.

PS5.13 MANAGEMENT MEETINGS

Fortnightly site meetings shall be arranged and facilitated by the Employer`s Agent. Senior Contractor management staff attendance shall be compulsory.

The Contractor shall be required to provide reporting with regard to project progress, resources (human, plant and equipment), community issues, environmental and health and safety aspects.

PS5.14 FORMS FOR CONTRACT ADMINISTRATION

The Contractor shall maintain a file which shall contain project information related to project progress, resources (human, plant and equipment), community issues, environmental, health and safety aspects, penalties imposed, claims lodged and outcomes, disputes and resolutions, payment and variations.

PS5.15 DAILY RECORDS

The Contractor shall keep daily site records as required by the Employer or his representative and as specified herein. Daily records shall include, labour, plant, materials, rainfall, environmental issues, health and safety issues, daily diary and the like. Such records are the property of the Employer and shall be made available to the Employer or his representative within 24 hours from being requested to do so.

PS5.16 BONDS AND GUARANTEES

In addition to GCC Clause 6.2.1, the Contractor shall provide the Form of Guarantee for the due and punctual fulfilment and completion of all the Contractor's obligations under the Contract. No extension of time of the Contract Period of Performance or any variation of the Contract nor the determination of the Contract by the Employer in terms of Clause 10 hereof shall in any way impair or diminish or terminate any liability to the Employer under and by virtue of such Guarantee.

Should the Contractor, when notified of the acceptance of his offer, fail to provide an approved Guarantee within the stated period, then the Employer may, at his sole discretion:
(a) Grant the Contractor a further reasonable period in which to provide the bond; or
(b) Withdraw his acceptance of the tender in which case the Contract shall be deemed to be void, but without prejudice to the Employer's rights to recover whatever damages he may have suffered by virtue of the Contractor's failure to fulfil his obligations.

PS5.17 PAYMENT CERTIFICATES

Payment certificates shall be submitted to the Employer`s Agent, in the format required, for approval and final submission to the Employer on a monthly basis.

PS5.18 INSURANCES PROVIDED BY THE EMPLOYER

The Employer shall provide all insurance as required in terms of the General Conditions of Contract.

PS6 FEATURES REQUIRING SPECIAL ATTENTION

PS6.1 PROJECT PARTICIPATION STRUCTURE

PS6.1.1 Project participant organizational structure

The project team consists of the following parties indicated below.

PS6.1.1.1 Johannesburg Water Project Manager:

A representative of Johannesburg Water who looks after the interests of JW by establishing a clear project goal and objective, monitoring the progress of the project, ensuring that all work

is done according to the scope of works and is also responsible for the successful execution of the project.

PS6.1.1.2 JW Site Staff

The JW Employer`s Agents Representative and Assistant Employer`s Agents Representatives who work closely with the contractor and supervise the construction, ensuring that the contractor complies with the specified quality of work and informing the Consultant Project Engineer / Manager of the progress of the works.

PS6.1.1.3 CONTRACTOR

Responsible for the coordination of the project as well as providing all the necessary labour, equipment and tools. The contractor is also responsible for implementing the works within the specified time frame, budget, quality and adhering to all statutory requirements.

PS6.1.1.4 SMME's

Small, Medium and Micro-sized Enterprises may be subcontracted to execute portions of the work.

PS6.1.1.5 Contractor's Staff

Provide the contractor with support in terms of site supervision, monitoring, administration and ensuring that safety regulations are in place where necessary and strictly adhered to.

PS6.1.1.6 Facilitators

Facilitators sourced and employed from the community for a period of time during the implementation stage of the works.

PS6.1.1.7 COMMUNICATION ISD MANAGER

Information Systems Development

PS6.1.1.8 Community Liaison Officer (CLO)

A representative linking the community to other role players in the project to ensure that communication between contractor, the local community and appointed subcontractor runs smoothly.

PS6.1.1.9 PRE-PAYMENT MANAGER

Provides supervision to the operations facilitator and ensures that the prepayment system functions as required by JW.

PS6.1.1.10 Operations Foreman

Carries out a variety of duties to maintain the efficient and safe use of the pipelines by JW.

PS6.1.1.11 DEPOT MANAGER

Johannesburg Water Depot Manager to provide assistance to the implementation team with regards to shut down arrangements, connecting to the existing system and sharing general knowledge about the system.

PS6.1.1.12 QCF

Quality Control Foremen working with the Employers Agent that is Semiskilled Plumber to independently evaluate work conducted by the Main Contractor & SMME's

PS6.1.1.13 SECURITY

The Contractor shall be responsible to provide security on site(s):

a) as he deems necessary. the employer shall not be held responsible for any loss or damage(s) suffered by the contractor, and his plant and, equipment, materials, subcontractors or employees as a result of a security incident of any nature.
b) which have been identified, by the Employer's Agent and/or Employer, as potential high risk areas requiring security during site visits for the duration of the contract. The Contractor shall arrange that the security meet with the Employer's Agent and/or Employer representative at a convenient and safe location and thereafter escort to the necessary areas.

PS6.2 PRACTICAL COMPLETION

As per GCC Clause 5.5.1 Practical Completion of the Works shall be deemed to have been reached when the Contractor and the Employer`s Agent has formally signed-off for:

a) **Work done on the road-reserve.** Work done by the Contractor on the road reserve must be 100% complete, tested and accepted by the Depot before the Employer`s Agent can sign for Practical Completion.

PS6.3 PROVISION AND GENERAL ITEMS FOR THE SMMES

Reasonable office and storage facilities shall be made available for use by the community SMMEs staff and for the safe keeping of their tools, equipment and materials. The facilities shall be limited to a minimum of a 6 X 3 meter lockable container, with allowance for office and storage for each SMMEs items and shall have shelves and hooks for storage of items. The Contractor shall determine the required size, shelving and hooks based on their calculation of the required number of SMMEs.

Allowance shall be made for the provision and maintenance of small tools and equipment required by the SMMEs to successfully complete their allocated work in the allocated time frames. This shall include wheel barrows, picks, shovels, racks, brooms, screw drivers, hammers, pliers and trowels.

Ablution and latrine facilities and water Supplies, electric power and communications, access and plant shall form part of the Contractor's Fixed and Time related cost.

PS6.8 NEGOTIATIONS WITH PROPERTY OCCUPANTS

The Contractor shall make all necessary arrangements with property owners regarding access to the site etc., and also regarding reinstatements of ground surfaces (grass, concrete, paving blocks, asphalt and vegetation), damage to land and property, etc.

Take over shall not be deemed to certify completion if any ground surface/s requiring reinstatement on any property is not completed by the Contractor. The Contractor may be requested to obtain a letter for the owner of each property concerned to the effect that he is satisfied with the reinstated condition of his property.

PS6.9 SECURITY

The Contractor shall be responsible to provide security on site(s) for the duration of the contract:

a) for his plant, equipment, materials, subcontractors or employees. The Employer shall not be held responsible for any loss or damage(s) suffered by the Contractor as a result of a security incident of any nature.

b) To escort the Employer`s Agent and / or Employer during site visits. The Contractor shall arrange that the security meet with the Employer`s Agent and/or Employer representative at a convenient and safe location and thereafter escort to the necessary areas.

PS6.10 OPERATION OF VALVES

Only employees of the Employer are permitted to operate primary and secondary water mains valves.

PS6.11 WORK OUTSIDE NORMAL WORKING HOURS

The Contractor is permitted to work outside of normal working hours only upon obtaining written permission from the Employer`s Agent. It is anticipated that all switch-over work (tying new infrastructure into existing) will be completed during hours that will not affect the supply of water to affected communities.

PS6.12 COMMUNITY LIAISON AND COMMUNITY RELATIONS

In all dealings with the community and workers employed from within the community, the Contractor shall take due cognisance of the character, culture and circumstances of the community involved and shall at all times use his best endeavors to avoid the development of disputes and to foster a spirit of co-operation and harmony towards the project. The Contractor shall at all times, keep the Employer`s Agent fully informed on all matters affecting the community. The Contractor shall keep the community fully informed of progress and planned interruptions.

PS6.12.1 Community Liaison Officer

The contractor shall make use of the Community Liaison Officer (CLO), where scheduled, which is to be appointed on behalf of Johannesburg Water and who shall be responsible for liaison between the Contractor/Employer`s Agent and the local community. The CLO will be responsible for keeping the community informed on the progress of the project and conversely keeping the Contractor and Employer`s Agent informed on relevant community affairs and grievances.

A Project Committee shall be established and shall meet on a regular basis to consider, discuss and resolve progress, relevant community matters, welfare of workers, expenditure, requirements of the Contractor and other matters that relate to the project. The committee, which may be chaired by a representative of Johannesburg Water shall consist of representatives of:

- Johannesburg Water
- The Employer`s Agent
- The Contractor

- The Community Liaison Officers (representing the labour employed) □
- The ISD consultant appointed by JW.

PS6.13 NOTICES AND WARNING TO CONSUMERS

The Contractor shall ensure he maintains service (water and/or sanitation) provision at all times whilst executing the works where:

a) The maximum amount of time of no service shall be 8 hours for any property. Any service disruption longer than 8 hours shall be temporary bypassed by methodologies approved by the Employer`s Agent or his duly authorized representative.

b) A Public Notification Program shall be implemented, requiring at minimum that the Contractor shall deliver written notices to each domestic and non-domestic customer affected by the works, 48 hours before commencement of the works, including providing: i) a summary of work to be completed; ii) the time and duration of service interruption; and

a) a local telephone number to contact the Contractor for inquiries or complaints. All complaints received shall be addressed and resolved within the standard Employer response times and a summary of such complaints and associated actions shall be presented to the Employer`s Agent or his duly authorized representatives on a monthly basis.

PS6.14 CONTINUITY OF SERVICE SUPPLY TO CUSTOMERS

The activities of the Contractor shall not unreasonably interfere with the service supply to customers and be executed outside the agreed and notice time frames.

Where the Contractor cannot reasonably re-establish services within times agreed and notice time frames he shall proceed to contact the affected customer and make alternative arrangements that shall be acceptable to the customer and the Employer`s Agent.

The associated costs of any customer claim arising from a lack of service provision due to the Contractor's negligence or his disregard for the Employer's SOP or his disregard for the conditions of this Contract, whilst executing activities as per this Contract, shall be solely for his account. The Employer shall have the right to make equivalent monetary deductions from monies owed to the Contractor or from his Guarantee under this Contract and any other active contract(s) with the Employer.

PS6.15 REINSTATEMENT OF ASPHALT BY JRA

The JRA shall be given first preference to provide and execute all the reinstatement of asphalt at places where excavation is within the roadway. The Contractor shall make other adequate arrangements where the JRA:

a) indicated that it will not, for whatever reason, be able to perform such asphalt resurfacing; and

b) is the cause of delays, where in particular the Contractor shall note that the Employer shall not be liable of any additional extension of time related cost obligations to the Contractor, as he shall be deemed have agreed adequate conditions with the JRA and allowed delays on the part of the Employer.

PS6.16 LABOUR INTENSIVE CONSTRUCTION

The portions of the Works to be constructed utilising labour intensive construction methods only, shall include but not be limited to:

a) clearing and grubbing of the Site;

b) excavation up to 1m deep (in soft and intermediate materials where ordered by the Employer`s Agent), spreading, processing and compaction;
c) backfilling of all pipe trenches to depths up to 1 m;
d) mixing, transporting, placing and finishing of small concrete works;
e) spoiling of all materials within distances not exceeding 20 m;
f) transportation of earthworks for distances not exceeding 20 m;
g) removal of oversized materials;
h) Installation of all pipes with diameters smaller than 200 mm;
i) Removing old pipes to JW depot
j) All on site retrofitting;
k) cleaning and tidying up of the Site.

PS6.16.1 Provision of a temporary workforce

The Contractor shall have regard for the stipulation laid down for all Labour Intensive projects that he employs labour from the local community through the Labour Desk that has been established for this purpose. The relevant Ward Councillor(s) and/or Community Liason Officer(s) shall be consulted during the process of appointing local labour. The Labour Desk shall assist in identifying available local labour and, where available, semi-skilled labour as well as local subcontractors. The Labour Desk shall also assist and advise regarding conditions of employment, minimum wages, disputes and disciplinary procedures. The workforce that is employed on site shall consist of local residents where applicable, except for approved key staff, in accordance with Clause 21 of the General Conditions of Contract.

The Occupational Health and Safety Act must be adhered to with reference to the safety of any employee irrespective of whether such employee is employed by the Contractor or by a local subcontractor. Furthermore, a contract of employment must be signed between the Contractor and each of his employees and subcontractors and between such subcontractors, and each of the subcontractor's employees with clear reference to the following conditions:

a) The minimum agreed wage rate per hour or per day;
b) The task rate for all labour intensive activities shall be R 95,00/task;
c) The agreed pay rate per unit of production where applicable;
d) UIF and WCA payments where applicable;
e) Minimum working hours per day;
f) Start and end times of a daily shift;
g) Lunch break times;
h) Company policy regarding the following:
   - Rain time
   - No work no pay, sick, absent
   - Disciplinary and grievance policies Method of payment Workers' clothing and safety equipment to be issued.

PS6.16.2 Restriction of the utilisation of personnel in the permanently employed construction personnel of the contractor

The Contractor shall limit the utilization on the Contract, of his permanently employed construction personnel to that of key personnel only, as defined below, and shall execute and complete the Works utilizing a Temporary Workforce of local residents, employed directly by the Contractor and/or by his SMMEs or specialist subcontractors. "Key personnel" means all;

a) Contractor managers,
b) site agents,
c) site clerks,

d) survey technicians,
e) quantity surveyors,
f) trainers,
g) supervisors,
h) foremen,
i) skilled plant operators and the like, and
j) all other personnel in the permanent employ of the Contractor or his SMMEs or specialist subcontractors who possess special skills, and/or who play key roles within the Contractor's or his SubContractor's operations.

PS6.17 ADDITIONAL PROTECTION ON ROAD WAYS

In the case of construction work across bridgeways and motorways, barricades consisting of 22,5 mm x 40 mm deals painted white, suitable supported and firmly fixed to heavy supports shall be provided at least 15 m in advance of the work. Further road-closed signs shall be prominently displayed. Where only a portion of roadway is closed, delineators, drums or upended pipes (painted white with red stripes) shall be placed along the traffic side at distances no more than twelve (12) metres apart.

In the case of construction or work across or within residential streets or collector roads; road closure signs, delineators (or drums or upended pipes (painted white with red stripes)) shall be placed across the street or road at distances no more than one-and-a-half (1.5) metres apart or plastic barricades. No road or street shall be closed without prior attainment of written approval, by the Contractor, from the local Roads Authority. The Contractor shall maintain such traffic accommodation on a daily basis for the duration of the Contract Period, and shall be solely responsible for any damages claimed as a result of the lack of such maintenance.

No separate payment shall be made for this item and applicable section's tender rates shall be considered to include for traffic accommodation and road protection.

PS6.18 POLITICAL AND COMMUNITY UNREST

The Contractor shall make allowance for all costs which might arise due to the interruption of works and / or standing time in terms of political and / or community unrest on the Contract. Only if a situation give rise to more than four (4) hours per day, for normal working hours only, of non-working progress on the Contract Area will such situation be considered an unrest situation payable to the Contractor under this item. The contractor shall notify the Client or its duly Authorized Representative/s of any unrest situation and shall indicate all active Contract sites affected.

PS6.19 INDEMNITY CERTIFICATE

The Contractor must, on completion of the Works, obtain certificates from all authorities concerned stating that they are satisfied with the condition of all borrow pits, detours, access roads and spoil material on their properties. The certificates must be handed over to the Employer`s Agent before the maintenance period starts. The certificates will not exempt the Contractor from any obligations concerning the backfill of trenches, finishing off of borrow pits, access roads, detours etc. This work must still be carried out to the satisfaction of both the Employer and the Employer`s Agent.

PS6.20 RETURN OF MATERIALS

All old valves, valve covers, meter boxes and all pipework that can be reused shall be returned by the Contractor to the Water Depot or as directed by the Employer`s Agent. The

Contractor shall obtain the signature of the Superintendent acknowledging receipt of materials returned. The Contractor shall determine the condition of the materials.

PS6.21 SUSPENSION OF CERTAIN ACTIVITIES

Notwithstanding what is stated in the General Conditions of Contract, the Employer`s Agent may suspend all retrofitting activities should the Contractor have commenced work on 75 erven per extension more than the number which has been completed and tested. Alternatively, the Employer`s Agent may suspend activities should the Contractor fail to complete isolated erven within extensions without satisfactory reasons. Such suspension shall remain in force until such time that the pipework on no more than 25 erven remains incomplete and untested or the isolated erven within extensions are completed and tested. All costs out of any suspension order as described above, shall be borne by the Contractor.

PS6.22 PROTECTION AGAINST WATER AND STORMS

The Contractor shall be responsible for the full adequate protection of the works against damage due to storms, rain, floods, stormwater, subsoil water and seepage from whatever source. The Contractor shall take over the site where the works has to be executed at the beginning of the Contract Period and the full risk and cost of dealing with all water shall be borne by the Contractor.

The Contractor shall also provide all necessary pipe work, pumps and other appliances necessary for adequate dewatering of all excavations and shall maintain these in good condition and provide adequate standby equipment to ensure that no disruption of work will ensue as a result of possible breakdown of equipment.

PS6.23 NOTICES, SIGNS AND BARRICADES

The Contractor shall erect all barricades during the construction period to safeguard the Works and protect members of the public from any risk associated with the partly completed facilities. The position and contents of all such barricades must be approved by the Employer`s Agent. All barricades, notices and signs shall be provided, erected, maintained and finally removed at the cost of the Contractor.

PS6.24 FINISHING-OFF AND TRIMMING

After completion of the works included under the Contract, the entire construction site (road reserves, private properties etc) shall be finally cleared of all excess earth, stones, boulders, debris and other waste material. All finishing, trimming and clearing previously done in terms of the requirements of the various sections of these Specifications shall be finally completed to the satisfaction of the Employer`s Agent. All materials resulting from the finishing and trimming operations shall be disposed of in designated spoil areas on site. The Contractor shall make his own arrangements with owners of properties on which such materials are to be deposited. Disposal shall be carried out in a neat and orderly manner and finished to a smooth level. The Contractor shall allow in his rates for all costs associated with finishing-off and trimming as no separate payment will be made for this operation.

PS6.25 INFORMATION SUPPLIED BY THE EMPLOYER`S AGENT

Certain information included in this document or supplied separately are presented in good faith and no guarantees can be given regarding the accuracy or representativeness thereof. The Employer can therefore not accept any responsibility for the accuracy of any information or for any damage resulting from the fact that the information later proved wrong or not representative. If the Contractor chooses to rely on the information he does so at his own risk.

PS6.26 PROTECTION OF FURNITURE AND EQUIPMENT

No work is to be done inside houses .

PS6.27 SITE MAINTENANCE

During progress of the work and upon completion thereof, the Site of the Works shall be kept and left in a clean and orderly condition. The Contractor shall store materials and equipment for which he is responsible in an orderly manner, and shall keep the Site free from debris and obstructions.

PS6.28 IDENTITY CARD FOR ACCESS TO PROPERTIES

The Contractor shall provide identity cards for all his staff and the staff of all his subcontractors. The identity card must have the following:

- Staff name;
- Identity number;
- Photo;
- Contractor's company logo or name; and
- JW logo.

The staff must carry their identity cards at all times while on site and no staff must access any property without showing his identity card.

PS6.29 CHANGES IN THE WORKS SCOPE

No increase or decrease (irrespective of the varying percentage) in the quantity of any work schedule, where such increase or decrease is not as a result of a Variation Order given under the Variation Clause but is the result of the quantities exceeding or being less than those stated in the tender schedule of quantities shall be deemed to be a variation to which this clause applies and no variation order shall be issued. However, the budget limitations shall be noted. Additionally the Employer reserves the right to vary the scheduled works scope without any tender rates re-negotiations on the part of the Contractor, irrespective of the percentage of variance, as follows for any work included in the Contract:

a) Increase or decrease the quantity thereof.
b) Omit portion thereof.
c)Quality change thereof.

PS6.30 GENERAL TECHNICAL REQUIREMENTS

a) Site camp: The site camp must be inside Alexandra boundaries.
b) Hard material: Adequate allowance must be made for excavation in hard material.

PS7 HEALTH AND SAFETY FOR CONSTRUCTION WORK

Tendering Contractors are to prepare Health and Safety Plans in accordance with Johannesburg Water's Health and Safety Specification (refer to Volume 3: Occupational Health and Safety Specification and Environmental Management Plan for Capital Investment Projects). The legal imperatives for this requirement stem from the Construction Regulations (2003), and more specifically the following:

Regulation 4(1)(a):	A client shall prepare a documented health and safety specification for th construction work, and provide any principal contractor who is making a bid o appointed to perform construction work for the client with the same
Regulation 4(1)(d):	A client shall take reasonable steps to ensure that each principal contractor's heal and safety plan is implemented and maintained on the construction site.
Regulation 4(2):	A client shall discuss and negotiate with the principal contractor the contents of th health and safety plan and thereafter finally approve the health and safety plan fo implementation.
Regulation 5(1):	A principal contractor shall provide and demonstrate to the client a suitable an sufficiently documented health and safety plan, based on the client's documente health and safety specification.

PS7.1 PROJECT-RELATED OCCUPATIONAL HEALTH AND SAFETY RISKS

According to the Construction Regulations (2003), a Health and Safety Plan "means a documented plan which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified". Apart from complying with the Health and Safety Specification (Volume 3), specific attention is drawn to the identification and assessment of risks. The tendering Contractors are required to consider *inter alia* the following risks (where applicable):

Project- and site-specific risks:

- Excavation
- Hand tools
- Working in confined space
- Site establishment
- Traffic control
- Gas detection
- Access to pits
- Machinery use
- Working close to existing services i.e. electrical, waste water etc
- Working close to traffic
- Working at night
- Domestic animals (on private property)
- Loading/unloading - of trucks
- Material delivery
- Material handling
- Waste handling

• Mixer operator • Placing concrete • Machine operator • Compressors – Air • Workshops • Excavator • Fire prevention and protection • Fuel supply • Laying of pipes • Trenches – Digging of
□ Use of portable electrical tools □ Gas welding-cutting operations □ Drivers – of vehicles □ Electrical installation – Maintenance of

Safe work and emergency procedures need to be prepared to address the relevant abovementioned risks.

PS7.2 GUIDE TO RISK ASSESSMENTS

PS7.2.1 Nine steps to Effective Risk Assessments

Step 1 Identifying the current as well as emerging hazard, risks or exposures.

Step 2 Aim to identify major hazards, don't waste time on the minor and detail except if such hazard has the potential be repeat itself on a frequent basis.

Step 3 Involve as many people as possible in the ongoing risk assessment process especially those at risk.

Step 4 Gather all the information and analyze it.

Step 5 Look at what actually could or has occurred including non-routine operations.

Step 6 Use a systematic approach to ensure all hazards are adequately addressed.

Step 7 Assess the risks identified or the risk has occurred by taking into account the effectiveness of current as well as controls under consideration.

Step 8 Ensure the process is practical, realistic, cost and business effective.

Step 9 Always record the assessment in writing including i.e. assumptions, date and why a particular decision has been made.

PS7.2.2 How serious is it?

Probability		Consequences	
A	Common	1	Fatality or permanent disability.
B	Has Happened	2	Major injury.
C	Could Happen	3	Average Lost Time Injury.
D	Not Likely	4	Minor Injury.
E	Practically impossible	5	Medical Treatment or less.

		Probability				
		A	**B**	**C**	**D**	**E**
Consequence	**1**	1	2	3	4	5
	2	2	3	4	5	6
	3	3	4	5	6	7
	4	4	5	6	7	8
	5	5	6	7	8	9

Risk rating		**Action**
1 - 3 =	Serious	Immediate (within 1 week).
4 - 5 =	High	Within 1 month.
6 - 7 =	Moderate	> 4 weeks.
8 - 9 =	Acceptable	No action but will consider from time to time.

PORTION 2: VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS

INTRODUCTION

Detailed under this section of the Document are the variations to the standardised specifications (SANS1200). The clause numbers hereunder consist of a prefix, such as "PSA" indicating an amendment to SANS 1200A, and a number that represents the number of the clause in SANS 1200A.

SANS 1200A: PRELIMINARY AND GENERAL

PSA GENERAL (1986)

PSA 2 INTERPRETATION

Add the following new clause:

"PSA2.9 SUPPORTING SPECIFICATIONS

City of Johannesburg Metropolitan Municipality, Public Road and Miscellaneous By-laws, Code of Practice for work in the road reserve (COP), Latest Version.
Should any requirement of this COP conflict with any requirement of the standardised or particular specifications the requirements of the COP shall prevail.
The COP is available at Johannesburg Roads Agency Offices, Wayleaves Department, Contact number: (011) 298 5000"

PSA 3 MATERIALS

PSA 3.1 QUALITY

Add the following to this sub-clause:

"The Contractor must supply and/or take delivery as necessary, deliver all material and is responsible for the handling, transport and storing of the material. All material, but especially fragile material, must be handled with care and any damaged material must be repaired or replaced according to the Employer`s Agent's instructions at the Contractor's expense.

Before material is used the Employer`s Agent must approve the manufacturer's published instructions. All material used must carry the appropriate official standardization mark and the Tenderer must produce on request certificates that show that the material comply with this requirement".

PSA 5 CONSTRUCTION

PSA 5.2 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS

Replace the words "traffic crossings" in the heading and in text of this sub-clause with the word "accommodation of traffic"

add the following at the end of the existing clause(s):

"The Contractor shall comply with the requirements of the COP and PS 5.7. This clause shall b applicable for all other parts/sections of the works.

The complete closure of any road shall not be permitted without the prior written conser of the Employer`s Agent."

PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

Delete the existing clause and replace with the following:

"The Contractor shall be held responsible for any damage to overhead or underground service and he shall take all necessary measures to protect them. All work or protective measures sha be subject to approval of the authority concerned. In the event of a service being damaged, th Contractor shall immediately notify the authority concerned as well as the Employer`s Agen The Contractor shall not repair any such service unless instructed to do so.

Timely written notice shall be given by the Contractor to the Employer`s Agent and to th authority or department concerned of the Contractor's intention to work across or near an existing works or services and such work shall not commence until the necessary permissio has been received. The Contractor will not be entitled to claim for any delay in the constructio programme caused by compliance with the requirements of this clause. Work across or nea any existing works or services shall be carried out in compliance with the requirements of th relevant authority or department.

Where no underground services are shown on the drawing or scheduled, but the possibility o their presence can reasonably be inferred, the Contractor shall ascertain, by explorator excavations using hand tools, or by specialist equipment for the detection of services a instructed by the Employer`s Agent, whether any such services exist within the relevant sectio of the Site. The Contractor shall complete such an investigation well in advance of the start o construction work in the said section and he shall submit a report in good time to enable th Employer`s Agent to make whatever arrangements are necessary for the protection, removal o diversion of the services before any construction work commences.

Whilst every effort will be made to ensure that any information relating to underground service is correct, the Employer and Employer`s Agent takes no responsibility for the accuracy, or fo the completeness of the information. The Contractor will be held responsible for any damage t services and shall be liable for the cost of making good the damage. All such costs incurred b the Employer will be deducted from monies due to the Contractor.

Manhole covers; valve boxes, hydrants, etc. shall not be covered over and shall be accessible all times.

After an existing service has been passed in laying the service pipe, but before backfilling ha been started, the Employer`s Agent or relevant authority shall be informed in order that the may certify in writing that the service has not been damaged."

PSA 5.5 DEALING WITH WATER ON WORKS

Add the following paragraph:

"The Contractor shall be deemed to have acquainted himself during tender stage with th groundwater conditions."

PSA 5.7 SAFETY

Add to the Sub-Clause:

"All work and particularly work carried out in the proximity of buildings, bridges, tanks or other structures shall be carried out in compliance with the regulations framed under the Occupational Health and Safety Act, No 85 of 1993 and the Minerals Act, (Act 50 of 1991) (including shoring where necessary) to ensure the safety of structures that are at risk.

The Contractor shall make available for the duration of the Contract safety helmets, gumboots and any other necessary safety equipment for sole use by the Employer`s Agent and his representative(s)."

PSA8 MEASUREMENT AND PAYMENT

PSA 8.1.2.3 Contractor to Price all Items

Add the following paragraph;

"The grouping of payment items under one all-inclusive rate is prohibited. Each payment item shall have its own rate. Where the Contractor elects not to insert a rate for any particular item, then it shall be deemed to be zero".

PSA8.2.1 Fixed-charge and value related items

Add the following at the end of the existing clause(s):

"Where lump sums are provided for a preliminary and general item or section of the schedu of quantities is provided to cover the Contractor's charges for compliance with th requirements of the conditions and specifications of Contract, ***if so required*** the Contracto shall provide a lowest-level composition of the various sub-items that result in the tot provided sum."

PSA8.2.2 Time-related items

Add the following at the end of the existing clause(s):

"Where lump sums are provided for a preliminary and general item or section of the schedu of quantities is provided to cover the Contractor's charges for compliance with th requirements of the conditions and specifications of Contract, ***if so required*** the Contracto shall provide a lowest-level composition of the various sub-items that result in the tot provided sum."

PSA8.3.2.3 *Add the following at the end of the existing clause(s):*

This shall include the complete costs for the provision of the SMMEs facilities, tools and equipment to site, and the erection (establishment) on site, the removal upon Contract completion or other of the storage facility and other fixed charged obligations.

PSA8.4.2.3 *Add the following at the end of the existing clause(s):*

This shall include the complete costs for the provision of the SMMEs facilities, tools and equipment to site, and the erection (establishment) on site, the removal upon Contract completion or other of the storage facility and other fixed charged obligations. **Unit (mont**

PSA 8.3 SCHEDULED FIXED-CHARGED AND VALUE-RELATED ITEMS

PSA 8.3.1 Contractual Requirements

Add the following at the end of the existing clause(s):

"The Contractor shall provide a lowest-level composition of the sum in the space provided. more space is required the Contractor shall use the Returnable Schedule item T2.2.33"

PSA 8.3.3 Other Fixed-charge obligations

Add the following at the end of the existing clause(s):

"The Contractor shall provide a lowest-level composition of the sum in the space provided. If more space is required the Contractor shall use the Returnable Schedule item T2.2.33"

PSA 8.3.2.1 Facilities for Employer`s Agent

Delete the existing clause and replace with the following:

"This rate shall include the complete costs for the provision of the Employer`s Agent's facilities (as listed below) to site, the erection (establishment) on site and the removal upon Contract completion or other. .....**Unit: Sum**

1) Facilities for Employer's Agent (3 No.)

a.Johannesburg Water Engineering Team
b) Nameboards (2 No)
c) Communication
d) Overheads, charges and profit on item c)
e) Boardroom
f) Computer facilities complete with printer and wifi router with internet connection
g)Survey equipment, assistants and material
h)Parking (4 No.)
i) CLO's Office

PSA 8.3.2.1.c) Communication

……Unit: Prov Sum

PSA 8.3.2.1.d) Overheads, charges and profit on item c) above

……Unit: %

The rate above shall cover the Contractor's overheads, charges and profit on the amounts stated for items c) above.

ADD THE FOLLOWING NEW SUB CLAUSE TO CLAUSE 8.3.2.2

PSA 8.3.2.2.k) SMME Fixed Charge
Items……..……..……Unit: Sum

The rate shall include the supply of steel standard ISO Containers with the following dimensions 8ft (2.43m) wide, 8.5ft (2.59m) high and length 20ft (6.06m) and must be lockable for the use of storing of SMMEs material; SMME offices, tools and equipment; other fixed related obligations; removal of facilities:

- **a)** Establishment of storage and Facilities for the SMMEs
- **b)** Tools and equipment
- **c)** Other Fixed charge related obligations
- **d)** Removal of Facilities

PSA 8.3.2.2.j Material Storage sheds for SMMEs ……Unit month

This shall include the complete monthly costs for the provision and maintenance of the SMMEs facilities, tools and equipment, supervision for the duration of the Contract and Other time-related obligations on site for the period Contract implementation. Refer to PS 6.3

PSA 8.3.5 Additional Contractual Obligations

PSA 8.3.5.2 OHS Act Obligations
……..Unit: Sum

The rate shall include the complete cost for the provision of resources (human and equipment), communication, transportation and travelling, documentation of activities and reporting activities required to fully comply with the implementation and maintenance of the Health and Safety Plan as per the Health and Safety Specifications contained in Volume 2 for the duration of the Contract. The contractor shall ensure that all personnel comply including SMMEs and the Meter Supplier's technical support staff.

PSA 8.3.5.3 EMP Obligations ……
Unit: Sum

The rate shall include the complete cost for the provision of resources (human and equipment), communication, transportation and travelling, documentation of activities and reporting activities required to fully comply with the implementation and maintenance of the Environmental Management Plan contained in Volume 2 for the duration of the Contract.

Add the following sub-clauses:
PSA8.3.5.4 Provide protective safety clothing ..... Unit: Sum

The rate shall cover the cost for the duration of the Contract to provide safety helmets, gumboots and any other required safety equipment as per PSA 5.7 above.

PSA 8.4 SCHEDULED TIME RELATED ITEMS

PSA 8.4.2.1 Facilities for Employer`s Agent

Delete the existing clause and replace with the following:

"This rate shall include the complete costs for the provision of the Employer`s Agent's facilities (as listed below) to site, the erection (establishment) on site and the removal upon Contract completion or other. .....**Unit: Month**

a.1) Facilities for Employer's Agent (3 No.)
a.2) Johannesburg Water Engineering Team
b) Nameboards (2 No.)
e) Boardroom
f) Computer facilities complete with printer and wifi router with internet connection
g) Survey equipment, assistants and material
h) Parking (4 No.)
i) CLO's Office

PSA 8.4.2.1.c) Communication
……Unit: Prov Sum

PSA 8.4.2.1.d) Overheads, charges and profit on item c) above
……Unit: %

The rate above shall cover the Contractor's overheads, charges and profit on the amounts stated for items c) above.

Add the following to the payment description paragraph:
"The sum tendered for item (i) shall provide full compensation for all equipment, assistants and materials provided in terms of these specifications (refer Schedule A PSAB: Engineer's Office) and sub-clause 5.5 of SANS 1200 AB"

PSA 8.4.2.2 Facilities for Contractor
Amend Unit:Sum with Unit:Month for all the items a) to j)

PSA 8.4.3 Supervision for duration of Construction *Add the following to this sub-clause:*
"The Contractor shall provide a lowest-level composition of the sum in the space provided. If more space is required the Contractor shall use the Returnable Schedule item T2.2.33"

PSA 8.4.5 Other Time-related obligations *Add the following to this sub-clause:*
"The Contractor shall provide a lowesr-level composition of the sum in the space provided. If more space is required the Contractor shall use the Returnable Schedule item T2.2.33"

PSA 8.4.6.4 Risk Assessments every month……..Unit: Month

The stated sum shall cover full compensation and all costs payable on a monthly basis, to for site specific risk assessments on tasks to be performed for the duration of the contract.

PSA 8.4.6.5 a) Training provided by SMME Unit: Prov. Sum

Accredited training programmes are targeted which will provide the beneficiaries with significant and recognized credit value in accordance with the National Qualification Framework (NQF).

b) Overheads, charges and profit on item 8.4.6.5 a) above
……Unit: %

The rate above shall cover the Contractor's overheads, charges and profit on the amounts stated for items a) above.

PSA8.4.7 On-site security .....Unit: Month

The rate shall cover the cost to provide security for staff and materials for the duration of the Contract. (See PS10.7). The Contractor may employ an independent service provider and the rate shall cover said service including all overheads associated with that service."

PSA 8.5 SUMS STATED PROVISIONALLY BY EMPLOYER'S AGENT

AMEND SUBCLAUSE 8.5.b)1 AND ADD THE FOLLOWING ITEMS:

i) Reinstatement of asphalt by JRA……....Unit: Prov. Sum

ii) Temporary protection of services…… Unit: Prov. Sum

iii) Community Liaison Officers ……..Unit: Prov. Sum

The stated sum shall cover full compensation and all costs payable on a monthly basis, to provide a full time qualified and suitable experienced 1x Community Liaison Officers for the duration of the contract. The stated sum shall also cover for the CLO salary, the cost of typing, printing and distributing notices, cellular facilities of minimum of R300 up to R500.

iv) Training of local labour……..……....Unit: Prov. Sum

v) Alterations and connection to Municipal services and repair to damaged services where approved by Employer's Agent……..……...Unit: Prov. Sum

vi) Employer's Agent's Equipment and Independent testing……Unit: Prov. Sum

The Contractor is responsible for both the cost of normal testing as described in the Project Specifications and for the cost of any additional test that indicates that the Specifications have not been complied with."

vii) Relocation of existing services……Unit: Prov. Sum

viii) Topographical Survey as per the Employer's Agent's instruction ……..…Unit: Prov. Sum

The rate shall include the provision of labour, material, plant and equipment for a survey and submit a CD with AutoCAD drawing/s and survey data in CSV or text format.

ix) Provision of photographic records ……..……Unit: Prov Sum

The rate shall include submission of high-resolution images of the Site before, during and after construction at close-out on a USB Memory Stick. The photographs will have a date and time stamp and will be clearly labelled to show the chainages at which the photo was taken.

x) Pressure logging, leak detection and conduct water conservation tests on selected pipelines……..……..……Unit: Prov Sum

xi) Additional supervision by the Employers Agent……..……Unit: Prov Sum

xii) SANRAL Wayleave Permit ……..……..Unit: Prov Sum

xiii) Provision of as-built information……Unit: Prov. Sum

The rate above shall cover the provision of labour, materials, equipment and plant required to provide information for as-built information including a survey. The Contractor shall submit AutoCAD drawing/s and survey data in CSV or text format on USB Memory Stick or any other means as agreed with Employer`s Agent.

xiv) Construction Work Permit ..... Unit: Prov. Sum

xv) Pipeline servitude registration ..... Unit: Prov. Sum

xvi) JW Stakeholder Relations……...……..Unit: Prov. Sum

The stated sum shall cover full compensation and all costs payable on a monthly basis, to provide a full time qualified and suitable experienced JW Stakeholder Relations Officer for the duration of the contract. The stated cost shall also cover for the cost of typing, printing data reports, cellular facilities of minimum of R300 up to R500.

xvii) Community awareness material ……..……Unit:Prov. Sum

The sum stated shall be for the sourcing of community awareness material, from 3 independent sources and shall be reviewed and selected by the client for approval and acceptance.

xviii) Overheads, charges and profit on items (a) to (q) above ……...Unit: %

The rate above shall cover the Contractor's overheads, charges and profit on the amounts stated for items (a) to (q) above.

PSA 8.7 DAYWORKS

ADD THE FOLLOWING NEW CLAUSES:

PSA 8.7.1 <u>Scope</u>

This section covers the method of measurement and payment for work carried out on a day work basis.

PSA 8.7.1.1 General Requirements

Work will be classified as day work only if the Employer's Agent considers no other rate in the Bill of Quantities appropriate for payment purposes.

An instruction regarding all work to be carried out under day work in terms of Clause 6.5 of the General Conditions of Contract for Construction Works, Third Edition (2015) will be issued at the discretion of the Employer's Agent. Some or all of the items priced under day work in the Bill of Quantities may possibly not be required for this Contract.

Before ordering any material, the Contractor shall submit quotations to the Employer's Agent for his approval, and shall submit such receipts or vouchers to the Employer's Agent as may be necessary for proving the amount claimed.

PSA 8.7.1.2 Measurement and Payment - Day works

The day work rates submitted for plant, vehicles and construction equipment, in the Bill of Quantities shall be a hire charge for the use of the vehicle and driver or constructional plant/equipment and operator (excluding VAT) and shall apply only to vehicles and construction equipment approved in writing by the Employer's Agent. The rate shall include for maintenance, fuels and oils and other operating costs, establishment, insurance and other contingency costs relating to the running of the vehicle, plant or equipment.

Where there is ambiguity between the power developed at the flywheel and mass of a machine, the power shall govern the measurement category.

The Contractor and the Employer's Agent will agree on the method of recording the working hours prior to the commencement of the work. Any long period of idling at any one time which in the opinion of the Employer's Agent or his representative is beyond that required for normal operating conditions will not be paid for as working time. Non-working hours for any reason shall not be measured for payment.

The percentage allowed for overheads etc. as per Clause 6.5.1.2.3 of the General Conditions of Contract for Construction Works, Third Edition (2015) shall include full compensation for all administrative costs, supervision, overheads, liabilities and obligations related to the running of the vehicles, constructional plant and equipment. The tendered percentage shall also include for profit and shall be subject to the Contract Price Adjustment factor laid down in the Contract Data.

PSA 8.7.1.3 Dayworks rates

PSA8.7.1.3 a) Labour

1) Foreman/Surveyor ..... hr
2) Artisan ..... hr
3) Semi-skilled labourer ..... hr
4) Unskilled Labourer ..... hr

Rates for items 1) to 4) shall include a mark-up for overheads, charges and profit for emergency work for operating during normal working hours only when instructed by the Employer`s Agent or Employee`s Agent`s Representative.

5) Extra over for night- or non-working times ..... %

This shall cater for overheads, charges and profit for emergency work for operating outside normal working hours only when instructed by the Employer`s Agent or Employee`s Agent`s Representative.

PSA 8.7.1.3b) Materials

1) Provisional sum for purchase of materials .....
PC Sum
2) Mark up on 1) above .....
%

PSA 8.7.1.3 c) Plant and Equipment
Unit: hr

1) Crane 65 - 80 t Capacity
2) Wheel loader 140 - 150 Kw
3) Plate compactor and tampers
4) Motor grader 150 - 160 Kw
5) Vibrating roller (500 - 630kg)
6) Concrete mixer
7) Concrete saw (self propelled)
8) TLB
9) Side Boom
10) LDV's - Capacity 1 ton
11) Compressor
    i. Small up to 200 cfm
    ii. Large greater than 200 cfm
12) Generator (Diesel driven)
    i. Small - 5 kVA (Diesel driven)
    ii. Medium – greater than 5kVA and up to 10 kVA
    iii. Large - greater than 10 kVA
13) Tipper truck
    i. Capacity 6m³ (small)
    ii. Capacity 10m³ (medium)
    iii. Capacity 12m³ (large)
14) Crane truck
    i. Capacity 2 - 4 ton (small)
    ii. Capacity greater than 4 ton up to 6 tons (medium)
    iii. Capacity more than 6 tons up to 8 tons (large)
15) Flatbed trucks

i. Capacity 3 ton (small)
ii. Capacity 5 ton (medium)
iii. Capacity 10 ton (large)

16) Conservancy/ Water tankers
i. Capacity 6,000 litres (small)
ii. bCapacity 9,000 litres (medium)
iii. Capacity 15,000 litres (large)

17) Excavator (Crawler excavator)
i. 20 tonne
ii. 30 tonne

18) TLB's (Tractor loader backhoe)
i. 2x4
ii. 4x4

19) Walk behind vibrating rollers
i. Model BW 61 (small)
ii. Model BW 76 (medium)
iii. Model BW 90 (large)

20) Compactors
i. Wacker
ii. Plate compactor

21) Compressors (Potable Diesiel Compressor)
i. Small up to 200 cfm
ii. Large greater than 200 cfm

22) Portable water pumps
i. Small – up to 2" diameter
ii. Medium – greater than 2" and up to 6" diameter
iii. Large – greater than 6"

PSA 8.8 TEMPORARY WORKS

AMEND THE SUB CLAUSE AS FOLLOWS

PSA 8.8.2 Dealing with Traffic or accommodation of traffic and access to properties ……
Unit: Sum

PSA 8.8.4 Existing Services

AMEND THE SUB CLAUSE AS FOLLOWS:

PSA8.8.4 a) Supply or hire of specialist equipment ……..…Unit: Sum

The sum shall cover the cost for the supply, operation and/or hire of specialist equipment for detection of underground services as ordered by the Employer's Agent.

PSA 8.8.4 b) Excavate by hand in soft material to expose existing services……..Unit: m^3

The rate shall cover the cost for removal of premix or other surfacing where necessary, excavating in all materials, shoring, backfilling, compaction and reinstatement of surfaces except for asphalt.

PSA 8.8.6 Dealing with water…….……..……..…..Unit: Sum

The tendered rate shall include all cost to ensure that no water enter or stand in excavated trenches, low laying areas or portions of the site under construction.

The tendered rate shall also include all cost to ensure that ingress of sub-surface water is controlled and pumped out of the excavated areas. All plant, labour and operation costs as well as equipment required to secure a dry working area and pumping of water shall be included in the tendered rate.

PSA 8.8.7 Dealing with other Service Authorities, obtaining of wayleaves, etc……..…..Unit: Sum

The contractor will be responsible to:

- Submit applications for all wayleaves into his name;
- Maintain wayleaves throughout the duration of the contract and
- Comply with conditions.

The tender rate shall include all costs for dealing with the following service authorities and for fulfilment of way leave requirements:

- Johannesburg Water
- City Power
- City Parks
- Eskom
- Telkom
- Rand Water
- Egoli Gas
- Sasol
- Neotel
- Dark Fibre Africa
- MTN
- Citi Connect
- Johannesburg Roads Agency

- Others which may be identified.

PSA 8.7 **DAYWORK**

Dayworks will be paid according to the stipulations of the special conditions of Contract.

Add the following item:

"PSA 8.9 Compensation in terms of **sub clause 9.1.4** for delays due to the circumstances described **sub clauses 9.1.1 and 9.1.2** of the general conditions of contract, as amended

.....
. Unit: day

The unit of measurement shall be the number of working days approved by the Employer`s Agent during which the contractor was delayed or prevented from executing the contract. In the event of delays for part of a working day only, such fractions of a working day shall be added to calculate the total delay.

SANS 1200AB: ENGINEER'S OFFICE (1986)

SANS 1200AB: ENGINEER'S OFFICE (1986)

PSAB 3 MATERIALS

PSAB 3.1 NAME BOARDS

Delete and replace the standard clause with the following:

"The Contractor shall supply and erect, at approved sites, two (2) nameboards that shall compl
as regards size, painting, decorating and detail, with the recommendations for the standar
board of the south African Institution of Civil Engineers. The Employer, Employer`s Agent an
Contractor to be painted on the boards shall be as ordered or as shown on a drawing.
Each board shall be made of tempered hardboard of thickness at least 12 mm, so braced on th
reverse side as to prevent warping, and mounted on two or more, as necessary, firmly plante
poles. Refer to detailed drawings." Four name boards are to be provided under this Contract.

PSAB 3.2 OFFICE BUILDING (S)

Delete and replace the standard clause with the following:

"3.2 (a) FACILITIES FOR THE EMPLOYER'S AGENT"

The Contractor shall provide and furnish one office for the use of the Employer`s Agent. Eac
office shall consist of one room with a floor area of at least 6m x 3m and a ceiling height of a
least 2.5 m. Each office shall be weatherproof, shall have a wooden boarded floor that is at leas
150 mm above the ground, and shall be provided with a ceiling and a lining to the walls, c
equivalent insulation, with an acceptable type of door with a secure lock, and two openin
windows of glazed area at least 3 m^2. Each office shall be well ventilated and shall be s
insulated as to provide comfortable working conditions.

The internal furnishings of each office shall include:

(i) Office desk with a surface area of at least 1.5m2 with at least 3 drawers one of which can be locked.
(ii) Two office chairs.
(iii) a lockable upright steel cabinet with three shelves or a steel filing cabinet with four drawers
(iv) Refrigerator
(v) Printer and other computer equipment as per PSAB4.3
(vi) Sufficient racks and hangers for hanging contract drawings. The hangers shall be of the "Barhold" type, with one hanger to five drawings.
(vii) 1 x Double 80-watt fluorescent light fittings complete with ballast and tubes.
(viii) an acceptable blind on each window
(ix) provision, as detailed in the project specification, for heating in winter and cooling in summer

The Contractor shall also supply a toilet for the exclusive use of the Employer`s Agent.
On completion of the Works, ownership of the buildings and their furnishings shall revert to the Contractor who shall remove them from the Site.

Computer facilities shall be provided as described under PSAB 4.3.
Office building shall be painted with an approved paint after erection and the paintwork shall be maintained during the contract period.
Each door shall be provided with a lock and two keys.
The sitting of all offices shall be to the Employer's Agent's satisfaction and shall be decided upon in consultation with him/her and confirmed in writing before erection.
All accommodation shall include the provision of access roads where required, fresh clean portable water and sewerage, which will be considered as part and parcel of the accommodation provided and will not be paid for separately.
The site Office shall be fenced right round with access gate.
All accommodation shall meet with the approval of the Employer's Agent.
The offices shall comply with the following requirements.

Dimensions	Boardroom	Employer's Agent's Office
Minimum floor area m^2	28 m^2	15
Minimum window area m^2	4.0 m^2	3.0
Minimum window area opening m^2	2.4 m^2	1.5
Minimum clear height m	2.5 m	2.5
Shaded parking for vehicles	2	2

Shaded parkings shall be as described under PSAB 3.3.

3.2(b) JW ISD Team Office

The Contractor shall provide and furnish one office for the use by the JW ISD team and local labour and shall include:

i) Office shall be at least 6m X 3m, with one entrance door and four windows (that can be opened),
ii) With acceptable blinds on each window,
iii) Three (3) reference table, having a top size of at least 2m long X1,5m wide X 0.9m high, iv) Two (2) four drawer steel filing, and ten (10) chairs, v) One (1) drawing hanging rank, vi) Proper lighting and two electrical power points, and
vii) Heating facilities (for winter) and cooling facilities (for summer)

3.2(c) CLO's Office

The Contractor shall provide and furnish one office for the use by the CLO's Office and shall include:

i) Office shall be at least 3m X 3m, with one entrance door and four windows (that can be opened),
ii) With acceptable blinds on each window,
iii) Three (3) reference table, having a top size of at least 2m long X1,5m wide X 0.9m high, iv) Two (2) four drawer steel filing, and ten (10) chairs, v) One (1) drawing hanging rank,
vi) Proper lighting and two electrical power points, and
vii) Heating facilities (for winter) and cooling facilities (for summer)

3.2 (d) The Boardroom shall be equipped with the following:

(i) Conference table large enough to accommodate twelve people and have an area of at least 15m2.
(ii) Fifteen office chairs
(iii) 2 x Double 80-watt fluorescent light fittings complete with ballast and tubes.

The Contractor shall also supply a toilet for the exclusive use of the Employer's Agent.
The Contractor must provide basic survey instruments: dumpy level, tripod stand and staff.

On completion of the Works, ownership of the buildings, furnishings and equipment shall revert to the Contractor who shall remove them from the Site.

3.2 (e) Parking

The Contractor shall provide four (4) shaded parking areas, each 3m x 3m, constructed of a steel tube frame and painted white, with minimum a 50mm layer of 19mm stone laid on the ground. This parking area shall be for the sole use of the Employer's Agent and his staff. Each parking shall be constructed so that the vehicle parked under it is always protected against the direct rays of the sun. The parking shall be positioned so as to provide easy and convenient access to the Employer's Agent's office."

3.2 (f) Location of the site camp In addition to the standard requirements:

i) The location of the office unit shall be selected in consultation with the Employer`s Agent.
ii) The Employer`s Agent must approve all internal furniture."

PLANT

PSAB 4.1TELEPHONE

REPLACE SUBCLAUSE 4.1 OF SANS 1200 AB WITH THE FOLLOWING:

"The Contractor shall at his own cost, arrange for the provision of two smartphones, airtime and data bundles for the duration of the contract for the Employer's Agent's representative. The Contractor at the tendered rates under the relevant scheduled item shall recover the associated charges and telephone calls and data bundles associates with the contract.

PSAB 4.2SURVEY EQUIPMENT

ADD THE FOLLOWING NEW CLAUSE:

The Contractor shall provide on site and make available for the exclusive use of the Employer's Agent and his staff, the survey equipment listed in Portion A of the Project Specifications.

All survey equipment provided by the Contractor shall be in good condition, properly calibrated and fit for the purpose.

In addition to survey equipment provided by the Contractor for the exclusive use of the Employer's Agent and his staff, the Contractor shall make available for use by the Employer's Agent, the further survey equipment listed in Portion 1 of the Project Specifications, at all times when such is reasonably required by the Employer's Agent and his staff for the purposes of the Contract."

PSAB 4.3 COMPUTER FACILITIES

ADD THE FOLLOWING NEW CLAUSE:

The Contractor shall, provide and insure for the duration of the contract, protect, secure and maintain computer facilities, including the following:

- Two laptops with a processor similar or equal to an Intel ® i7 processor, at least 8 GB Ram, a hard disk drive of at least 1TB;
- an external hard disk drive of similar or larger capacity as the internal hard disk drive of the laptop for backups;
- an additional mouse, keyboard and screen;
- an A3 Colour printer with sufficient ink / toner, capable to scan, print, copy and fax;
- Wireless data modem;
- Data plan for at least 20GB data per month;

The following software shall be properly installed on the computer, and the original license agreements and disks shall be provided to the Employer's Agent for safekeeping:

- Microsoft Windows 10 or newer
- MS-Office 365 including at least MS Word and MS Excel
- MS Project
- .pdf viewer

All computer equipment provided shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

The Contractor shall further provide at his own cost, all paper and black ink cartridges and other consumables reasonably required by the Employer's Agent."

PSAB 5 CONSTRUCTION

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 5 OF SANS 1200 AB:

PSAB 5.6 SURVEY EQUIPMENT

All survey equipment provided by the Contractor shall be kept fully serviceable at all times by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Employer's Agent's staff.

Where required by the Employer's Agent, the Contractor shall, at his own cost, promptly arrange for the recalibration of survey equipment provided."

SANS1200 C SITE CLEARANCE (1982)

PSC SITE CLEARANCE

PSC 3 MATERIALS

PSC 3.1 DISPOSAL OF MATERIALS

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:

"Small diameter pipeline routes shall be cleared to a distance of 1,0m on both sides of the pipeline centre line and large diameter pipeline routes shall be cleared to a distance of 2,0m 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 R 1000.00 will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily."

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.2 PAYMENT

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 metres to the nearest metre or," otherwise specified. Clear and grub working space and provide a pipelaying platform, an access road, pipe storage strip and pipe storage mounds alongside the trench for pipelaying operations (maximum working strip of 6m).

REPLACE ITEM 8.2.5 WITH THE FOLLOWING:

PSC 8.2.5 Take down existing fences:

(a) Description of fence ……..……....
Unit: m or km

(b) Etc for other items

The unit of measurement shall be the metre or kilometer of fence taken down and removed from the site.

The rate shall cover the cost of taking down the complete fence (fence height up to 2m) as scheduled and removing all fence material from the site, filling of holes, leveling ground surfaces and cleaning the site as well as providing temporary fence during construction."

PSC 8.2.8 Demolish and remove structures/buildings and dismantle steelwork, etc.

REPLACE "Unit: sum" *WITH* "Unit: sum or number of m²".

REPLACE THE LAST SENTENCE WITH:

"The rate shall cover the cost of all such separate items as scheduled in the Schedule of Quantities."

ADD THE FOLLOWING ITEMS:

PSC 8.2.11a Temporary fencing or hoarding:

(a) Supply, erect and remove temporary five strand barbed wire fences to protect excavations……..…… …… Unit: m

(b) Etc for other usage and types.

The unit of measurement shall be the linear metre of fence or hoarding supplied and erected, and in the case of temporary fencing for maintaining and removing on completion of the works or part of the works.

The tendered rate shall include full compensation for the cost of supplying and erecting the complete fence as specified or scheduled and in the case of temporary fencing for taking down the fences, removing from the site, filling of holes, leveling ground surfaces and cleaning the site.

Seventy per cent (70%) of the tendered rate shall be payable on completion and approval of the temporary fences, and the remaining thirty per cent (30%) on completion of the removal of the fences.

PSC 8.2.11b Removal of man-made surfaces

The rate shall cover all plant, labour, material, saw cutting (asphalt and concrete), breaking up, lifting, loading, transportation, off-loading surfacing and storing (where applicable).
Unit: m² unless otherwise stated.

Roadways, Asphalt and other layers
i) Asphalt (≤ 50mm thick) and including base, sub-base and subgrades layers up to 800mm deep.
ii) Asphalt (> 50 ≤ 100mm thick) and including base, sub-base and subgrades layers up to 800mm deep.
a)Footways and driveways
Asphalt ≤ 50mm thickness
Asphalt > 50 ≤ 100mm thickness

Interlocking concrete segmental paving blocks (all colours)
Concrete slabs (450 x 450mm)
Brick paving
Unreinforced concrete ≤75mm thick
Reinforced concrete ≤75mm thick
Grassing
Kerbing (all types of kerbing) ……... (Unit: m)

PSC 8.2.12 Backfilling and reinstatement of man-made surfaces

The rate shall cover the cost of all associated plant, labour, material, loading, transportation from storage, off-loading and placing (levelling and compacting where applicable) the following materials in roadways, footways and driveways in accordance with the COP: Unit:m² unless otherwise stated.

PSC 8.2.12.1 Backfilling and reinstatement of roads

a) Scenario A
i) 150mm base – G2 Graded crushed stone to 102% Mod AASHTO density
ii) 150mm subbase – G5 Graded crushed stone to 97% Mod AASHTO density
iii) 150mm Fill – G7 material compacted to 95% Mod AASHTO density
iv) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

b) Scenario B
i) 150mm base – G2 material compacted to 97% Mod AASHTO density
ii) 150mm subbase – C4 Stabilised gravel material to 95% Mod AASHTO density*
iii) 150mm selected subgrade - Insitu material compacted to 93% Mod AASHTO
***Rate shall include stabilization agent.**

c) Scenario C (Foot paths)
i) 150mm base – Recovered material compacted to 93% Mod AASHTO
ii) 150mm selected subgrade – Insitu material compacted to 90% Mod AASHTO

d) Surfacing
i) 30mm Bitumen hot –mix: Fine
ii) 70mm Bitumen hot –mix: BTB

PSC 8.2.12.2 Backfilling and reinstatement footways

a) Using removed materials:
i) Interlocking concrete segmental paving blocks (all colours)
ii) Concrete slabs (450 x 450mm)
iii) Brick paving
iv) Grassing
v) Kerbing……... (Unit:m)

b) Using new supplied materials:
i) 30mm Bitumen hot –mix: Fine
ii) Interlocking concrete segmental paving blocks, including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and blocks

1) Grey blocks
2) Coloured blocks

iii) Concrete slabs (450 x 450mm) including a 20mm river sand bedding layer, jointing mortar.
iv) Brick paving including a 20mm river sand bedding layer, jointing sand (plaster sand) and mortar infill between edge restraint and bricks.
v) Unreinforced concrete ≤ 75mm thick (15MPa)
vi) Reinforced (395 mesh) concrete ≤ 75mm thick (15MPa)
vii) Grassing
viii) Concrete channeling, including formwork, leveling and compacting 300 x 125mm cast in situ concrete of 15MPa.
ix) Kerbing, including a 50mm bedding (cement and river sand), jointing mortar and 15MPa concrete haunching at all joints. (Unit:m)

PSC 8.2.13 Reinstatement of existing masonry walls and steel palisade fences

The rate shall cover the cost of reinstating existing masonry walls, plastered or unplastered, and steel palisade fences (including any gates) including plant, labour, material, on-loading, transporting, off-loading and cleaning for the following:

Unit: m^2

a) Face brick
i) 110mm wall
ii) 220mm wall
iii) 330mm wall

b) Plastered
i) 110mm wall
ii) 220mm wall
iii) 330mm wall

c) Steel palisade fences (height = 2.1m)

PSD EARTHWORKS

PSD 2 INTERPRETATIONS

PSD 2.1 SUPPORTING SPECIFICATIONS

REPLACE SUBCLAUSE 2.1.2 WITH THE FOLLOWING:

"PSD 2.1.2: Any of the other SANS 1200 Specifications may form part of the Contract Documents."

PSD 2.3 DEFINITIONS

REPLACE THE WORD AND THE DEFINITION FOR "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 FOR "Specified density" *WITH THE FOLLOWING:*

"Specified density: The specified dry density expressed as a percentage of modified AASHTO dry density."

REPLACE THE DEFINITION FOR "Stockpile" *WITH THE FOLLOWING:*

"Stockpile (verb): The process of selecting and, when necessary, loading, transporting and off-loading material in a designated area for later use for a specific purpose."

ADD THE FOLLOWING DEFINITIONS:

"Commercial source: A source of material provided by the Contractor, not the Employer, and including any borrow pit, provided by the Contractor.

Fill: An embankment or terrace constructed of material obtained from excavations or borrow pits. In roads it includes the earthworks up to the underside of the selected subgrade level.

Fill (material): Material used for the construction of an embankment or terrace.

Roadbed: The natural in situ material on which the fill, or in the absence of fill, the pavement layers, are constructed."

PSD 3 MATERIALS

PSD 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

PSD 3.1.1 Method of classifying

ADD THE FOLLOWING:

"The classification of material other than 'soft excavation' shall be agreed upon before excavation may commence.

The Contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to such an extent that a new classification is warranted for further excavation. Failure on the part of the Contractor to advise the Employer's Agent in good time shall entitle the Employer's Agent to reclassify, at his discretion, such excavated material."

ADD THE FOLLOWING NEW SUB CLAUSES:

PSD 3.1.3 CLASSIFICATION FOR HAND EXCAVATION

Classification of material for various types of hand excavation will be based on the results of a dynamic cone penetrometer. The category of material shall be determined

by testing the material at regular intervals and at various depths along the centre line of the trench. A minimum of 5 tests shall be done at each location and the average number of blows of the tests shall be used to determine the category of material.

The interval between test locations shall be determined by the variation of material type but shall not exceed 50m. The depth of testing shall be determined by the variation of material type and can increase or decrease in hardness with increasing depth of excavation. Table PSD 3.1.3 indicates the categories:

TABLE PSD 3.1.3: Classification for Hand Excavation

Category of Material	**Consistency**		**DCP Blows to Penetrate 100mm**	
	Granular	**Cohesive**	**Granular**	**Cohesive**
Soft Soft excavation shall be excavation in material that can be efficiently removed from the trench using a pick and shovel but not requiring prior breaking using mechanical equipment such as pavement breakers	Up to medium dense	Firm to stiff	0-6	1-5
Intermediate Intermediate excavation shall be excavation in material that require loosening with a hand spike (gwala) before being removed from the trench	Dense	Stiff to very stiff	7-15	6-8
Hard Hard excavation shall be excavation in material that requires prior breaking using mechanical equipment, such as pavement breakers with clay spades, before being removed from the trench.	Very dense		16-50	-15
Rock Rock excavation shall be excavation in material other than described above which by nature of the material requires prior breaking using mechanical equipment, such as pavement breakers with moil points, before being removed from the trench	-	-	>50	>15

PSD 3.2.3 Material suitable for backfill or fill against structures

REPLACE THE CONTENTS OF THIS SUBCLAUSE 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.

(b) The material shall not contain large clay lumps that do not break up under the action of the compaction equipment.

(c) The liquid limit of the material shall not exceed 40, neither shall the Pi exceed 18."

PSD 3.3 SELECTION

ADD THE FOLLOWING SUBCLAUSE:

PSD 3.3.3 Selection in borrow pits and excavations

Approval of a borrow area for a certain purpose does not necessarily mean that all the material in that area is suitable for the specified purpose. What it does mean is that the borrow area contains some suitable material. The onus shall rest on the Contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose.

When the Contractor has to select excavated material for a specific purpose, the above provisions relating to borrow areas shall apply *mutatis mutandis* to excavations.

The Contractor shall not waste or contaminate material that has been selected for a specific purpose."

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)."

REPLACE SUB-PARAGRAPH (a) AND (b) WITH THE FOLLOWING AND ADD SUB-PARAGRAPH c):

a) adequately protected by a barrier or fence comprising fluorescent orange plastic netting of height at least 1 000mm and as close to the excavation as practicable; and

b) provided with notice boards marked "CLOSED – GESLUIT" at each end of closed or partially closed roads; and

c) provided with flashing orange lights, placed at 15m intervals along the barricading at night.

ADD THE FOLLOWING TO THIS SUBCLAUSE:

Should the Contractor fail to provide adequate lighting, signing and barricading, access to properties, or leave the site in a dangerous condition, the Employer's Agent shall be entitled to suspend all work under the Contractor until in the Employer's Agent's opinion the Contractor's obligation in these respects have been fulfilled and/or arrange for any emergency work to be carried out by some other agency and to deduct the cost of this work from any monies due to the Contractor.

PSD 5.1.1.2 Safeguarding of excavations

REPLACE "Machinery and Occupational Safety Act" *IN SUB-PARAGRAPH* (a) *WITH* "Occupational Health and Safety Act, 1993 (Act 85 of 1993)."

ADD THE FOLLOWING TO SUB PARAGRAPH (d):

Loose ground, materials, tools and appliances shall be kept clear of the edge of the excavations and a pathway at least 0,30 m shall be left clear along the edge of the excavation.

PSD 5.1.1.3 Explosives

REPLACE THE CONTENTS OF THIS SUBCLAUSE AS FOLLOWS:

Where blasting is resorted to, it shall be carried out strictly according to Explosives Act and Regulations 1956 (Act No. 26 of 1956, as amended). However, in no case will blasting be allowed if a reasonable possibility exists of injury to any foundation, wall, pipe, cable or any structure, complete or partly complete. Where the Employer's Agent considers blasting to be dangerous, the same shall not be permitted and his decision shall be final and binding.

Wherever blasting is permitted and resorted to in the vicinity or within the limits of existing townships, roads, etc., it shall only be executed under the cover of sufficient earth backfill, heavy wire mesh screens or rubber matting of adequate weight and area to prevent the blasted material from being ejected from the trench. If any damage should occur, the Contractor shall carry out remedial work arising from such damage and will be held to have allowed therefore in his price.

The Contractor shall undertake such blasting so that the Peak Particle Velocity (PPV) as measured at the closest point to the existing outfall sewer and or building structure shall not exceed 25mm/s. Each blast shall be monitored and the findings recorded by an appropriately qualified explosives expert using a suitably calibrated apparatus. The Contractor shall also timeously inform the relevant inspectorate and obtain the required

blasting permit from the South African Police Services, Division of Explosives before proceeding with any blasting on site. If in the opinion of the Employer's Agent, the Contractor makes careless use of explosives, he may forbid the Contractor the use of explosives.

It is a condition that should blasting result in the disturbing of material outside the trench, the Employer's Agent will require the Contractor to remove the disturbed material and backfill it to a compaction standard of the natural in-situ material. All this work for correcting areas of disturbed material will be done at the Contractor's cost.

The schedule rate for hard rock excavation shall cover all costs incurred in connection with supply, transportation, storage and handling of explosives, the related blasting costs and any remedial work should this be required.

PSD 5.1.1.4 <u>Hard rock excavation without using explosives</u>

ADD THE FOLLOWING TO THIS CLAUSE:

It is a condition that should blasting result in the disturbing of structures outside the trench; the Employer's Agent will require the Contractor to remove the rock material by means of pneumatic or hydraulic breakers, e.g. jack-hammers or wood-peckers.

The schedule rate for hard rock excavation without using explosives shall cover all costs incurred in connection with supply of specialist equipment, the transportation to and from the site as well as the removal and disposal of the hard material should this be required.

PSD 5.1.2 <u>Existing services</u>

PSD 5.1.2.2 <u>Detection, location and exposure</u>

REPLACE THE CONTENTS OF SUBCLAUSE 5.1.2.2 WITH THE FOLLOWING:

"The exposure by the Contractor of underground services, as required in terms of subclause 5.4 of SANS 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: 93% Mod AASHTO density; and

(b) In all other areas: 90% 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 SANS 1200 DB.

Payment in respect of exposing the services by means of hand excavation as described above, will be made in accordance with subclause PSA 8.8.4

Payment in respect of reinstating layerworks in roadways will be made in accordance with subclause 8.3.6.1 of SANS 1200 DB."

PSD 5.1.2.3 Protection of cables

REPLACE SUBCLAUSE 5.1.2.3 WITH THE FOLLOWING:

PSD 5.1.2.3 Protection during construction

Further to the requirements of subclause 5.4.2 of SANS 1200 A (as amended), major excavating equipment and other plant 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 SANS 1200 A (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 minimize the occurrence of any further damage occurring."

PSD 5.1.2.4 Negligence

DELETE SUB-CLAUSE 5.1.2.4

PSD 5.1.3 Stormwater and Groundwater

ADD THE FOLLOWING TO THE SUB-CLAUSE:

"The Contractor shall, where applicable and at the earliest practicable opportunity, install the permanent drainage specified or shown on the drawings and shall at his own cost provide the temporary drainage required to protect the Works."

PSD 5.1.4 Nuisance

PSD 5.1.4.3 Excavated material not to endanger or interfere

AMEND THE CLAUSE AS FOLLOWS:

"A safe, clear path shall be kept open at all times for pedestrians. Equipment, materials and waste shall be stored, stockpiled or removed in such a manner that pedestrians are not endangered and that the nuisance level is kept to a minimum. If construction activities occupy the whole footway and verge area so that pedestrians are forced to walk in the traffic lane, adequate protection from traffic shall be provided.

Where instructed by the Employer's Agent or where the Works impose a danger to traffic or pedestrians, the Contractor shall at his own cost remove off Site excavated material to temporary stockpiles (approved by the Employer's Agent) and the return to Site, excavated material for use as backfill or bedding."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSD 5.1.4.4 Open Trenches

Unless otherwise permitted and where relevant, not more than the 100 m of trench in one place shall be opened ahead of the completed and backfilled pipeline."

PSD 5.1.5 Reinstatement and Maintenance of Roads

ADD THE FOLLOWING TO THE SUB-CLAUSE:

"Where crossings have been made, the roads shall be reinstated in accordance with the details specified in subclause 5.9 of SANS 1200 DB."

PSD 5.1.6 Road Traffic Control

DELETE THE SECOND SENTENCE OF SUBCLAUSE 5.1.6

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):

"When the nature of the material precludes the above procedure, additional excavations shall be carried out to provide working space for the erection of formwork. The rate tendered for item 8.3.5 will be deemed to include the cost of a working width of 600 mm, but the Contractor may excavate a greater working width at no additional cost to the Employer."

REPLACE THE CONTENT OF PARAGRAPH (e) WITH THE FOLLOWING:

"Where excavations have been carried below the authorised levels, the Contractor shall backfill such excavations to the correct level with approved gravel compacted to 90% of modified AASHTO density or to the density of the surrounding material.

Where excavations have been carried out in hard material, the Employer's Agent may direct the over-excavation to be backfilled with 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 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 the additional concrete that 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 5.2.2.3 Disposal

REPLACE THE SECOND SENTENCE WITH THE FOLLOWING:

"The Contractor shall provide all necessary spoil sites for the spoiling of all surplus and unsuitable materials and shall make the necessary arrangements with the owner of the site where the material is disposed of, and pay all charges and levies as may be applicable for the use of such spoil sites.

Every spoil site provided by the Contractor shall be approved by the local authority in whose area it is located, and the spoiling shall comply with the applicable statutory and municipal regulations as well as the requirements of the owner of the spoil site.

Payment to the Contractor in respect of locating and making arrangements for suitable spoil sites and spoiling material at such sites will be made in accordance with the provisions of subclause PSD 8.3.14."

ADD THE FOLLOWING SUBCLAUSE IN SUBCLAUSE 5.2.2:

PSD 5.2.2.4 Selection and stockpiling

Approval or designation of the material in a particular borrow pit or excavation for a particular purpose does not imply that all the material in the borrow pit or excavation is suitable for the particular purpose to which the said approval or designation relates, nor that all material in the borrow pit or source should be used for the particular purpose. The Contractor shall select suitable material from that borrow pit or source, discard unsuitable material and reserve material for other purposes as necessary.

The Contractor shall organize and carry out his operations in such a manner as will prevent the contamination of suitable embankment and backfill material with unsuitable materials. Any excavated material which becomes, in the Employer's Agent's opinion, unsuitable for use in embankments or backfill as a result of contamination, shall be disposed of in a manner acceptable to the Employer's Agent and shall be replaced by the Contractor with materials acceptable to the Employer's Agent, all at the Contractor's cost."

PSD 5.2.5 Transport for earthworks

REPLACE THE CONTENT OF SUBCLAUSE WITH THE FOLLOWING:

"The transport of all excavated materials, irrespective of the distance and source, shall be deemed to be free-haul, the cost of which is included in the Contractor's tendered rates and prices for the excavation of the materials. No separate compensation shall apply for the transportation of excavated materials."

PSD 7 TESTING

PSD 7.2 TAKING AND TESTING OF SAMPLES

REPLACE THE CONTENT OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The Contractor shall arrange with the approved independent laboratory by the Contractor to 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 specifications and shall submit the results of these tests to the Employer's Agent in a form approved by him.

The compaction requirements for fills shall be deemed complied with when at least 75% of the dry-density tests on any lot show values equal to or above the specified density and when no single value is more than five percentage points below the specified value."

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.1 Site preparation

REPLACE SUBCLAUSES 8.3.1.1 AND 8.3.1.2 WITH THE FOLLOWING:

"Where site preparation such as clearing, grubbing, the removal of large trees or the removal and stockpiling of topsoil is required, the provisions and scheduled items of SANS 1200 C shall apply."

PSDB EARTHWORKS (PIPE TRENCHES)

PSDB 3 MATERIALS

PSDB 3.5 BACKFILL MATERIALS

ADD THE FOLLOWING PARAGRAPHS TO SUBCLAUSE:

"(c) Cement-stabilised backfilling

Backfilling shall, where directed by the Employer's Agent, be stabilized with 5% cement. The 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) Soil-crete backfilling

The aggregate for soil-crete 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 acquire a consistency that allows the mixture to 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 5 CONSTRUCTION

PSDB 5.1 PRECAUTIONS

PSDB 5.1.2 Stormwater, Seepage and Dewatering of Excavation

PSDB 5.1.2.3 Sloping ground

ADD THE FOLLOWING SENTENCE AT THE END OF THE PARAGRAPH:

"All trench excavations on sloping embankments shall be backfilled in accordance with 5.6.2 over the full extent of the actual trench excavation and to the original embankment ground level."

PSDB 5.1.3 Accommodation of traffic and access to properties

REPLACE THE SEMICOLON AND THE WORD "and" *AT THE END OF THE 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 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.

The Contractor shall make available on site at all times a sufficient number of steel plates at least 2.0m x 2.0m x 8mm thick to be laid across open trenches to provide access to private properties. The cost of providing, placing and removing the steel plates shall be included in the rates for trench excavation.

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 NEW SUBCLAUSE TO SUBCLAUSE 5.1:

PSDB 5.1.5 <u>Removal of existing pipelines</u>

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 reuse and pipes declared unfit for reuse shall be dealt with in an applicable manner described in the specifications, or on the Drawings or on the Employer's Agent's instructions, as relevant."

PSDB 5.2 MINIMUM BASE WIDTHS

ADD THE FOLLOWING SUB PARAGRAPH TO:

c) Should the excavated trench width exceed the specified side allowance on each side of the pipe of 400mm by a value greater than 400mm, remedial measures shall be as directed and shall be provided at the Contractor's cost unless it can be shown that such excess width is due to factors beyond the Contractor's control.

Trench widths should be as near vertical as possible in order to minimize the quantity of selected fill material to be provided."

PSDB 5.4EXCAVATION

ADD THE FOLLOWING SUB CLAUSES:

PSDB 5.4.1 Principles

"a) The cost of trimming excavations by hand or machine shall not be paid for separately but shall be included in the rates tendered for excavation.

b) All excavated material shall be kept within defined limits and shall, wherever possible, be deposited alongside the trench. The material shall be deposited so as to leave a clear strip of at least one metre between the edge of the trench and the excavated material and shall not cause undue inconvenience to traffic and property owners. The material shall be placed and kept well clear of all manhole covers, culvert in- and outlets, fire hydrants, benchmarks, stand pegs, fences, etc.

c) To prevent vertical trench walls from collapsing, excavated material shall, wherever possible, not be stacked on the side of any underlying strata sloping down towards the trench and in this regard attention is specifically drawn to the shales sloping south to north in the Pretoria area.

d) Excavations more than 1,5 m deep shall be adequately shored or braced to support the overhanging material and other loads which may occur. If the Contractor is of the opinion that shoring or bracing for an excavation of depth of more than 1,5 m is not necessary, he shall notify the Employer's Agent accordingly in writing, including a report from a professional Employer's Agent or a professional technologist competent in excavations. The report shall include the relevant laboratory tests.

e) The Contractor shall provide all the open and close timbering, strutting and shoring required for the safety of the excavations and structures adjacent to the trenches, and shall be solely and wholly responsible for ensuring the adequacy of these measures for this purpose.

Without in any way affecting or detracting from the Contractor's responsibility, the Employer's Agent shall have the right to instruct the Contractor to provide additional or improved timbering, shoring or strutting where he considers this to be necessary. The Contractor shall have no claim for additional payment on this account.

The shoring method adopted shall be compatible with the soil type and the excavating, backfilling and pipe-laying methods adopted and shall not place any undue restrictions on the laying of the pipes.

Timbering and shoring shall be left in position until the Employer's Agent has authorised their removal.

f) Shoring and bracing may not be necessary where the Contractor elects to slope the sides of the excavation to at least the maximum angle of repose measured relative to the horizontal plane, as determined by laboratory tests. Sloping of the sides could be combined with steps. The Contractor will submit the proposed excavation profile to the Employer's Agent for approval.

g) The cost for shoring, bracing and sloping of the sides will be included in the rates tendered for excavation. The cost for the services of a professional Employer's Agent or a professional technologist, including the relevant laboratory costs, shall be included in the tendered rates.

h) The Safety officer, or another competent person appointed by the Contractor in writing, shall inspect every excavation, including bracing and shoring:

(i) daily, prior to each shift;

(ii) after every blasting operation;

(iii) after an unexpected fall of ground;

(iv) after substantial damage to supports; and

(v) after rain,

in order to pronounce the safety of the excavation to ensure the safety of persons, and those results are to be recorded in a register kept on site and made available to an inspector, the Employer, Employer's agent, contractor or employee upon request;

i) Each excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, shall be

(i) adequately protected by a barrier or fence of at least one metre in height and as close to the excavation as is practicable; and

(ii) provided with warning illuminants or any other clearly visible boundary indicators at night or when visibility is poor."

PSDB 5.4.2 Hand Excavatability

PSDB 5.4.3 Excavation of Asphalt Surfaces

The existing asphalt road surfacing shall be saw-cut prior to excavation commencing for the full width of the trench as specified on the construction drawings so as to ensure a neat finish to the reinstated surfacing.

PSDB 5.6 BACKFILLING

PSDB 5.6.3 Disposal of Soft Excavation Material

DELETE THE EXISTING CLAUSE AND REPLACE WITH:

"The Contractor shall locate and negotiate for tipping sites for the disposal of surplus material and bear all costs in connection therewith. Arrangements for the consent of the owner of a property to deposit spoil and or temporary spoil thereon shall be confirmed in writing. Such arrangements shall be approved before being implemented. All spoil sites shall be neatly finished off and compacted to 90% of MOD.AASHTO density."

PSDB 5.6.6 Completion of Backfilling

ADD THE FOLLOWING:

Backfilling should not lag more than 50m behind the laying operation.

PSDB 5.7 COMPACTION

ADD THE FOLLOWING:

"Where pipelines cross existing gravel roads, backfilling shall be carried out as specified in Subclause 5.7.2 and payment therefore will be made under sub item 8.3.3.3."

PSDB 5.9 REINSTATEMENT OF SURFACES

ADD THE FOLLOWING TO THIS SUB CLAUSE:

PSDB 5.9.2 Private Property and Commonage

The ground and paved surface of servitudes, parks, driveways, roadways and sidewalks shall be reinstated to at least the standard and conditions as existed previously.

Grass sods shall be cut out from the grassed areas to be excavated and shall be set aside, preserved and kept damp until used for reinstatement. All other material to be used for reinstatement shall be suitably stored for such purpose.

The rate for reinstatement of block paved surfacing shall include all costs for the supplying and laying of the surfacing. The rate shall also cover for taking brick paving out carefully, stockpiling and replacement with new if bricks are broken or damaged. The rate must furthermore provide for all plant, labour and material costs associated with the work.

The rate for reinstatement of asphalt or concrete paved surfacing shall include all costs for the saw cutting, supplying and laying of the surfacing. The rate shall also cover for removal and spoiling of the material. The rate must furthermore provide for all plant, labour and material costs associated with the work.

The width of any trench through an area paved with bricks or precast concrete units shall be the minimum practicable width that, in the opinion of the Employer's Agent, can be removed without cutting bricks or precast units.

PSDB 5.9.4 Bitumen roads: Sub-base and Base

DELETE THIS SUB CLAUSE AND REPLACE WITH THE FOLLOWING:

Johannesburg Roads Agency will reinstate all asphalt surfaces. Refer to PS 6.7.

ADD THE FOLLOWING NEW SUB CLAUSES:

PSDB 5.9.7 Construction of Layers for Footways

The reinstatement of the paving blocks shall be the responsibility of the Contractor. The reinstatement and backfilling of pavement layers shall be done in accordance with PS 6.7

ADD THE FOLLOWING NEW SUB CLAUSES:

PSDB 5.9.8 Existing Kerbs and Channels

"Where excavations have to cross existing kerbs and channels, then:

a) In the case of a precast kerb and channel the kerb, segmented paving blocks and channel shall be carefully removed and stored so as to avoid any damage to or theft of the kerb and channel, and replaced after the excavation has been backfilled. Any

damage to or theft of the kerb and channel shall be made good by the Contractor at his expense.

a) In the case of cast insitu or extruded insitu kerb and channel the kerb and channel shall be cut with a diamond tipped saw and carefully removed so as to avoid any damage to the remaining kerbs and channels. After the excavation has been backfilled the portion of kerb and channel removed shall be replaced with a cast insitu kerb and channel of the same profile as the existing kerb and channel."

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.11 LOCATION OF EXISTING SERVICES

Positions and details of known existing services as received from the various Departments are indicated on the Construction Drawings. Exact positions cannot be guaranteed by The Employer's who will not be held responsible for any damages to any services. The Contractor shall excavate by hand to locate any such services and ensure that care is taken not to damage these services.

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.12 DEALING AND PROTECTING EXISTING SERVICES

All existing services, underground as well as above ground level, shall be protected by the Contractor in an appropriate manner, for the duration of the construction or as deemed necessary by the Employer's Agent, such that no damage to or interruption of the services shall occur.

ADD THE FOLLOWING NEW SUB-CLAUSE:

PSDB 5.13 GAS MAIN, ELECTRICITY AND TELECOMMUNICATION POLES

Gas mains, electricity and telecommunication poles along the pipe route are to be stabilised and protected prior to excavation and for the duration of construction.

ADD THE FOLLOWING NEW CLAUSE:

PSDB 5.14 TREES IN CONSTRUCTION PATH

When ever possible any trees that lie within the construction path, shall not be removed and care shall be exercised to avoid damaging them. If the Contractor considers the removal of any tree unavoidable he/she shall obtain in writing the approval of the Employer's Agent and the Environmental Consultant prior to removal of any trees. Rates to cover removal and replacement where practical are provided in the schedule of quantities. A penalty of R1, 000.00 will be applied for any unauthorized or unnecessary damage to any tree which in the opinion of the Employer's Agent could have been avoided.

ADD THE FOLLOWING NEW SUBCLAUSE 5:

PSDB 7 TESTING

ADD THE FOLLOWING NEW SUBCLAUSE:

PSDB 7.2 Inspection at Intermediate Stages of Construction

The Contractor shall call the Employer's Agent, giving him reasonable notice, to inspect the works at the following intermediate stages of construction:

a) After completion of the trench excavation and preparation of the trench bottom and before any pipe is laid.

b) After the selected backfill material has been placed around the pipe and before the remainder of the trench is backfilled.

c) Before placing of premix on roads or any final surfacing on constructed footways. Work shall not progress through the specified stages without the approval of the Employer's Agent or his representative on site.

Failure to comply with the provision of this clause shall result in the suspension of the backfilling work until the testing has been approved by the Employer's Agent."

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.1 BASIC PRINCIPLES

ADD THE FOLLOWING PRARGRAPH:

"The basic principle of measurement and payment for earthworks for a pipe trench is that the rates tendered for excavation shall also cover the cost of trimming, handling and shoring or bracing as specified in clause PSDB 5.4".

PSDB 8.3 SCHEDULED ITEMS

PSDB 8.3.1 Site Clearance and (if specified) Removal of topsoil

RENAME THE FOLLOWING SUB-ITEM:

c) Removal, stockpiling and replacing of Topsoil (depth stated) ……..Unit: m^3

ALSO REPLACE THE LAST SENTENCE OF THIS SUB-ITEM:

"The rate for item (c) shall cover the cost of stripping to the stated depth, stockpiling, maintaining and replacing the topsoil, as well as the prevention of dust nuisance."

PSDB 8.3.2 Excavation

a) Excavate in all materials, for trenches, backfill compact and dispose of surplus material

ADD THE FOLLOWING SUB-ITEM:

The rate shall also cover the cost of excavating for trenches using labour-intensive construction methods. The rate shall exclude the cost of removal of grass sods and

compaction but shall include for the disposal of surplus/unsuitable material. The rate shall, in addition, cover the costs for compliance with the requirements of PSDB 5.4.1.

b) Extra over item (a) above for:

ADD THE FOLLOWING AT THE END OF THE EXISTING SUB-ITEM 2:

(2) Non-explosive breaking as per instruction of the Employer`s Agent ……Unit: m^3

"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 SUBITEMS IN 8.3.2(b):

(3) Hand excavation and backfill where ordered by the Employer's Agent ……Unit: m^3

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, which was excavated by the 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 with his obligations under the Contract to

(i) utilize construction appropriate to the nature of the specific parts of the works; and/or

(ii) protect existing structures and/or services; and/or

(iii) comply with all prevailing legislation and regulations.

(4) Cutting of premix and concrete surfaces…..……..Unit: m^2

The cutting of premix and concrete surfaces shall be measured per square metre of cut as scheduled. Cutting of premix and concrete surfaces shall be done with a diamond tipped saw or by some other approved method. The depth of the cut shall be such that the adjoining premix and concrete surfaces are not disturbed when excavation takes place. The cutting of surfaces shall be done 100mm on either side of the trench.

(5) Backfill stabilised with 5% cement where directed by the Employer's Agent……..Unit: m^3

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 subclause 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) Soilcrete backfill where directed by the Employer's Agent ……..……Unit: m^3

The unit of measurement shall be the cubic metre of soil-crete placed on the Employer's Agent's instructions in accordance with subclause PSDB 3.5(d), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required."

(7) excavation with care around existing pipe of similar diameter (to be removed) ……..…….
Unit: m

The unit of measurement shall be metre of pipelength which needs to be excavated which coincides with the pipelength of existing pipe of similar diameter to be removed. This payment item is to compensate the Contractor for the added complexity of excavation. The existing pipe will be disposed of (priced elsewhere) and does not need to be protected. The tendered rate shall include full compensation for excavating around the existing pipeline."

(8) Dump rock

The unit of measurement shall be the cubic metre of dump rock placed on the Employer's Agent's instructions, measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying, selecting, and placing the rock."……..……Unit: m^3

AND ADD THE FOLLOWING NEW SUBITEMS IN 8.3.2:

"(d) Widening and deepening in all materials, for valve chambers and dispose of surplus material ……...Unit: m^3

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, but excluding the displaced volume of the pipe, already taken into account in item (a) above.

(e) Extra-over item (d) above for

(1) Intermediate Rock……
Unit: m^3

(2) Hard Rock……..……
Unit: m^3

PSDB 8.3.3 Excavation ancillaries

PSDB 8.3.3.1 Make up deficiency in backfill material (Provisional)

ADD THE FOLLOWING AFTER THE LAST SENTENCE:

"The rates for items (a), (b) and (c) shall also cover the sieving of material if instructed by the Employer's Agent."

ADD THE FOLLOWING SUBITEMS:

"(d) Supplying of 38 mm stone from any source as required…….....Unit: m^3

(e) Supplying soil for soil cement from any source……....
Unit: m^3

(f) Crusher run from any source……..….
Unit: m^3"

PSDB 8.3.3.3 Compaction in road reserves

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

"PSDB 8.3.3.3.3 Compaction in road crossings"

*REPLACE THE SENTENCE, "*The volume will be measured as specified in 8.2.2, 8.2.3 and 8.3.3.1"*, WITH THE FOLLOWING:*

"To determine the volume in the case of gravel roads, the depth will be measured from the underside of the gravel wearing course to the top of the fill blanket, and in the case of bitumen roads, from the underside of the subbase to the top of the fill blanket.

The rest of the trench shall be backfilled as specified in clauses 5.9.3, 5.9.4 and 5.9.5, as applicable, and payment will be made under item 8.3.6.1."

PSDB 8.3.3.4 Overhaul

REPLACE THE CONTENTS OF THIS ITEM WITH THE FOLLOWING:

"Measurement and payment shall be in accordance with subclause PSD 5.2.5."

PSDB 8.3.4 Particular items

8.3.4(a) Shore trench opposite structure or service

REPLACE THE HEADING OF THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(a) Shore trench opposite structure or service for depths:"

ADD THE FOLLOWING AFTER THE LAST SENTENCE:

"Separate items will be measured for depths of trenches in increments of 1 m. The rate for each stated category shall cover the cost of shoring from ground level up to the full depth of the stated category. Payment for this item will only be made if written instructions were issued by the Employer's Agent over and above the Standard Specifications for safety of excavations as specified in SANS 1200 DB, subclause 5.1."

PSDB 8.3.4(b) Temporary works: Control water inflow from …….. to ……..

REPLACE THIS SUBITEM WITH THE FOLLOWING:

PSDB 8.3.4(b) Accommodation of existing flows for temporary or permanent connections or construction of new structures or pipe trenches:

1) (Description of item stated) …… Unit: Sum

2) Etc for other structures

The tendered sums shall include full compensation for any inconvenience suffered, for normal and exceptional risks, for unforeseen eventualities and for maintaining the accommodated flow as long as necessary and shall include for the design and construction of all necessary temporary measures such as additional clearing, grubbing, earthworks, culverts, structures, pipework, pumping, cleaning up and any other associated work that may be required as specified in Clause PS1.5. Where a temporary structure for the accommodation of an existing flow has been designed by the Employer's Agent and is to be constructed by the Contractor, payment for such structure shall, unless otherwise stated in the scheduled item, be made under the applicable sub items in this payment item."

PSDB 8.3.5 Existing services that Intersect or Adjoin a Pipe Trench

PSDB 8.3.5 a) Services that intersect a trench

ADD TO THE FIRST SENTENCE OF THIS SUB CLAUSE AS FOLLOWS:

After "Except where water pipes are to be recovered" add "*and water leads for erf connections need to be renewed*"

ADD THD NEW SUBCLAUSE PSDB 8.3.5 c) TO CLAUSE 8.3.5 AS FOLLOWS:

PSDB 8.3.5 c) Services that require special care

1) Description of service……Unit: No

2) Etc for other items……Unit: No

The Unit of measurement shall be the number of each service described. Electricity, telecommunication poles and water mains along the pipe route are to be stabilised and protected prior to excavation and for the duration of construction. The rate shall cover the temporary stabilization and protection of electricity and telecommunication poles.

ADD THD NEW SUBCLAUSE PSDB 8.3.6.2 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.2 <u>Reinstatement of surfacing for footways</u>

a)Brick paving …….. Unit: m²

b)Concrete paving …….. Unit: m²

c)Concrete slabs …… Unit:. m²

d) Asphalt paving …… Unit:. m²

The Unit of measurement shall be square metre of a reinstated. The rate for reinstatement of footway surfacing shall include all costs for careful removal, replacement of damaged sections and laying of the surfacing using labour intensive construction methods. The rates shall include for the lifting, stockpiling and replacement of broken or damaged bricks, blocks or slabs and shall provide for all plant, labour and material costs associated with the work.

The width of any trench through an area paved with bricks or precast concrete units shall be the minimum practicable width which, in the opinion of the Employer's Agent, can be removed without cutting bricks or precast units.

ADD THE NEW SUBCLAUSE PSDB 8.3.6.3 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.3 <u>Reinstatement of kerbs and channels</u>……Unit: m²

The unit of measurement shall be square metre of area reinstated. The rate shall cover the cost of all labour, plant and material required and shall also include for the disposal of all unsuitable materials.

ADD THD NEW SUBCLAUSE PSDB 8.3.6.3 TO CLAUSE 8.3.6 AS FOLLOWS:

PSDB 8.3.6.4 <u>Reinstatement of grassed surfaces</u>
……Unit: m²

The unit of measurement shall be square metre of area reinstated. The rate shall cover the cost of careful removal of grass sods to a minimum depth to a minimum depth of 100mm, stockpiling, maintenance for later re-use and reinstatement thereof."

DELETE THIS SUBCLAUSE AND REPLACE WITH THE FOLLOWING:

PSDB 8.3.6.5 <u>Reinstatement of fence</u>

a)Description of fence……Unit: m

b)Etc for other items

The unit of measurement shall be the metre of fence reinstated complete. The rate shall cover the full compensation, labour, material and ancillary works for the reinstatement.

ADD THIS NEW SUBCLAUSE:

PSDB 8.3.8 <u>Form Firebreaks (On Employer's Agent's instruction)</u>

Measurement will be in square metres over the area instructed by the Employer's Agent…..... Unit: m^2

ADD THIS NEW SUBCLAUSE:

PSDB 8.3.9 Discontinue operations unexpectedly and transfer plant, equipment and labour (provisional item)

(a) Over a route distance not exceeding 280 m……..... Unit: No of transfers

The rate for unexpected discontinuity in operations along the route of the pipeline and transfer, plant, equipment and labour shall include everything necessary to close down in sequence the various operations in the construction train and transfer them to the new working point.

PSDK GABIONS AND PITCHING

PSDK 3 MATERIALS

PSDK 3.2 Pitching

PSDK 3.2.1 Stone

REPLACE THE CONTENTS OF TABLE 2 WITH THE FOLLOWING:

"TABLE 2 SIZE AND MASS OF INDIVIDUAL STONES FOR PITCHING

1	2	3	4
Size/mass of pitching	Thickness of pitching Mm, min	Least dimension Mm, min	Mass kg, min
Extra heavy	600	300	180
Heavy	400	190	50
Medium	300	150	27
Light	200	110	11

PSDK 5 CONSTRUCTION

PSDK 5.3.3 Grouted pitching

REPLACE THE WORDS "(Table 4)" *IN THE SECOND LINE OF THE FIRST PARAGRAPH WITH* "(Table 2)"

PSG CONCRETE STRUCTURAL

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 sulphate resistant cement shall be used on this project.

If the Contractor wishes 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.) The tendered rates, however, shall be based on the use of sulphate resistant cement only".

PSG 3.2.3 Storage of cement

ADD THE FOLLOWING:

"Cement shall not be store for longer than 12 weeks without the Employer's Agents permission".

PSG 3.4 AGGREGATES

ADD THE FOLLOWING SUBCLUASE:

PSG 3.4.4 Aggregate of dolomatic origin

All aggregates for structural concrete, manholes, pipe encasement, pipe bedding cradles, mass filling, etc. shall be of dolomatic origin. The quantity of insoluble matter in respect of concrete made with aggregates of dolomatic origin, determined according to the method described in SANS 677, Appendix C, shall not be more than 15%.

PSG 4 PLANT

PSG 4.5 FORMWORK

PSG 4.5.1 Design

ADD THE FOLLOWING:

All form work with scaffolding required for any part the works shall be designed by the Contractor, and before commencing with the erection of any formwork or scaffolding, the Contractor shall submit the methods he proposes to use to the Employer's Agent for approval. The Employer's Agent has the authority to order alterations to the design or the sizes of any part of the formwork or scaffolding. The Contractor shall check the safety and suitability of all such alterations. The fact of the Employer's Agent has approved or altered any part of the formwork of scaffolding shall not be construed as

relieving 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 to hold formwork will be allowed into the project or through the concrete unless expressly approved by the Employer's Agent.

Only approved tie-rods consisting of solid rods (that remain embedded in the concrete) and with removable ends shall be used to hold the formwork of the walls. The removable tie-rod ends shall facilitate removal without damage to the concrete, and no permanently embedded parts of such tie-rods shall haveless than 50mm of cover to the finished concrete surface.

The cavities left in the concrete when the tie-rod end cones are removed shall soundly caulked with a cement mortar to which an approved shrinkage-reducing agent has been added, and shall be neatly to finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying special tie-rods as well as the filling of 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 in the reinforcing steel shall nowhere be less than:

(a) 40 mm or

(b) 5 mm plus the maximum size of the coarse aggregate, whichever is the largest

PSG 5.2 FORMWORK

PSG 5.2.5 Removal of formwork

ADD THE FOLLOWING SUBCLAUSE:

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 that propping of beams and slabs".

PSG 5.3 HOLES, CHASES AND FIXING BLOCKS

ADD THE FOLLOWING:

"Cover blocks for reinforcing and fixtures may be placed into the concrete provided that neither the strength nor any other desirable characteristics (such as the appearance) of the concrete section is affected or impaired in the opinion of the Employer's Agent.

The holes or cavities left by the ferrule heads in the concrete of water-retaining structures shall be filled with an approved non-shrink grout applied strictly in accordance with the manufacturer's specifications."

PSG 5.4 PIPES AND CONDUITS

ADD THE FLLOWING:

"All pipes passing through to concrete floors, walls or slabs shall be cast into a concrete member simultaneously with the casting of the member. Openings for pipes shall only be left in concrete members when so directed by the Employer's Agent or when shown on the drawings. Pipes shall be installed in such openings according to the details shown on the drawings.

If water tightness is a requirement where pipes are cast into walls, floors and slabs, the Contractor shall ensure water tightness where smooth-surfaced pipes are used by using an approved method such as tape wrapping the pipes prior to casting in. The cost of such method will be deemed to be included in the rates tendered for item PSG 8.10".

PSG 5.5 CONCRETE

PSG 5.5.1 Quality

PSG 5.5.1.5 Durability

The exposure conditions of the concrete are classified as "severe".

PSG 5.5.1.7 Strength concrete

ADD THE FOLLOWING:

"The concrete mixes for sulphate resistant cement shall be designed by an approved laboratory for approval by the Employer's Agent before commencement of any concrete work".

PSG 5.5.3 Mixing

PSG 5.5.3.2 Ready-mixed concrete

ADD THE FOLLOWING:

"Ready-mixed concrete may be used on the Site. The contractor shall take samples for testing from every load delivered to the Site".

PSG 5.5 5 Placing

ADD THE FOLLOWING SUBCLAUSE:

PSG 5.5.5.10 "Concreting of the wall between horizontal construction joints shall be carried out in both directions from a point on the wall in order to close the gap with fresh concrete".

PSG 5.5.7 Construction joints

ADD THE FOLLOWING:

"Horizontal construction joints are permitted in structure walls in positions indicated on the drawings or approved by the Employer's Agent. Vertical construction joints in the wall are subject to the written approval of the Employer's Agent and the cost of all such vertical or horizontal construction joints will be deemed to be included in the rates for cast-in-situ concrete. This also applies to the preparation of concrete to form construction joints in the flume walls as specified on the drawings.

The construction joints in water-retaining structure shall be made strictly in accordance with the details shown on the drawings. The joints between screeds and concrete floors shall be regards as construction joints and the surface of the floor shall be prepared as described for construction joints.

Should the Contractor's method of construction necessitate the placing of construction or other joint in a position not shown on the drawings, such method of construction and position of the joint shall be approved by the Employer's Agent in writing. The cost of such joint shall be included in the tendered rates and shall include scrabbling of the concrete where steel reinforcement is continuous.

The walls shall be cast in lifts of height that permits each lift to be poured without interruption in one continuous operation during working hours.

It is the Contractor's responsibility to ensure that construction 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.

For construction joints at kickers all additional costs for concrete, preparation, etc will be deemed to be included in the rates tendered for concrete in walls or sides and kicker joints or construction joints will not be measured separately".

PSG 5.5.8 Curing and protection

ADD THE FOLLOWING:

"Curing by retaining the formwork in place or by covering with a waterproof membrane are the curing methods strongly recommended. Concrete will not be paid for unless properly cured and proof of curing is continuously visible on the Site".

PSG 5.5.11 Watertight concrete

ADD THE FOLLOWING:

"The minimum cement content in water-retaining structures shall be 325 kg/m³, and the maximum cement content shall be 450 kg/m³ in reinforced concrete."

The maximum water cement ratio for water-retaining structures shall be more 0, 50".

ADD THE FOLLOWING SUBCLAUSE:

PSG 5.5.11.1 Cleansing and Disinfection

"Before being put into use all structures which will contain potable water are to be thoroughly cleaned out and disinfected inside by brushing, removing all dirt, grit and rubbish, hosing with clean water and finally washing with a solution of permanganate of potash mixed in the proportion of 1gm to 5 litres of water. Excess solution should then be run to waste before testing for watertightness.

In cases where there is a risk of discolouration of potable water by the permanganate solution, chloride of lime or other approved chlorinating chemicals shall be used for disinfection. Pipework installed by the Contractor and which is in direct or indirect contract with the potable water shall similarly be disinfected."

PSG 5.5.16 Soilcrete

Where soilcrete is specified for filling under floor slabs the soilcrete shall comply with the requirements of subclause PSDB 3.5 (d) of section 1200 DP as amended and shall be placed as specified in this subclause.

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 specified permissible deviation is binding in itself. The cumulative 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 of height	5	3	2
Subject to a maximum	50	30	10

PSG 7 TESTS

PSG 7.1 FACILITIES & FREQUENCY OF SAMPLING

PSG 7.1.1. <u>Facilities</u>

ADD THE FOLLOWING:

"The Contractor shall provide sufficient storage capacity for the concrete cubes and shall arrange to have them tested by an approved laboratory.

The cost all testing, including the cost of sampling, storage and transporting samples should 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-mix concrete will not be accepted for evaluation in terms of subclause 7.3, but samples for testing shall be taken off such concrete at the point of placing ".

ADD THE FOLLOWING SUBCLAUSE:

PSG 7.3.6 <u>Testing for watertightness</u>

Water for testing shall be provided by the Contractor and shall be responsible for providing all necessary equipment that may be required for filling the structures.

The structure shall be filled with water at a uniform rate not exceeding 2.0 m in 24 hours until the top water level been reached. The water level will then be carefully noted and recorded by the Employer's Agent in relation to a fixed benchmark, and shall be contained by the addition of further water for a sterilising period to permit complete absorption of water by the concrete.

The sterilising period may be 7 days for a maximum design crack width of 0.1mm or 21 days for 0.2mm or larger. After the sterilising period, the level of the liquid surface shall be recorded at 24-hour intervals for a test period of 7 days. During the 7 day test period the total permissible drop in level, after allowing for evaporation shall not exceed 1/500 the one of the average water depth of the full tank, or 10 mm.

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.

In the event of appreciable leakage being evident at any of the stages of the filling or testing or the event of the Employer's Agent considering the final degree of water tightness to be unsatisfactory, the contractor when ordered by the Employer's Agent shall discontinue such filling or testing and shall, at his own expense, take approved steps immediately to rectify the leakage, until a satisfactory test is obtained, which shall prove to the Employer's Agent that a sufficient degree of watertightness has been obtained.

The cost of emptying a water-retaining structure which cannot be drained shall be borne by the Contractor. The water shall be discharged in a manner approved by the Employer's Agent and shall be such that the employer can utilise the water is he so desires.

The water shall not be used as a medium for addictives to affect remedial work or to stop leaks.

The cost of retesting the structure for watertightness shall be borne by the Contractor".

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.1 MEASUREMENT AND RATES

PSG 8.1.1 Formwork

DELETE "or splays over 20 mm x 20 mm" FROM THE FIRST LINE OF PARAGRAPH 8.1.1.2

ADD THE FOLLOWING PARAGRAPH 8.1.1.2

"Splays up to and including 25 mm x 25 mm will not be measured separately and will be deemed to be included in the formwork costs".

ADD THE FOLLOWING PARAGRAPHS

"8.1.1.7 For construction joints at kickers (joint F), all additional costs for formwork to edges up to 300 mm high will be deemed to be included in the rates tendered for vertical formwork to sides of walls and will not be measured separately in narrow width.

8.1.1.8.1 No formwork will be measured to edges of blinding layers under structures and the cost thereof (if needed), will be deemed to be included in the rates tendered for concrete in blinding layers.

8.1.1.8.2 Back-shuttering or formwork to top revealed surfaces of sloping - or conical formwork will only be measured to surfaces over 40° and 85° to the horizontal.

8.1.1.8.3 Formwork to horizontal surfaces in pump stations, valve chambers, man holes or sumps can either be removed through the manhole cover opening or the Contractor may use permanent formwork at his own cost as no claims in this regard will be considered".

PSG 8.1.2 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 authorised 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 net area covered by mesh, excluding overlaps.

Clips, ties, separators, stools and other steel used for positioning reinforcement will not be measured, unless these are 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 8.1.3 Concrete

Delete "or the plank size of the excavation where additional excavation is provided to facilitate erection of forms" from the second line of paragraph 8.1.3.1(c).

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

PSG 8.8 HD BOLTS AND MISCELLANEOUS METAL WORK .....Unit : No.

Whether to be supplied by the Contractor or by others will be stated . Separate items will be scheduled as specified in 8.7 (b) .

The rate shall cover the cost of supplying and delivering or taking delivery (as applicable) , fixing or casting into concrete, and all cleaning, preparation, and finishing , as applicable for the following items.

PSG 8.8.1 a) Manhole access frame and covers
i) 900 mm x 900 mm

PSG 8.8.2 100mm ND air ventilation pipes with vermin proof mesh inside and outside

ADD THE FOLLOWING:

PSG 8.9 Testing for watertightness

The lump sum figure will cover all the required processes to be carried out in accordance with the information and specifications referred to in clause PSG 5.5.11.3

The tendered lump sum shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.10 Cleansing and disinfection

The lump sum figure will cover all the required processes to be carried out in accordance with the information and specifications referred to in clause PSG 5.5.11.4

The tendered lump sum shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.11 Slip joints

Measurement shall be for the total area of 500um DPC placed in 2 layers underneath the reservoir wall-footings to form the slip joint as detailed on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.12 Thermo insulation

Measurement shall be for the entire area of roofing to be covered with a 100mm thick layer of well-graded, thoroughly cleaned, 19mm concrete aggregate placed as shown and detailed on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.13 Drain pipes

Measurement shall be per linear metre of drain pipe required as indicated in the bill of quantities and on the drawing. The protective geotextile for these pipes is to be measured and included with this item.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified and must include the pipe and associated protective geotextiles.

PSG 8.14 Geofabric layer

Measurement shall be for the total area of geotextile as specified in the bill of quantities and on the drawings, placed between the no-fines concrete drainage layer and the 30mm thick blinding layer

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.15 Manholes

Measurement shall be for the complete number of manholes required as specified on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.16 Bearing strip

Measurement shall be per linear metre of limitgliss bearing strip required to be placed between the reservoir wall and roof as specified on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.17 Roof weepholes

Measurement shall be for the number of weepholes required as per the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSG 8.18 Brickwork

PSG 8.18.1 Brick Walls

The bricks shall be clay face bricks to SABS 227, class FBX. The bond shall be English or Stretcher bond. The bricks shall be placed in class 1 mortar. All jointing shall be square pointed by recessing the mortar a minimum of 5 mm. All brickwork shall be cleaned of any excess mortar by wire brush and acid wash cleaning as required.

PSG 8.18.2 Brick Reinforcement

Brick reinforcement shall be installed every third brick layer.

PSG 8.18.3 Lintels

Lintels to be prestressed concrete manufactured to SANS 1504 – 1990.

PSHA STRUCTURAL STEELWORK (SUNDRY ITEMS)

PSHA 8 MEASUREMENT AND PAYMENT

PSHA 8.3 SCHEDULED ITEMS

ADD THE FOLLOWING:

PSHA 8.3.7 Manhole cover ..... Unit: No

Measurement shall be for the supply and installation of the required number of manhole cover and frame assembly's as specified on the drawings or as listed in the bill of quantities.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSHA 8.3.8 Roof ventilators ..... Unit: No

Measurement shall be for the required number of hot-dipped galvanized steel roof ventilators as specified on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSHA 8.3.9 Internal Ladder ..... Unit: No

Measurement shall be for the required number of internal ladders as specified on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSHA 8.3.10 External Ladder ..... Unit: No

Measurement shall be for the required number of external ladders as specified on the drawings.

The rate tendered shall include full compensation for all materials, equipment and work required in order to complete the work as specified.

PSL MEDIUM-PRESSURE PIPELINES

PSL 2 INTERPRETATIONS

PSL 2.4 ABREVIATIONS

ADD THE FOLLOWING:

HDPE : High density polyethylene

mPVC : Modified Polyvinyl chloride

PSL 3 MATERIALS

PSL 3.1 GENERAL

ADD THE FOLLOWING TO CLAUSE:

The contract specifications for materials and construction activities will conform to SANS 1200, SANS 1914-5 and Johannesburg Water requirements. The project specifications will include specific items to ensure proper implementation, control reporting on labour based construction and methods as included in the specifications.

Materials for this contract should preferably be obtained from manufacturers who operate an effective quality management system such as that described in SANS 0157 or ISO 9000.

PSL 3.4 STEEL PIPES, FITTINGS, AND SPECIALS

PSL 3.4.3 Pipes of nominal bore over 150mm

OMIT PARAGRAPH (C) AND INSERT THE FOLLOWING:

"Steel pipes and fittings shall be manufactured in accordance with API 5L X42 (yield strength of 289MPa). The wall thickness of the pipes and fittings shall be as specified. All pipes and specials shall be supplied complete with flanges as specified to SANS 1123 or unless stated otherwise.

Cathodic protection design will be done by a specialist and will be procured separately and construction will be as directed by the specialist.

The pipe manufacturer shall submit to the Employer's Agent the steel maker's certificates covering all steel used. These certificates shall indicate the process of manufacture, the chemical analysis and the physical properties of the steel except that, at the option of the pipe manufacturer, the physical properties of the steel may be determined from specimens taken from finished pipe. The pipe manufacturer shall also provide X-rays and welding approval certificates for all circumferential welds, including welding for flanges"

PSL 3.7 OTHER TYPES OF PIPES

PSL 3.7.1 uPVC Pipes

ADD THE FOLLOWING TO THE SUB CLAUSE

"Class 16 uPVC Pipe systems shall conform to SANS 966-1998 Part1 or II as applicable and have integral pipe end sockets of the rubber ring joint type. All uPVC - pipes shall be in 6m lengths. Fittings and specials for uPVC pipes shall be manufactured in Grade 14 cast iron, rated to at least 1600kPa working pressure. Unless otherwise specified fittings and specials shall be bitumen dipped.

PSL 3.7.2 Polyethylene Pipes

REPLACE THE SUBCLASE WITH THE FOLLOWING

"HDPE pipes of diameter up to and including 63 mm shall conform with SANS 4427 Part 2 for Type IV pipes. HDPE pipes greater than 63 mm shall conform with SANS 4427 Part 3 for Type V pipes. Unless otherwise specified, pipes shall be Class 16 and plain ended for butt welding".

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.7.3 uPVC Pipes

Class 16 uPVC high impact pipes shall conform to SANS 1283 (alternatively ISO 4422) shall be used unless otherwise indicated. Jointing shall be effected by means of approved "press-on" shouldered ends and cast iron and steel victaulic clamps. Unless otherwise specified, pipes shall be Class 16.

Where the cutting of any pipe is necessary, shouldered ends shall be fixed to the pipe by means of an approved machine capable of clamping the pipe without causing any damage to the pipe and pressing on the shouldered end by means of a hydraulic operated jack applying a uniform axial force to locate the shouldered end truly in position. The use of impact force to either the pipe or shouldered end will not be permitted. No on-site fixing of shouldered ends shall be permitted. "

ADD THE FOLLOWING NEW SUBCLAUSES:

PSL 3.7.4 mPVC Pipes

High impact mPVC Class 16 and shall conform to SANS 1283 for diameter up to and including 315mm with a fully end load restraint coupling system approved by Johannesburg Water.

PSL 3.7.5 Concrete Pipes

Concrete pipes will be Class 100D with spigot and socket joints to SANS 677.

PSL 3.8 JOINTING MATERIAL

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.2 Flexible couplings

OMIT THE EXISTING CLAUSE AND INSERT THE FOLLOWING:

"All flexible couplings shall be "Viking Johnson" couplings without centre register, or approved similar.

Rubber rings shall be of the wedge-type and shall be manufactured from natural or synthetic rubber only. Reclaimed rubber shall not be used in the manufacture of the rubber rings."

PSL 3.8.3 Flanges and accessories

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"The dimensions and drilling of standard flanges shall comply with the requirements of SANS 1123 and SANS 1476 for a working pressure as specified. Flanges shall be machined flat, i.e. without a raised joint face. Puddle flanges shall have the same dimensions as standard flanges but shall be undrilled. Flanges to be drilled according to the relevant tables as specified.

Faces of flanges which will be in contact with jointing gaskets shall receive a protective coating of such thickness and consistence as will not impair the air/gas/water tightness of the joint."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.8 <u>Victaulic joints</u>

Joints for uPVC and medium steel pipelines shall conform to SANS 815: Standard specifications for shouldered end pipes, fittings and couplings.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.8.9 <u>HDPE Pipe joints</u>

Joints for HDPE pipe shall be by means of welding, welded flanges or approved external compression type fittings (Plasson or similar approved)."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.9 CORROSION PROTECTION

PSL 3.9.2 Steel pipe

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"All coating and linings shall be completed strictly to the publication "Corrosion Protection for Civil, Mechanical and Electrical Engineer" 2000 Edition.

Manufacture and deliver 600 mm ND Grade X42 spigot and socket steel pipe, 8mm wall thickness, 12 mm Cement Mortar Lining placed through pigging. Pipes and fittings shall be externally coated with fusion bonded medium density polyethylene or solvent-free epoxy or other as specified by the Employer. Application of the coating system shall be as directed by the manufacturer.

Test certificates of the lining thickness must be furnished to the Employer's Agent for his approval."

All pipe fittings shall bear a permanent mark for identification.

PSL 3.9.2.3 Repairs to epoxy coatings

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

PSL 3.9.2.3.1 General

(a) Where the damage is extensive the remedial procedures shall be agreed in writing with the Employer's Agent.

(b) All repairs shall comply with the requirements of the repair-product manufacturer's data sheet. The Employer's Agent may at his discretion request that repaired coating areas undergo adhesion tests.

(c) The Contractor shall repair any damage occurring during transport, on site during handling, assembly, storage, and erection.

(d) The repaired area shall be tested in accordance with Sub-Clauses 8.4 and 8.12 of SANS 1217 for compliance with the relevant requirements for thickness and electrical insulation defects respectively.

(e) Any item showing electrical insulation defects exceeding an average of five per square metre (a cluster of pinholes within a radius of 25 mm being regarded as a single defective area), or flaking or other signs of loss of adhesion, shall not be repaired. The item shall be blast cleaned and re-coated in accordance with the relevant requirements of the Clause PSL 3.9.2.3.3.

PSL 3.9.2.3.2 Repair Methods for Minor Defects

The repair of areas showing electrical insulation defects or low film thickness shall, if approved by the Employer's Agent, be carried out as follows:

(a) Degrease in accordance with Clause PSL 3.9.2.3.4.

(b) Thoroughly abrade the damaged area, including an adjacent surrounding area of at least 25 mm wide, with a medium grade 220 abrasive paper;

(c) Vacuum-clean the surface to remove dust and debris in accordance with SANS 5769.

(d) Wipe the abraded paint surface with methyl ethyl ketone and allow to dry, and

(e) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.

(i) Solvent free epoxy; or
(ii) Fusion-bonded epoxy powder repair kit.

NOTE: Apply a final topcoat over the repaired area to achieve a pleasing, uniform finish of the item.

PSL 3.9.2.3.3 Repair Methods for Major Defects

The total un-coated areas for renovation by the applicator shall not exceed 0.5% of the total surface area of a component. Each un-coated area for renovation shall not exceed 2 500 mm². If damaged areas are larger, the items containing such areas shall be re-coated.

The repair of areas showing damage down to the steel surface shall, if approved by the Employer's Agent, be carried out as follows:

(a) Degrease in accordance with Clause PSL 3.9.2.3.4

(b) Blast-clean all damaged areas to Sa 3 (ISO 8501-1).

(c) Feather the surrounding paint for a distance of 25 mm beyond the damaged areas with a medium grade 220 abrasive paper.

(d) Vacuum-clean the surface to remove dust and debris in accordance with SANS 5769.

(e) Wipe only the abraded paint surface with methyl ethyl ketone and allow drying.

(f) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.
(i) Solvent free epoxy or
(ii) Fusion-bonded epoxy powder repair kit.

NOTE: Apply a final topcoat over the repaired area to achieve a pleasing, uniform finish of the item.

PSL 3.9.2.3.4 Degreasing

(a) All surfaces to be coated shall be tested for oil and grease contamination by the water break free test.

(b) Oil and grease contamination shall be removed by:
- Steam-cleaning;
- An emulsifiable or aqueous detergent applied in accordance with SANS 1344; and
- An alkaline cleaning solution.

(b) Allow to react, and then rinse off with clean, potable water to remove all residues prior to surface preparation, all in accordance with Clauses 3.3 and 3.4 of SANS 10064.

(c) The surfaces shall be tested after degreasing and show no oil, grease and chemical contamination after degreasing.

(d) Care shall be taken to avoid entrapment of cleaning agents in recesses or other retention areas.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 3.9.2.4 REPAIR OF DAMAGED SINTAKOTE

PSL 3.9.2.4.1 General

Damaged Sintakote or similar approved shall be repaired in accordance with the procedures detailed in the Tyco Handling and Installation Manual for steel pipeline systems for the repair of Sintakote or in accordance with clause 3.2 or clause 3.3 or in a similar approved manner.

PSL 3.9.2.4.2 REPAIR OF SMALL PINHOLE TYPE DEFECTS

PSL 3.9.2.4.2.1 Surface Preparation

- Clean and dry the area to be repaired including the removal of dirt, dust and other contaminants. Slightly roughen the area around the repair for a minimum distance of 50 millimetres using a coarse file or abrasive paper.
- Wipe the surface with a clean dry rag.

PSL 3.9.2.4.2.2 Priming

- Stir the primer to ensure complete mixing prior to application. Apply a thin even coat of Densopol Primer D (or similar approved) around the area of repair using a paint brush or roller
- Allow the primer to tack dry(approximately 10 to 20 minutes)

PSL 3.9.2.4.2.3 Tape Wrapping

- Apply Deponsole 60 tape (or similar approved) to the repair area ensuring a minimum of 50 mm overlap onto sound coating around the defect area.
- Apply Denso MP/HD P.V.C self adhesive over wrap tape or Stopaq Wrappingband CZH (or similar approved) around the full pipe circumference to completely cover the repaired patch.

PSL 3.9.2.4.3 REPAIR OF LARGE AREA OF DAMAGE WHERE STEEL IS EXPOSED

PSL 3.9.2.4.3.1 Surface preparation

Cut out the area of Sinkakote or similar approved and clean the steel surface in accordance with AS1627.2.Clean and dry the area to be repaired .Slightly roughen the area around the repaired using a course file or abrasive paper. Wipe the surface clean with a dry clean rag.

PSL 3.9.2.4.3.2 Priming

- Stir the primer to ensure complete mixing prior to application. Apply a thin, even coat of Densopol Primer D or similar approved onto the steel surface and around the periphery of the Sintakote or similar approved.
- Allow the primer to track dry(Approximately 10 to 20 minutes)

PSL 3.9.2.4.3.3 Filling/Priming

- Cut out a piece of Bitumen Mastic Strip to fit into the bare steel area prior to applying the primer.
- Insert the cut out piece of Bitumen Mastic Strip into the repair area.
- Re-apply a thin even coat of Densopol Primer D or similar approved rover the patch and adjacent area of Sintakote or similar approved.
- Allow the primer to track dry(Approximately 10 to 20 minutes)

PSL 3.9.2.4.3.4 Tape Wrapping

- Apply Densopol 60 tape (or similar approved) to the repair area ensuring a 50mm overlap over the fitted patch.
- Apply Denso MP/HD P.V.C self adhesive over wrap tape or Stopaq Wrappingband CZH (or similar approved) around the full pipe circumference to completely cover the repaired patch.

PSL 3.9.2.4.4 SURFACE PREPARATION

All joints shall be fully welded and sealed and all sharp edges and corners ground off to a radius of not less than 1.5 mm. All weld spatter and irregularities shall be removed. Any unsound or damaged edges of sintakote (or similar approved) shall be cut back into the sound coating and the edges chamfered.

The surface shall be cleaned by means of power tools to achieve a minimum surface preparation in accordance with AS1627.2 TO CLASS St. 2. All dust, dirt, moisture and grease shall be removed. Slightly roughen the sintakote (or similar approved) 100 millimeters both sides of the joint, using a coarse file or abrasive paper. Wipe the surface clean with a dry rag.

PSL 3.9.2.4.5 PRIMING

- Stir the primer to ensure complete mixing prior to application, Apply a thin even coat of Densopol Primer D (or similar approved) to the steel and roughened sintakote (or similar approved) surfaces using a paintbrush or roller.
- Allow the primer to touch dry (approximately 10 to 20 minutes)

PSL 3.9.2.4.6 MASTIC FILLING

To improve the contours for wrapping the tape, fillet welds, sharp edges of sintakote (or similar approved), test plugs or welding lid holes shall be filled and profiled with Bitumen Mastic Strip. The mastic filling shall be molded such that the Densopol 60

tape (or similar approved) can be applied with no sharp edges protruding or air entrapment.

PSL 3.9.2.4.7 TAPE WRAPPING

Commencing at least 100 milliliters back onto the primed sintakote (or similar approved) one complete turn of 150 milliliter wide Densopol 60 tapes (or similar approved) shall be applied. Release film shall be removed before application. While holding the tape under tension, the pipe shall be spirally wrapped using a 55 percent overlap and finished 100 mm onto the primed sintakote (or similar approved) with one complete circumferential wrap around the pipe. The tape shall be cut off in the downward direction of wrapping. New roles of tape shall have the ends overlapped at least 75 mm.

During wrapping the tape shall be smoothed out by hand to exclude any air bubbles or wrinkles and to seal overlaps.

Care shall be taken to prevent any folds or misplacement of the tape, especially under the pipe, and to prevent the tape becoming contaminated during wrapping.

The butt-welds in segmental (lobster bends) are to have the tape applied partial layer by partial layer with a 55 percent overlap until a full spiral wrap can be made (refer sketch in appendix A) continue wrapping onto the primed sintakote (or similar approved) for at least 100mm with one complete circumferential wrap around the pipe.

Straight steel pipes shall also be wrapped with Densopol 60 (or similar approved) with a 55 percent overlap in accordance with the above clauses.

PSL 3.9.2.4.8 STEEL FITTINGS AND FLANGES

PSL 3.9.2.4.8.1 GENERAL

Procedures for the protection of steel fittings applies to both main pipeline fittings and branch pipe work. Fittings manufactured and coated by Tyco shall be factory coated with Sintakote (or similar approved). Difficult fittings such as valves may be protected using a more conformable petrolatum system in accordance with TS29 only with the approval of an SA Water representative.

PSL 3.9.2.4.8.2 SURFACE PREPARATION

Still surfaces shall be prepared in accordance with clause 4.1.

PSL 3.9.2.4.8.3 TAPE WRAPPING

Prepare and wrap all straight sections leading up to the fitting and flange in accordance with section 4.

PSL 3.9.2.4.8.4 PRIMING

- Stir the primer to ensure complete mixing prior to application. Apply a thin even coat of Densopol Primer D (or similar approved) to the prepared steel surfaces

and a minimum of 50mm onto the Densopol 60 (or similar approved) wrapped areas using a paint brush.
- Allow the primer to touch dry (approximately 10 to 20 minutes).

PSL 3.9.2.4.8.5 MASTIC WRAPPING

Unavoidable sharp edges such as bolts, nuts and collars shall have mastic strip molded over the positions or edges. Strip with a 55 percent overlap onto itself and minimum 50mm overlap onto the Densopol 60 or Sintatoke (or similar approved) coated pipe work. Press the Bitumen Mastic Strip firmly into place ensuring no air voids are beneath the Bitumen Mastic Strip.
Note: The Bitumen Mastic Strip provides corrosion protection to the steel work and is similar in composition to Densopol 60 (or similar approved), but it does not have a woven carrier.

PSL 3.9.2.8.6 OVER WRAPPING

150 or 100mm wide Denso MP/HD tape (self adhesive PVC) (or similar approved) shall be spirally wrapped over the Bitumen Mastic Strip with a 55percent overlap. While wrapping, the Denso MP/HD tape or Stopaq Wrapping band CZH (or similar approved) shall be pulled firmly and the lapse properly sealed.

PSL 3.9.2.8.7 TESTING

All repairs and wrapping shall be tested using a high voltage “spark” tester in accordance with AS3894.1 at an operating voltage of 15 KV.

PSL 3.9.3 Protection against electrolytic corrosion

OMIT THE EXISTING CLAUSE AND INSERT THE FOLLOWING:

“All joints and fittings shall be fully wrapped with approved protective tapes. Protective tape shall comply with either Specification A or Specification B as ordered by the Employer’s Agent.

Specification A

This tape shall be made up of pre-bonded components to form a composite single wrap tape. The adhesive inner protective tape must provide complete protection to steel piping against electrolytic corrosion. It shall be impermeable to water, chemically inert and physically stable and must provide a perfect seal at the overlap on a spiral-winding pattern.

The adhesive outer protective tapes shall be tough and impact resistant, providing suitable protection of the inner protective tape against mechanical damage. It shall be stable and not crack or deteriorate when buried. The tapes shall be chemically resistant to all common acids and alkalis normally encountered in the soils at the construction site.

The tapes shall be suitable for both machine and hand application.

The Combination electrical characteristics of the inner and outer wrap together must exceed:

Dielectric strength = 25kV/mm
Insulation = 10 0hm metre
The following minimum criteria shall be satisfied:

	Inner Tape	Outer Wrap
Thickness (mm)	0,3	0,3
Tensile strength (kg/cm width)	3,3	5,0
Elongation at break (%)	200%	50%
Adhesion to primed steel (gm/cm width)	220	220

Specification B

This tape shall be made up of a non-woven synthetic fibre carrier impregnated and coated on both sides with a compound incorporating high melting point bitumen (Densotherm or similar approval). During application the tape shall be correctly heated and laps adequately sealed all in accordance with the instructions and recommendations of the supplier.

Before the application of any protective material, the surface of the pipe shall be thoroughly cleaned and all loose or damaged pipe coating removed. All ridges, depressions and steps in the surface shall be filled with an approved filler so as to present a smooth uniform surface. After the filler has hardened, the entire surface to be wrapped shall be primed with a primer or otherwise treated as recommended by the supplier of the tape.

The protective tape shall be applied as a spiral wrap with not less than 50% overlap. The width of the tape shall be appropriate for the section to be wrapped."

PSL 3.9.5 Joints, nuts, bolts and washers

DELETE AND REPLACE WITH THE FOLLOWING:

"All bolts and nuts shall comply with the requirements of the relevant sections of SANS 1700 and shall be of Grade 4.6 steel. Washers shall be provided at each nut and shall be of the same material (or coating where applicable to match the bolt and nut. Nuts and bolts subject to vibration shall be machined finished fitted with plain washers and treated with "Loctite" or equivalent.

Bolts other than jacking bolts shall project not less than 3mm and not more than 10mm from the heads of the nuts after tightening.

All bolts to be built into concrete work as well as bolts to be installed above ground level (outside buildings), directly above and under water shall all be of stainless steel grade 304. Bolts for flexible couplings and flanges for underground installation shall be hot dip galvanized. Bolts to be installed inside buildings shall be hot dip

galvanized. Galvanizing shall be in accordance with the Standard Corrosion Protection Specification (Heavy coating).

Suitable plastic sleeves and/or washers shall be used for protection against corrosion by bi-metallic action".

PSL 3.9.6 Corrosive soil

ADD THE FOLLOWING TO THE EXISTING CLAUSE:

"Steel pipes, pipe fittings and steel flanges in contact with soil shall over and above the protection as described above be protected as specified in Clause 3.9.3 with "DENSO" tape and/or mastic or approved similar. Application shall be strictly in accordance with the manufacturer's instructions. A polyethylene tape of 300 microns minimum shall be spirally wrapped over the petrolatum tape and fixed to the clean pipe ends with pressure sensitive tape."

PSL4 PLANT

PSL 4.4 PACKING

ADD THE FOLLOWING NEW SUBCLAUSE:

Goods should be suitably packed in such a manner as will ensure safe and efficient transport by road or rail, and the Contractor shall include in his prices for whatever packing may be necessary in this respect. Small items particularly liable to damage or loss in transit should be crated. All crates and packing material shall, after use, become the property of the Employer unless distinctly specified otherwise, or if returnable, shall be so at the Contractor's expense. Pipes shall be supported during transport in such a manner as to prevent damage to the lining and coating.

PSL 5 <u>CONSTRUCTION</u>

PSL 5.1 LAYING

PSL 5.1.1 General

(a) Delivery of Pipes

Pipes shall be off-loaded alongside and as close as possible to the trench excavated for the pipes. The Contractor shall be responsible for the supply and delivery of pipes and shall make all the arrangements necessary for the transportation of the pipes from the factory workshop to the site, as well as for the provision of special tractors and haulers to deliver the pipes at steeply sloping sections of the pipe route. The expenses for the above operations shall be included in the rates tendered for pipes.

The Contractor shall deliver pipes at the appropriate position on Site when and as requested by the Employer's Agent. The Employer's Agent reserves the right to order that the pipes be delivered and stacked at either the top or the bottom of a steep slope or to request that the pipes be stored at the manufacturer's workshops until needed on the Site.

(b) Off-loading of pipes

The pipes shall be protected against damage at all times and shall only be lifted with wide sling straps or flat-faced hooks. The use of chains, cables etc. shall not be permitted.
Pipes shall be supported by means of heaped loose sand or sand bags where they are stored or unloaded alongside the trench.

(c) Repair of damage and protection during transportation
The Contractor shall undertake all repairs to damaged pipes and/or pipe coatings at his own expense.

The pipes shall be protected against damage at all times during transportation. Appropriately shaped wood-blocks, at least 150 mm wide and sufficiently upholstered, shall be provided on transport vehicles as support for the pipes. The use of chains, cables etc. to secure or lift pipes shall not be permitted. If the Contractor is of the opinion that the ends of the pipes should be protected, suggestions to this effect are to be submitted with the Tender. Expenses with regard to such protection shall be considered to be included in the tendered rates for pipes.

(d) Pipe-laying Personnel
The laying of pipes and ancillary fittings shall be performed only by a qualified person who is registered by the local authority as an artisan in the plumbing, pipe fitting, or drain laying trades or who is qualified by reason of having attended and passed a course on pipe laying. Proof of competence will be required prior to commencement of the works.

(e) Pipe-laying
All equipment is to be approved by the Employer's Agent. Equipment shall be of such design that it will not damage or disturb pipes, pipe coatings and/or existing pipelines.
Before a pipe is laid it shall be visually examined for damage. No pipe shall be laid without the permission of the Employer's Agent.

Any manufacturing defects shall be reported to the Employer's Agent without delay and the Contractor shall simultaneously make arrangements for its repair.

Any damage done to the coating during transportation, unloading or storing of pipes, shall be repaired by the Contractor.

Before any pipe is placed, the bottom of the trench shall be examined to ensure that the coating of the pipe will not be damaged in any way possible when the pipe is placed in position and that the pipe supported evenly and uniformly throughout its entire length.

Any damage arising during or after laying of pipes shall be repaired by the Contractor and the Employer's Agent may request that the pipe be removed from the trench to this purpose.

Before pipes are placed, the bedding of the trench shall be examined with regard to compaction, alignment and grade, for each pipe length between the survey pegs and manholes. Permission to lay pipes shall be obtained from the Employer's Agent. The pipes shall subsequently be placed in position and joints made as specified in this Section.

Accessories shall be installed where indicated or where instructed by the Employer's Agent.

(f) Cleaning of pipeline

As the pipes are laid, they shall be cleaned on the inside by brushing and removal of all loose material.

(g) Jointing of pipes
After the pipes have been placed in position, they shall be accurately aligned to ensure that the gaps between the different pipe lengths are uniform.

(i) Change of direction (bends, specials)
Each change of direction shall be made by, either cutting a single segment from the pipe, using a special, or deflecting a flexible coupling according to the manufacturer's instructions and as approved by the Employer's Agent. All work involved in the manufacture of a special shall be done in the manufacturer's workshop and delivered complete at the Site, alongside the pipe route.

The manufacture, testing and coating of specials and repair of damaged parts shall be carried out in compliance with specifications.

(k) Casing of pipes
Where pipes must pass through or be encased in concrete, they shall be placed and secured in the precise positions indicated on the Drawings and the shuttering shall be placed around the pipe and secured. The concrete shall subsequently be thoroughly compacted around the pipes to form a watertight joint.

The Contractor shall be responsible for grouting, compacting and waterproofing around all pipes and accessories passing through the walls and/or floors of structures, whether the Contractor himself or another contractor supplies and installs the pipes and accessories.

PSL 5.1.4 Depth and Cover

PSL 5.1.4.2 Cover

ADD THE FOLLOWING TO THIS SUBCLAUSE:

"The minimum cover to finished surface over water mains shall be at least 1000 mm in trafficked areas and at least 800 mm elsewhere. At valves the depth of the pipeline shall be increased if necessary to ensure a minimum cover of 100mm over the valve cap. The cover shall be maintained as close as possible to the minimum without local sags or humps and shall not be increased above the minimum by more than 200mm without the approval of the Employer's Agent."

PSL 5.1.4.3 Crossing Existing Services

IN ADDITION TO THE EXISTING CLAUSE THE FOLLOWING SHALL APPLY:

a) Except as allowed in b) below, water mains shall be so laid in road verges, that the minimum cover from the finished surface level to the top of the pipe barrel is 1000mm. Under carriageways, water mains shall be laid so that the minimum cover is 800 mm.
b) The Contractor may increase the cover by a maximum of 200mm. However, except as allowed in a) above, no decrease in cover will be permitted.
c) Where water mains cross existing piped services, the minimum clear distance between the outsides of the pipe barrels shall be 150mm.

PSL 5.2 JOINTING METHODS

PSL 5.2.2 Flanges (Steel Pipelines)

ADD THE FOLLOWING TO THIS SUBCLAUSE:

Before being brought together, the ends of the pipes, fittings, couplings and all flanges are to be inspected and cleaned and ensure that all parts forming the joint are undamaged and clean.

In jointing flanges for valves etc, the faces of the flange shall be cleaned thoroughly and the jointing material, cut properly to size, is to be inserted immediately before bringing the two flanges together. Before closing the joints, the flanges must be parallel to each other, with at least two-thirds of all bolts inserted in the bolts holes and evenly distributed over the circumference of the flange. After the fittings have thus been aligned and well supported, the joint shall then be closed by bolting up all bolts to uniform tightness. On completion of the joint, the flanges and bolts shall be painted with one coat of bituminous paint which shall be supplied by the Contractor. An approved rubber based adhesive shall be used for holding rubber insertions in position while flanges are being brought together.

PSL 5.2.3 Welding

ADD THE FOLLOWING TO THIS SUBCLAUSE:

The Employer's Agent shall have the right to carry out Qualification Tests for each welder employed on the works. No welder shall be employed who fails to pass such test.

Site-welded joints are to be tested by radiographic examination or other approved method as ordered by the Employer's Agent who will also make the necessary arrangements for such tests to be carried out. Holiday detection tests shall be carried out in the field to ensure continuity to lining and wrapping.
After jointing and testing, the protective lining and wrappings are to be rendered continuous with the same materials as applied to the body of the pipe.

In the event of any welded joint proving in any way unsatisfactory when the pipeline is subjected to the radiographic or hydraulic tests, the Contractor shall be held entirely responsible for all costs involved in repairing the joint or cutting it out and welding in a new section of pipe, as may be ordered by the Employer's Agent, and thereafter restoring the lining and wrapping, if these have become damaged, all to the satisfaction of the Employer's Agent.

The tendered prices for supply, delivery, laying, jointing and testing of pipes are to be including for all the work described above and for the supply of all necessary materials, welding electrodes, welding plant, etc.

a) General

Internal field welding of pipes which have been lined will be permitted only for pipes of DN800 and larger where a man is able to enter the pipe to make good the lining after welding and testing, in accordance with Clause 7.2 of SANS 1200L, has been completed. Pipes of lesser diameter may be field welded externally where concrete linings at the joints will be made after the pipeline has been laid through pigging and once all welds have been tested and approved.

At the discretion of the Employer's Agent, roll welding will be permitted, provided pipe alignment is maintained by use of skids or of structural framework to accommodate two or more lengths of pipe with an adequate number of roller dollies to prevent sag in the pipe. The entire root bead, however, shall be made with the pipe in a stationary position.

All pipes welded in the trench shall be properly laid and aligned before welding commences. Bell holes shall be excavated at all field welds. The Contractor shall not lift the pipe to provide adequate access for the welders to enable them to stovepipe weld the joint.

The alignment of abutting ends shall be such that the offset will not exceed 1.7 mm. Line up clamps shall be used for joint "fit-ups". The use of "bridges and wedges" or any method that may induce unnecessary stresses is forbidden.

Both ends of coated and lined pipes shall be wrapped for a distance of at least 800 mm on either side of the weld by means of an asbestos mat or other approved material to ensure that weld spatter or other damage is not caused to the coating and lining during the welding process. The pipe trench shall be kept free of all dirt and water in the vicinity of the weld until after all corrosion protection measures have been completed and approved. "

b) Welding procedure and qualification of welders

Welding shall be done by only qualified welders who satisfy the requirements of API 1104, Clause 3.0. Before any welding of pipeline materials commences, the qualification of welders shall have been approved, all detailed welding procedure specifications with weld diagrams required for their completion shall have been submitted for approval in a neat form and the welding procedure qualification tests shall have been successfully concluded all in accordance with the relevant standard specifications. Each welder shall mark the pipe adjacent to the weld with the figure assigned to him.

Sufficient records shall be kept by the Contractor to ensure that all field welds can be subsequently identified with the welder concerned.

As far as practicable all out of trench welding shall preferably be done by an automatic submerged process and the Contractor shall provide all necessary plant to carry out this process. MSEAP welding may be used where in-trench welding is done.

Heat treatment for welding shall be in accordance with API 1104 if required by same and the Contractor shall provide an approved shield to protect the pipe joint from wind and weather during heat treatment and welding.

c) Line up

Pipes shall be lined up in such a manner as to prevent damage thereto. If the pipe to be used has a longitudinal seam, these seams shall be staggered by not less than twenty degrees and welded sections, or single lengths, shall be assembled in such a manner that this seam shall remain in the top quadrant of the pipe during coating operations and after lowering into the trench.

d) **Cleaning of pipe ends** Before welding, all foreign matter shall be removed from the beveled ends. If any of the ends of the pipe joints are damaged to the extent that satisfactory welding contact cannot be obtained, the damaged pipe ends shall be cut and beveled with an approved beveling machine. These field bevels of pipe ends shall be made to the satisfaction of the Employer's Agent. Should laminations, split ends, or other defects in the pipe be discovered, the joints of pipes containing such defects shall be cropped, repaired, or removed from the line as designated by the Employer's Agent.

e) Inclement Weather

No welding shall be carried out during rain or high wind unless the welder and joint are adequately protected and sheltered, to ensure that the welding is not impaired.

f) Protection of coatings and linings

Before welding commences, a suitable apron at least 800 mm wide shall be wrapped around both sides of the area to be welded to ensure that weld spatter does not damage the coating and lining.

g) Butt-welding

Pipes and specials to be joined by field welding shall be supplied with ends beveled for welding. All welding of joints shall comply with API 1104 and only approved type welding rods shall be used. If backing rings are permitted, they shall be placed in position and wedged up or adjusted so that the pipe ends are completely circular and properly mated. The space between abutting pipe ends, when aligned for welding, shall be such as to ensure complete penetration without burn-through. For pipes having the same dimensions, the spacing shall be approximately 1.5 mm. The alignment of the abutting pipe ends shall be such as to minimize the offset between pipe surfaces. For pipes of the same nominal wall thickness, the offset shall not exceed 1.5 mm. Internal line-up clamps shall be used wherever practicable and may be removed after the root bead is 50% completed, provided that the completed part of the root bead is in segments of approximately equal lengths, spaced about the circumference of the pipe. If conditions make it difficult to prevent movement of the pipe, or if the weld will be unduly stressed, the root bead shall be completed before releasing clamp tension.

External line-up clamps shall be used where it is impracticable to use internal line-up clamps. Partial root beads made when using external clamps shall be uniformly spaced about the circumference of the pipe, and shall have an accumulative length of not less than 50% of the pipe circumference before the clamps are removed.

Tack welding shall be carried out to maintain the root gap and position of the pipe

ends during the welding proper. The number of tack-welds shall be kept to a minimum but shall not be less than four around the circumference of the pipe.

After proper preparation and tack welding, the root bead shall be carried out followed by successive filler passes, and capper pass in accordance with the approved welding procedure.

The filler and finish beads shall be deposited by an acceptable method and each filler bead shall be approximately 3 mm in thickness. Completed welds shall have a reinforcing of not less than 0.8 mm and not more than 1.5 mm above the pipe surface around the entire perimeter of the weld, and the width of the finish or cover shall be not more than 3 mm greater than the original groove. The number of beads required shall be governed by the wall thickness of the pipe, so that the completed weld will have the reinforcement previously specified; provided, however, that each weld shall consist of at least three beads. No two beads shall be started at the same point. No mitre welds will be permitted, and all welds are to be at ninety degrees (± 5°) to the axis of the pipe. All slag and scale shall be removed from each bead for visual inspection immediately after each bead is run.

In all field butt-welds where it is possible to work inside the pipe, the inside weld shall be done first.

The chemical composition of weld metal and parent metal shall be similar and the inner weld metal or reinforcement shall not extend more than 1 mm above the inside metal surface of a pipe or special, and any excess shall be removed by grinding.

Defects caused by stray welding arc flashes shall be removed by grinding, provided that the pipe wall thickness is not reduced to less than the specified minimum thickness, otherwise the portion shall be cut out and repaired.

h) Fillet welding

Welding shall be as for fillet-welding as applicable externally. The jointing internally will be Cement Mortar Lining placed through pigging. External joint coating will be by use of a fusion bonded medium density polyethylene or similar approved.

i) Repair of welds

Rectification of defective welds shall be in accordance with API 1104 and to the satisfaction of the Employer's Agent. All costs related to the repair of defective welds shall be borne by the Contractor. Defective welds shall be repaired immediately they are found to be so. The Employer's Agent has the right to stop the Contractor proceeding with further pipe laying in the event of the Contractor delaying the rectification of defective welds. Furthermore, no consideration will be given to any claims arising from delays in construction resulting from such action.

All welded joints which have been repaired shall be 100% radiographed or otherwise tested to the Employer's Agent's satisfaction at the Contractor's own expense.

PSL 5.2.5 Flexible Coupling Joints

ADD THE FOLLOWING NEW SUBCLAUSE:

Where ordered, steel flexible couplings are to be of the Viking Johnson or similar approved type, each comprising one centre collar, two special flanges, two rubbers rings and mild steel bolts.

Adaptor joints shall be of a similar design, but one end shall be flanged to enable connection of plain ended pipes to flanged specials.

The flanges are first put on, over the end of each pipe, and the rubber rings are then placed in position by stretching them over the pipes or by using special tapered plugs inserted into the ends of the pipes. The rubber rings must be free from twist and so placed that the distance from the ring to the end of the pipe is 3mm less than half the length of the centre collar. The latter shall then be placed over the end of one of the pipes and the two pipe ends brought together up to about 6mm apart. The bolts shall then be inserted into the flanges and carefully tightened up evenly on each nut in turn to ensure a watertight joint, care being taken that the gap between pipes is not thereby reduced. In the event of the central joint collar having an internal central ring or register, the pipes shall be brought together until both pipe ends are in contact with the register, after which one pipe shall then be drawn back by 6mm.

On completion of testing and bonding, the entire joint shall be protected by covering with moulded bituminous mastic. Special moulds shall be well primed internally with thick whitewash to prevent adhesion of the mastic to the mould and shall then be clamped over the pipe and around the coupling. The bituminous mastic, suitable heated, shall then be poured into the mould so as to encase the coupling entirely. The mould shall then be stripped and cleaned for use elsewhere on the main. The tendered prices for laying and jointing are to include for the supply of bituminous mastic and the use of the necessary moulds. Alternatively "Denso Tape" protection or equal approved may be offered and full details and specification must accompany the tender.

PSL 5.2.6 Cut Pipes

ADD THE FOLLOWING NEW SUBCLAUSE:

Cut pipes may be used where permitted by the Employer's Agent when required as closure lengths. The ends which have been cut shall be dressed square and to a smooth even finish suitable for jointing by welding or couplings which shall not be inferior to that of the uncut pipe. The finished dimensions of ends cut at site must be within the tolerances applicable to the ends of the particular type of pipes to be laid under this Contract. The cost of cutting and trimming pipes shall be included in the rates for laying and jointing of the pipes. The Contractor's priced rates for laying and jointing of pipes shall be held to include for all cutting of pipes, closures, etc.

PSL 5.8 BRICKWORK IN CHAMBERS AND MANHOLES

ADD THE FOLLOWING TO THIS SUBCLAUSE:

"The joints of exposed faces shall be flush-trowelled, hard and smooth and shall be rubbed for the full width of the joint as the work proceeds to give a hard polished finish."

ADD THE FOLLOWING NEW SUBCLAUSE

PSL 5.11 WORK ON EXISTING MAINS

Where connections are to be made to existing mains, the Contractor shall excavate back along the existing main only as far as is necessary to complete the connection satisfactorily and shall ensure that the existing mains are disturbed as little as possible. Backfilling shall be carefully placed and properly compacted beneath existing and new work to ensure that the mains, specials, etc. are properly bedded.

Work on existing mains and components of the reticulation system shall be carefully planned in consultation with the Employer's Agent. The work shall be carried out expeditiously to ensure that the disruption of services and inconvenience to the local residents is kept to a minimum. All tie-ins shall be completed within a maximum of 10 hours.

The Contractor under strict supervision by the Employer's Agent or The Employer will do all these connections.

Hand excavation must be used to expose the existing mains and erf connections where required. While every effort has been made to ensure that the information relating to these connections is correct the Employer's Agent or The Employer takes no responsibility for the accuracy, or for the completeness of the information."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 5.12 CONNECTION TO THE EXISTING MAINS

The Contractor shall supply all necessary fittings / materials for under pressure connections suitable for all pipe sizes.

The Contractor shall confirm all measurement on site prior to ordering any pipe fittings."

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 5.13 PIPELINE RENEWAL WORK

All material recovered as a result of the repairs or replacement of the components shall be returned to the Contractors store where they shall be cleaned, sorted and listed. A list of the recovered material shall be handed to the Employer's Agent on a monthly basis. All recovered material shall be delivered to the Zandfontein Water Depot on a regular basis or at the end of the Contract.

ADD THE FOLLOWING NEW CLAUSE:

PSL 5.14 STERILISING OF WATER MAINS

All new water mains shall be sterilised at 10mg/l free chlorine for 12 hours and will then be thoroughly flushed.

PSL 7 TESTING

PSL 7.2 INITIAL TESTS ON WELDED STEEL PIPES

PSL 7.2.2 Radiographic Examination

Fifteen percent of all field welded joints, as ordered by the Employer's Agent, shall be examined radiographically as scheduled. All other welds (inside and outside) shall be subjected to a dye penetrant test as per Clause 7.2.1 of SANS 1200L and the costs associated with this work shall be included in the rates for the pipeline or elsewhere as no separate item has been scheduled for this activity.

ADD THE FOLLOWING SUBCLAUSE TO 7.2

PSL 7.2.3 Hydrostatic Test

(a) All pipes and fittings shall be subject to an approved hydrostatic test and to a test pressure determined as follows:

$$P = \frac{2000\ t\ f}{D}$$

Where

P = test pressure in kPa
F = 85 percent of the guaranteed minimum yield strength in MPa for steel plate
D = outside diameter of the pipe in mm
T = wall thickness in mm.

(b) Hydrostatic testing shall not be carried out until all aspects of fabrication have been completed.

(c) The pressure shall be applied steadily by approved means and maintained without variation sufficiently long for proof and inspection.

(d) Should water sweat or ooze from any part or any defects of any nature be discovered the pipe shall be emptied and the defects made good. The pipe shall then be tested again. Should a pipe, after repair, fail to pass the second hydraulic test the Employer's Agent may order its rejection.

(e) The fact that any pipe may have passed the hydraulic test at the works shall not exempt the Contractor from his liability under Clause 7 of the General Conditions of Contract for Construction Works, Third Edition (2015).

(f) If a pipe fails to pass any of the above tests in Clauses PSL 7.2.1, PSL 7.2.2 or PSL 7.2.3, it shall be rejected, but the Employer's Agent may permit repairs or alterations to be made to enable the pipe to pass the test.

(g) The Employer's Agent may require one or more pipes to be tested to destruction. If practicable the Employer's Agent may require the Contractor to repair the pipes and retest them. The cost of repairs will be paid by the Employer as an extra to the Contract."

ADD THE FOLLOWING NEW SUBCLAUSE:

"PSL 7.5 VALVES

a) Gate Valves

All gate valves shall be flanged isolation valves to SABS 664, Class 16, or as specified, anti-clockwise closing. All valves 400 mm and bigger are to be supplied with an approved **open spur gear box assembly** with a gear ratio of 6:1, complete with a valve toby and shall have separate by-passes with an appropriate size complete with valves.

1. For the valves with a diameter larger than or equal to 400mm ND:

   Wedge type gate valves, PN 16 or as specified in the BoQ. Multi-Stage Spur gearing with 6:1 minimum ratio, having operating spindles on the input spindle and at a stage where the valve can be stroked without exceeding the maximum input torque of 275Nm if no differential pressure is applied to the valve. Valves to be supplied with a 100 mm bypass valve.

   1.1 For the valves with a diameter smaller than 400 mm ND:

   Wedge gate valve PN 16.

2. The gears shall be robust and machine cut and their mounting shall be of substantial design.

3. Each pinion gear spindle shall be supported between two bearings or alternatively one bearing of sufficient depth to prevent misalignment of the opinion gear and spindle. The bearings shall be fitted with bronze bushes and shall be provided with grease nipple lubricating points and shall be lubricated prior to delivery. All points to be lubricated shall be fitted with 1/8 inch BSP straight nipples for grease-gun lubrication. Adequate lubrication shall be provided for all gear and indicator bushes.

4. All valves shall open by anti-clockwise rotation of the main spindle and gearboxes shall be fitted with an intermediate idler where necessary.

5. In the case of Type A and Type B gearing a shear pin or other safety device shall be incorporated between the high and low gears to prevent damage to the valve if excessive force is applied. Two spare pins shall be attached to each valve.

   6..Shear pins shall be easily replaced in the field. Hard-driven pins will not be accepted as shear pins.

b) Air Valves

Air valves must be double acting air valves of compact single chamber design with both small and large air release orifices inside the chamber. The valve must also act as a vacuum breaker, with intake capacities of 60 % of discharge rates given.

The unit measurement for valves shall be number of each described assembly

The rate shall include supply installation and testing including for all corrosion protection, bolts, gaskets, and any other contingency work.

c) Water Meters

Flow meters are to be electromagnetic flow meters, to be supplied, delivered, installed and commissioned.

The meter will consist of a primary head, which is to be installed in a water pipeline and a remote wall-mounted signal converter.

The principle of operation is in accordance with Faraday's Law of Induction, whereby field coils in the primary head are energized through a pulsed direct current from the signal converter.

The flow meter shall be of the electromagnetic type, utilising pulsed DC excitation and shall be microprocessor based. It shall be capable of measuring flow rate and flow total in both directions, with two independent totalisers to give flow for network management purposes.

There shall be separate isolated analogue (4 to 20 mA) and pulse outputs (volts free) for forward and reverse flow. These outputs shall be fully user configurable.

The accuracy shall be better than 0,15% of the reading or +/- 1 mm/s whichever is the greater, in both forward and reverse directions. The working flow range shall be 10 mm/s to 15 m/s (i.e. 1500:1).

The repeatability shall be 0,05% of the reading or better. This performance is required for water management and/or billing purposes.

The meter shall offer lifetime stable zero so that routine zeroing is not required. The meter shall automatically indicate zero flow under empty pipe sensor conditions.

The meter performance shall have been verified on a test facility that is internationally acceptable (such as NAMAS, NIST, or equivalent), such that fully traceability is assured. Laboratory traceability packs shall be available on request.

It shall be possible to verify the calibration of the complete flow system (sensor and transmitter) in-situ, without removal of, or access to the sensor. A calibration certificate shall be provided. Condition monitoring of the sensor, transmitter and interconnection cable shall be available to provide verification of long-term satisfaction field system operation. This shall be traceable and shall conform to ISO 9000 series quality standards.

The meter shall be designed and manufactured under the ISO 9000 series quality standards. The meter shall have lay lengths to current ISO standards for magnetic meters to facilitate interchangeableness of products.

The wetted materials shall be compatible with, and suitable for, the appropriate application. An internationally recognized body such as WRC, AWWA, or equal shall certify the liner. Acceptable electrodes are stainless steel, Hastelloy C, Tantalum, or Titanium.

The power supply shall be 85 - 265 v AC, 40 - 400 Hz for mains powered devices, or 24 v for DC powered devices without the need for link setting or voltage selection to allow for dips and surges without disruption.

The impedance shall be 10 to the power 15 ohms or greater so that electrode fouling does not affect signal integrity.

The meter shall be furnished with built-in grounding electrodes of the same material as the sense electrodes.

The flow sensor shall be rated IP68, and be suitable for indefinite submergence to a depth of 10 m.

Multiple diagnostic and self-monitoring functions such as empty pipe detection, low/high flow, reverse flow, flow over-range, etc. shall be standard features. Integral and dual output alarms shall be provided. Serial communication shall be provided as standard. It shall be possible to pre-commission the system using a configurator and verify all display and outputs.

Dual or triple line alphanumeric backlit display shall indicate user defined flow rate and flow total units and all menu selection shall be possible from outside the electronic housing.

Data shall be stored in non-volatile memory with a retention capacity of 10 years.

The meter software shall incorporate dual password features, to prevent inadvertent or fraudulent program or unit changes.

The electronic housing may be integral or remote and may be safety certified to FM, CENELEC, CSA.SAA, or Gost standards for international usage without the need for air purging. It shall be NEMA 4X/IP65 or better with separate electronics and termination areas for enhanced protection. The system shall conform to EMC Directive 89/336/eec to 10 v/m, for electromagnetic radiation susceptibility standards.

The tube must be lined with an approved potable water liner - neoprene or hard rubber, which will stand up to the duty and conditions specified. Vacuum conditions must be considered.

All end connections shall be flanged, drilled to SABS 1123, Table 1 000 / 3 or table 4 000 / 3 as specified.

A set of earth rings and copper connecting wire must be supplied with each primary head.

Electrical protection must be class IP68.

The signal converter must be of the wall-mounted type.

It must be possible to use a signal converter with any other primary head of the same make, with reasonable accuracy.

The maximum cable run between a signal converter and its primary head will be 100 m.

Power supply will be 24 V direct current with battery backup.

Easily accessible, numbered, screwed – clamp terminal blocks must be provided in the terminal boxes.

Prices for additional cable must be quoted in the Bill of Quantities.

The signal cable must have double shielding and consist of 1,5 mm² stranded drain wire, 2 x 0,5 mm² stranded insulated wire leads, first-metal foil shield, insulation, 0,5 mm² stranded drain wire, second-metal foil shield and outer sheath.

Battery powered units must have provision for intermittent energizing of the sensor field winding and a minimum battery life of two (2) years.

Output signals shall be suitable for data loggers.

The meters must be connected to the Johannesburg Water Telemetry system via the instrumentation hut. For this purpose, 130m of power cable must be supplied, as well as 130 m of data cable.

The unit must be free from interference voltages. The Contractor must submit details of the protection that will be provided against stray currents, ground currents and lightning. (SABS 1529- 9)

Analogue and frequency outputs must include the following features:

- Selectable as 0-20 mA or 4-20 mA
- Adjustable to 22 mA maximum
- Current output connections to suit the above
- Current output galvanically isolated
- Flow indication in either direction
- Automatic range change and selectability
- Low flow cut-off on analogue outputs
- Adjustable damping outputs

24 V(5 V selectable) for electronic counter (1 Ohm resistance) on frequency outputs.

24 V output for Electro-mechanical counter with selectable pulse width.

Frequency shall be adjustable, so that 10 to 36 x 106 pulse/hour can be made to coincide with the selected maximum flow range.

Display to be through LCDs and must indicate totalised flow and instantaneous flow rate in selectable unit.

Totalised flow (forward and reverse) and flow rate can either appear simultaneously or flash alternatively.

Selectable status indication must be provided for:

- Errors
- Range change
- Flow direction
- Analogue and frequency output exceeded

A zero check facility must be provided.

Meters are to be installed with comprehensive flange insulation kits.

e) Pressure reducing valves

The pressure will be reduced in one step. The final pressure reduction parameters will be finalized during the flow and pressure logging activity for which a Prov Sum has been allowed in the BoQ. PRVs will be rated 16 bar and will be flanged to SABS 1123 table 1 600 / 3. The PRV shall be complete with anti-cavitation trim and single rolling diaphragm for stability under ow flow conditions. The valves shall have ASTM A536 ductile iron body and cover, AISI 316 stainless steel stem and seat, EPDM diaphragm and sealing disc, 18-8 stainless steel cover bolts and washers, NSF61 fusion bonded epoxy coated internally and externally to a minimum of 250 microns. The valves shall have auxiliary control system consisting of copper tubing and brass compression fittings, valve to be supplied with pressure reducing pilot valve.

All repairs and maintenance shall be possible without removing the valve from the line. To facilitate easy removal and replacement of the inner valve assembly and to reduce unnecessary wear on the guide, the stem shall be vertical when the valve is mounted in a horizontal line.

Each valve shall be air tested prior to shipment. The standard test shall include leakage test, seat leakage test, and stroke test.

The valves shall be covered by a minimum three year (3) warranty against defects in materials and workmanship. The stainless-steel seat shall be covered by a lifetime replacement warranty.

The auxiliary control system shall be fitted with a large filter assembly, to prevent fouling of the control system. This filter shall be fitted with a transparent drain cap, which allows maintenance personnel to inspect the strainer, without the need to shut of the system, or remove the strainer from service.

The main valve body shall be fitted with a visual position indicator, to offer the maintenance personnel visual indication of the valve position, as well as opening and closing speed controls. The strainer shall have an integral blowdown valve and discharge tube for facilitate the ease of maintenance.

f) Level control valves

Level Control Valves shall be rated 16 bar and will be flanged to SABS 1123 table 1 600 / 3. The valves shall be complete with anti-cavitation trim and single rolling diaphragm for stability under ow flow conditions. The valves shall have ASTM A536 ductile iron body and cover, AISI 316 stainless steel stem and seat, EPDM diaphragm and sealing disc, 18-8 stainless steel cover bolts and washers, NSF61 fusion bonded epoxy coated internally and externally to a minimum of 250 microns unless otherwise specified. The valves shall have auxiliary control system consisting of copper tubing and brass compression fittings, valve to be supplied with altitude pilot valve and rate of flow pilot valve.

All repairs and maintenance shall be possible without removing the valve from the line. To facilitate easy removal and replacement of the inner valve assembly and to reduce unnecessary wear on the guide, the stem shall be vertical when the valve is mounted in a horizontal line.

Each valve shall be air tested prior to shipment. The standard test shall include leakage test, seat leakage test, and stroke test.

The valves shall be covered by a minimum three year (3) warranty against defects in materials and workmanship. The stainless steel seat shall be covered by a lifetime replacement warranty.

The auxiliary control system shall be fitted with a large filter assembly, to prevent fouling of the control system. This filter shall be fitted with a transparent drain cap, which allows maintenance personnel to inspect the strainer, without the need to shut of the system, or remove the strainer from service.

The main valve body shall be fitted with a visual position indicator, to offer the maintenance personnel visual indication of the valve position, as well as opening and closing speed controls. The strainer shall have an integral blowdown valve and discharge tube for facilitate the ease of maintenance.

g) Dismantling Joints

Dismantling joints to be fusion bonded epoxy coated to a minimum of 250 microns unless otherwise specified. The dismantling joints shall conform to the following table:

	Flange to Flange details		
ND	**Nominal length (mm)**	**Minimum length (mm)**	**Maximum length (mm)**
100	194	175	213
200	194	175	213
250	194	175	213

	Flange to Flange details		
ND	**Nominal length (mm)**	**Minimum length (mm)**	**Maximum length (mm)**
300	194	175	213
600	300	275	325
750	300	275	325
800	300	275	325
900	307	277	337

PSL 8 MEASUREMENT AND PAYMENT

PSL 8.2 SCHEDULED ITEMS

PSL 8.2.1 Supply, Lay and Bed Pipes……Unit: m

Pipelines will be measured by length over all lengths as laid. No deductions will be made for specials and valves.

The rate shall cover the cost of the provision of the specified pipe complete with couplings or flanges, and joints or bends up to and excluding 15 degrees, and the costs of handling, inspecting, transporting, bedding, laying, welding, jointing, testing and, when relevant, disinfecting of the pipes and the joints.

PSL 8.2 SCHEDULED ITEMS

REPLACE THE EXISTING SUBCLAUSE WITH THE FOLLOWING:

PSL 8.2.8 Recover Old Pipeline

(a) up to 2 m to pipe invert
……..Unit: m.

(b) up to 3 m pipe invert
……..Unit: m.

(c) up to 4 m pipe invert
……..Unit: m.

(d) over 4 m pipe invert
……..Unit: m.

The total length of the pipeline to be recovered will be measured by the length for each stated depth range. No deduction will be made for valves, specials, and the like.

REPLACE THE FOLLOWING SECTION WITH:

The rate shall cover the cost of the excavation removal of the pipes, valves, and fittings from the trench, the handling and transporting to the Employer's stores i.e. any Johannesburg Water Depot, and the cleaning and listing of the salvaged recovered materials and backfilling. Care must be taken to cause as little damage to the pipes as possible.

REPLACE THE EXISTING SUBCLAUSE WITH THE FOLLOWING:

PSL 8.2.13 Valve and Hydrant Chambers, etc. .... Unit: No.

Valve and hydrant chambers, manholes, etc., will be measured as complete units. The rate shall cover additional excavation (see Subclauses 8.2.2 and 8.2.3 of SANS 1200 DB), materials, plant, and labour necessary for the complete construction including the installation of the surface boxes or covers excluding reinforcement and pipe specials. Reinforcement shall be measured separately.

ADD THE FOLLOWING NEW SUBCLAUSE

PSL 8.2.16 c) <u>Demolish Structure</u>

a) Description of connection, types and diameters involved……...Unit: No

b) Etc for the other items

The unit of measurement shall be sum for various types of connection into existing line mains

The rate shall cover the cost of excavation, plant and labour required, demolishing the existing chambers, safeguarding the existing valves and specials from damage and safely disposing of the rubble material.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 8.2.17 <u>Connect to Existing Mains</u>

a) Description of connection, types and diameters involved……...Unit: No

b) Etc for the other items

The rate shall cover the cost of isolating, cutting, excavation (up to 2 m deep), bedding, dewatering and exposing the existing main at the connection point, supply necessary fittings for under pressure connections for the section of the mains as required, temporary support, safety precaution backfilling and the removal of surplus and

unsuitable material. The supply and installation of fittings and couplings shall be measured separately. The rate shall also include removing the existing connection.

ADD THE FOLLOWING NEW SUBCLAUSE:

PSL 8.2.18 Recover valves, fittings, specials, etc

a) Description of item……Unit: No.

b) Etc for other item

The unit of measurement shall be number of described item to be recovered

The rate for the recovery of the above shall cover the cost of the excavation, breaking out existing brick or precast concrete, and removal of the valves, fittings and specials, removal of debris and spoil to Contractor's dump site, the handling and transporting of the recovered materials to the JW Depot and the listing of the salvaged materials.

PSL 8.2.19 Cathodic Protection

i. Procurement of the services and a cathodic protection (CP) specialist for the temporary design of a CP system to be aligned with the existing JW system……. Unit: Prov Sum

The Employer`s Agent will provide the specification, administer the procurement process and prepare a report for JW, who will select the preferred service provider, and the Contractor will appoint and enter into an agreement accordingly. Payment to be on approved milestones.

ii. Implementation of the tenporary cathodic protection system..... Unit : Prov Sum

Once final system has been designed and approved, the system to be implemented by an approved specialist contractor. The main contractor to procure the services of a specialist contractor based on the documentation prepared in the design. Final selection of specialist subcontractor to be approved by JW.

iii. Procurement of the services and a cathodic protection (CP) specialist for the permanent design of a CP system to be aligned with the existing JW system……. Unit: Prov Sum

The Employer`s Agent will provide the specification, administer the procurement process and prepare a report for JW, who will select the preferred service provider, and the Contractor will appoint and enter into an agreement accordingly. Payment to be on approved milestones.

iv. Implementation of the permanent cathodic protection system Unit : Prov Sum

Once final system has been designed and approved, the system to be implemented by an approved specialist contractor. The main contractor to procure

the services of a specialist contractor based on the documentation prepared in the design. Final selection of specialist subcontractor to be approved by JW.

v. Overheads, charges and profit on item i. to iv. above ……Unit: %

The rate above shall cover the Contractor's overheads, charges and profit on the amounts stated for items i. to iv. above.

PSL 8.2.20 Supply and install fittings assembly…….....Unit: No

The unit of measurement shall be the number of a described item to be installed. The applicable particular specification contained herein on various clauses will apply to the various pieces, for example **PSL 7.5** will be applicable to any valve and air valve in the assembly.

The rate shall include supply installation and testing including all corrosion protection, bolts, gaskets, and any other contingency work to enable the proper operation of the fittings assembly.

PSL 8.2.21 Rehabilitation of Valves …….....Unit: Prov Sum

The unit of measurement shall be a Prov Sum.

The Employer's Agent shall confirm which valves are to be rehabilitated during Construction. Before rehabilitation of any valve commences, the Employer's Agent shall approve a written quote therefore. The quote shall include removing and re-installing the existing valve, all transport, rehabilitating the valve by the valve supplier or agent, or other approved company, the provision of a factory test certificate for the rehabilitated valve and the issuing of a 12 month guarantee for workmanship and materials used for the rehabilitation of the valve. Payment will be based on the approved quote.

PSL 8.2.22 Overheads, charges and Profit for the Rehabilitation of Valves, including removal, transport and re-installation
…….....Unit: %

This percentage shall include the removal of the valves to be rehabilitated, all necessary transportation of the valves between the Site, the supplier, agent or approved company or testing facilities, and the reinstallation of the valves on site. It shall also include all overheads, charges and profit for the Contractor.

PSL 8.2.23 Breaking and repairing sections of existing chamber walls to remove existing pipeline and install new pipeline, and reinstating.
..…….....Unit: No

The unit of measurement shall be the number of a described instances where the existing pipeline, which will be replaced, will pass through an existing chamber.

The rate shall include the breaking of a section of the existing chamber wall where the existing pipeline passes through it, and the reinstatement of the chamber wall after the

new pipe has been installed. The work to be done will be as per the relevant drawing. The supply and installation of fittings are measured elsewhere.

PSL 8.2.24 Supply and install pipeline markers Unit: No.

This rate shall include supply and install concrete pipe markers at each PI (point of intersection) and each road crossing and on the straight line in such positions that the marker can be seen on both sides of each other marker. The marker shall have permanent markings as directed by the Employer.

PSL 8.2.25 Supply and install, test and make good 10 mm diameter ball valves Unit: No.

This rate shall include shall include supply and installation of a 10 mm diameter threaded ball valve with associated connection appurtenances. This shall be installed on the marked pipe fittings in all valve chambers as shown on drawings or as directed by the Employer`s Agent.

PSL 8.2.25 Supply and installation of Kaypipe geopipe or similar approved for the seepage drain complete with all necessary fittings for the various pipe diameters Unit: m.

The rates shall cover the cost of providing the pipes and the cost of laying, bedding, jointing, making
connections into manholes, and testing the pipeline

PSLB BEDDING (PIPES)

PSLB 3 MATERIALS

PSLB 3.1 SELECTED GRANULAR MATERIAL

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Selected granular material shall have a PI not exceeding 10 and shall be free from sharp-ended particles or particles exceeding 19 mm in size."

"Selected fill material shall have a PI not exceeding 15 and shall be free from sharp-ended particles or particles exceeding 19 mm in size."

PSLB 3.3 BEDDING

ADD THE FOLLOWING:

"uPVC and HDPE pipes are deemed to be flexible pipes for the purposes of this subclause."

PSLB 3.4 SELECTION

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 7 TESTING

PSLB 7.1 DENSITY

REPLACE THE SECOND SENTENCE IN THE FIRST PARAGRAPH WITH "The test will be carried out using the Troxler method."

ADD THE FOLLOWING SUB-CLAUSE

PSLB 7.1.1 Submission of bedding compaction test results

The Contractor will be required to submit to the Employer's Agent four (4) compaction test results of bedding for every 100metres. Bedding compaction to be 90% MOD AASTHO density. The compaction tests to be performed by the Troxler method.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.1 PRINCIPLES

ADD THE FOLLOWING TO THIS SUB-CLAUSE

PSLB 8.1.3 Volume of bedding materials

The volume of bedding material shall be measured net i.e. the volume of the pipe is to be deducted.

PSLB 8.1.5 Disposal of displaced material

DELETE THIS SUB-CLAUSE AND REFER TO CLAUSE PSDB 5.6.3:

PSLB 8.1.6 Free-haul

DELETE THE WORDS "of 0,5 km" *IN THE FIRST LINE OF THIS SUBCLAUSE.*

PSLB 8.2 SCHEDULED ITEMS

PSLB 8.2.1 Provision of bedding from trench excavations

DELETE THIS SUB-CLAUSE AND REPLACE WITH THE FOLLOWING:

PSLB 8.2.1.1 Without the need for screening or other treatments:

a) Selected granular material.....Unit: m^3

b) Selected fill material.....Unit: m^3

The rates shall cover the cost of acquiring, from any point along the trench excavation as be Selected by the Employer's Agent within 5,0 km, bedding that complies with the relevant requirements of the specification, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working, and of disposing of displaced material within a free haul distance 5,0 km.

PSLB 8.2.1.2 Including for screening and/or other treatment:

a) Selected granular material.....Unit: m^3

b) Selected fill material.....Unit: m^3

The rates shall cover the cost of screening by means of mesh sieves or otherwise treating excavated material, at any point along the trench excavation as may be selected by the Employer's Agent, in order to produce bedding that complies with the relevant specification, delivering it to points along the trench, within 5,0 km, spaced to suit the Contractor's methods of working, of making good any backfill deficiency there may be from points where screened backfill material has been acquired, and of disposing of displace material within a free haul distance of 5,0 km.

PSLB 8.2.1.3 Kaymat geotextile grade A6 or similar approved surround to 19mm stone bedding or similar approved

The area measured will be that of the bedding face scheduled or ordered to be backed with geotextile. The rate shall cover the cost of supplying geotextile cutting, waste, placing, joining, overlapping and fastening the geotextile in position……Unit m^2

PSLB 8.2.1.4 Supply and installation of up to 2m deep flownet drainage core with bidum or similar approved filter jacket and all necessary fittings..... .....Unit: m

PSLB 8.2.2 <u>Supply only of bedding by importation</u>

PSLB 8.2.2.3 From commercial sources (Provisional)

ADD THE FOLLOWING SUB-SUBITEM TO THIS CLAUSE:

"(c) Special bedding material

1) Description of material…… Unit: m^2 or m^3

2) Etc for other items

The unit of measurement shall be the square metre or cubic metre of material as specified.

The rate shall cover the cost as specified for (a) and (b)." The rate shall include the cost of acquiring from commercial sources, transporting regardless of distance, off loading and placing in the trench bottom clean where ordered by the Employer's Agent.

DELETE THIS CLAUSE AND REPLACE WITH THE THE FOLLOWING:

PSLB 8.2.4 Encasing of Pipes in Concrete
…… Unit: m^3

a) Class 20Mpa/19mm concrete including reinforcement.
b) Soilcrete encasement to pipes as directed by Employer's Agent
c) Cellular concrete as directed by the Employer's Agent

The volume will be computed from the dimensions of the concrete as given on the drawing. The rate shall cover the cost of dealing with any excavation (in all materials including disposal of surplus) that is additional to that measured under the item for pipe trench excavation, the cost of encasing the pipe in concrete including the cost of formwork (if any), etc., and the cost of formwork to form flexible joints at 4 m centres.

PSLB 8.2.6 Compaction Test

Compaction testing using the troxler method……..Unit: No

PSLC **CABLE DUCTS**

PSLC 3 **MATERIALS**

PSLC 3.1 DUCTS

ADD THE FOLLOWING:

PSLC 3.1.1 **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 "E" to indicate electricity cables."

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 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 diameter of duct.

The rates shall cover the cost of providing all the materials and the cost of laying the ducts, installing the draw wire, jointing, bedding and providing all as specified."

PSLD SEWERS

PSLD 7 TESTING

PSLD 7.2.6 Watertightness of Manholes

Wherever practicable, after selected manholes have been inspected and approved by the Employer`s Agent, they are to be tested in his presence or in the presence of his authorised representative in the following manner:

All sewer inlets and outlets to and from the manhole shall be closed with expanding plugs or other approved apparatus. Water is then to be introduced into the manhole up to a level 25mm below the underside of the roof slab. The water level is to be maintained for not less than one hour or such longer period as may be necessary to accurately record the rate of leakage, if any. Careful and accurate records shall be kept at frequent and regular intervals of the variation of the level of the water in the manhole and of the quantity of water added so that the rate of leakage exceeding 1.25 l per hour per meter of depth of manhole or in the event of any weakness, defect or fracture or visible signs of leakage occurring in the manhole under the test, the Employer`s Agent shall have the right to order the test to be discontinued. The Contractor shall have the right to order the test to be discontinued. The Contractor shall thereupon, at his expense, search for and rectify any weakness or defect in the manhole. Such work or rectification is to consist of repair or replacement or both. The manhole shall thereafter be re-filled with water and re-tested in the manner specified. The process shall be repeated until a satisfactory leakage rate is obtained.

Alternatively, manholes may be tested by thoroughly saturating the ground in the immediate vicinity of each manhole by excavating a shallow trench around the manhole and filling the trench with water. If after maintaining the water level in the trench for two hours, the internal faces of the manhole and benching show no signs or dampness or leakage the manhole shall be deemed to have passed the test.

The Contractor will be paid for the hydraulic testing of manholes as specified in the bill of quantities. The Contractors price for the hydraulic testing of manholes shall include for all arrangements for supply of water for testing, the cost of water so used where the water is not obtained free of cost from the Employer, for any rectification work and retesting and for all labour, plant and materials required to carry out the specified tests.

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 8.2 SCHEDULED ITEMS

PSLD 8.2.3 Manholes

ADD THE FOLLOWING:

Construct leachate manhole complete as shown on drawings..... No.

Manholes shall be measured according to the depth from cover level to the invert level, allowing for manhole covers and lids as specified

PSLD 8.2.11 Connection to existing sewer

ADD THE FOLLOWING:

The rate shall cover the cost of connecting into the existing sewer while operational, including locating and exposing the existing manhole, creating a new connection through the wall of the manhole, sealing the connection and backfill and compaction around the manhole.

Excavation for the new pipe, bedding, backfilling and reinstatement shall be measured separately under the relevant sections of the Bill of Quantities.

ADD THE FOLLOWING:

PSLD-8.2.12 Testing of manholes ……..No.

The tendered rate for the testing of manholes shall include for the supply and transporting of the water, provision of all plugs, stoppers, pumps, measuring equipment and disposal of water on completion of the test as described in PSLD 7.2.6 - Watertightness of Manholes.

No payment shall be made for tests which fail.

PSLG PIPE JACKING

PSLG 8 MEASUREMENT AND PAYMENT

PSLG 8.2 SCHEDULED ITEMS

REPLACE THE PAYMENT PARAGRAPH WITH THE FOLLOWING:

PSLG 8.2.6 Supply and Install Pipes by Pipe Jacking Method, Complete with Excavations and grouting

The rate shall cover the cost of the activities specified in 8.2.2, 8.2.3, and 8.2.4 for a 1371 mm OD diameter concrete pipeline (Class 100D with external metal sleeve and butt joint) by pipe jacking method, complete with excavations in soft and intermediate material and grouting of external voids with a 1:2 cement and plasticiser mix, for the stated road and railway crossing lengths: (length of each section stated) ..... Unit: m

REPLACE THE PAYMENT PARAGRAPH WITH THE FOLLOWING:

PSLG 8.2.9 Grouting Voids

a) Grouting voids inside (annulus) pipe jacking sleeves with cement/sand grout (mix ratio 1:2 cement:sand with plasticiser)
……Unit: m³

ADD THE FOLLOWING PAYMENT PARAGRAPHS:

PSLG 8.2.11 Brick Wall Closures

The rate shall cover the Supply and installation of brick wall closure to ends of all concrete jacking pipes.
……..Unit: No.

PSLG 8.2.11 Brick Wall Closures

The rate shall cover the Supply and installation of brick wall closure to ends of all concrete jacking pipes. ……..Unit: No.

PSLG 8.2.12 Concrete pedestals complete with clamps

The rate shall cover the Supply and installation of Pipe pedestals as per the drawings , complete with clamps and including supply of all materials required for drilling and epoxying of dowels onto the concrete walls of the sleeve……..Unit: No.

PSLG 8.2.13 Extra-Over for Using Alternative Rectangular concrete section of 2100mm Wide x 2100mm Height internal dimensions AND 250mm wall thickness or similar approved.

The rate shall cover the additional cost to Supply and installation of rectangular section in place of the circular concrete jacking pipes. ……..Unit: m.

PORTION 3: PARTICULAR SPECIFICATIONS

INDEX

Page

PD **Employment and training of labour SW.95**
CONTRACT PARTICIPATION GOALS - SUBCONTRACTING

TECHNICAL SPECIFICATIONS FOR VALVES AND HYDRANTS

PORTION 3: PARTICULAR SPECIFICATIONS

PD EMPLOYMENT AND TRAINING OF LABOUR

PD1 SCOPE

This specification covers the requirements for the employment and training of workers on the Contract.

PD2 COMMUNITY LIAISON OFFICER

The Project Steering Committee will identify a Community Liaison Officer (CLO) to facilitate liaison between the Contractor and the community and amongst other things to ensure that the employment of local labour proceeds smoothly.

All decisions regarding identification and hiring of labour, relieving labour of their duties, local problems and any other matter of local importance related to the Contract, will be made in consultation with the CLO.

PD2.1 APPOINTMENT, OFFICE AND REPLACEMENT OF CLO

- The CLO will be appointed for the duration of the construction phase of this Contract.
- The CLO will occupy his own office in the Contractor's camp from where he will fulfil his duties to identify, screen and nominate labour from the community in accordance with the Contractor's requirements.
- The CLO will communicate with the Contractor daily regarding labour requirements.
- Should it become apparent that the appointed CLO fails to meet his duties, he may be relieved from his duties and replaced by a new CLO in consultation and approval with the Project Steering Committee.
- One CLO will be appointed per ward from the time that work starts in that ward until al work in that ward has been completed.

PD2.2 DUTIES OF THE CLO

- He/she will attend all meetings of the committee pertaining to this Contract.
- He/she will be available on site daily between the hours of 07:30 and 18:30, and at other times as the need arises.
- He/she will consult with the Contractor and the Employer`s Agent daily to determine the labour requirements regarding amount and skills, to identify possible labour disputes, and to inform local labourers timeously when they will be relieved.
- He/she is responsible to screen candidates, to inform them of their conditions of temporary employment and to ensure their timeously availability.
- He/she will ensure that all workers who are involved in activities where productivity rates have been agreed, are fully informed regarding the expected level of productivity for the given tasks to be assigned as part of this Contract.

- He/she will attend disciplinary proceedings to ascertain that hearings are fair and reasonable.
- In consultation with the Contractor, he will determine the needs of the local labour for relevant technical training. Again he will be responsible for the identification of suitable trainees. He will also be required to attend some of the training sessions.
- He/she will keep a daily written record of his interviews and community liaison.
- He/she will attend the first part of the monthly Contractual site meetings to report about the local community labour involvement as well as any other relevant problem that needs attention.
- He/she will liaise regularly with the Project Steering Committee to ensure that their co-operation is obtained and their decisions accommodated. He/she will thus act as a liaison officer between the Contractors on site and the local community through the project committee. – He/she will be involved in all SMME related matters (Contracts, terminations etc)

PD2.3 SCHEDULED ITEM

PD2.3.1a *Community Liaison Officers - Salaries* ..... **Unit: Provisional Sum**
The tendered sum shall include full compensation for the provisions of the 1x CLOs including salary, provision of an office, transport costs, the cost of typing, printing and distributing notices, and for all other obligations described in Clause PE2.2.

PD2.3.2b *Community Liaison Officers – Cellular phone* ..... **Unit: Provisional Sum**
The Contractor must the supply the 1x CLOs with a cellular phone for the duration of the CLO employment Contract and this rate must cover the cost of procuring and commissioning that phone.

PD2.3.2c *Community Liaison Officers – Cellular phone calls*..... **Unit: Provisional Sum**
The Contractor must allow R 500,00/ month per CLO for work related calls. Calls above this amount will be for the CLO account.

CONTRACT PARTICIPATION GOALS - SUBCONTRACTING

PSSC PAYMENT RELATED TO SMME WORK

PSSC 1 Value of Subcontracted Works ..... Unit : Prov. Sum

(i)SMME CONTRACTOR PACKAGE 1 VALVE CHAMBERS
(ii)SMME CONTRACTOR PACKAGE 2 CIVIL WORKS
(iii)SMME CONTRACTOR PACKAGE 3 TRAINING AND CORPORATE SOCIAL RESPONSIBILITY
(iv)SMME CONTRACTOR PACKAGE 4 PAVING & FENCING
(v)SMME CONTRACTOR PACKAGE 5 LEACHATE DRAIN

The Main Contractor shall retain liability and responsibility for the management, scheduling, and quality control of all works performed by the subcontractors. The Main Contractor will be expected to conduct a competitive process to procure SMMEs. The SMMEs will provide rates for the items marked SMME in the Bill of Quantities. The Main Contractor will recommend a Subcontractor or Subcontractors to Johannesburg Water and provide all information requested by the Employer or Employer`s Agent related to the procurement process. The Employer`s Agent will evaluate all rates provided by the Subcontractor for fairness. Johannesburg Water will then either a) approve the appointment of the Subcontractor or Subcontractors or b) enter negotiations with the Main Contractor and subcontractor / s or c) request that the Contractor recommend a different subcontractor.

PSSC 2 Overhead, charges and profit fee for the Main Contractor to oversee subcontracted works.

The Main Contractor shall retain liability and responsibility for the management, scheduling, and quality control of all works performed by the subcontractors. This item will be calculated as a percentage of the sum of works allocated to the subcontractors and shall include the process to appoint a subcontractor as described in PSSC 1, as well as all costs and charges to manage all subcontracted works.. ……..…….…. Unit: %

PSSC 3 Training for SMMEs .....
PC Sum

This item will include accredited and certified on-the-job training for SMMEs

PSSC 4 Overhead, charges and profit for the Main Contractor to provide for training for SMMEs

This item will be calculated as a percentage of PSSC 3 . ……..…. Unit: %

Johannesburg Water (SOC) Ltd

CONTRACT NO: JW14090R

REPLACEMENT OF A 600MM DIAMETER BULK STEEL PIPELINE FROM LINBRO RESERVOIR TO ALEXANDRA TOWNSHIP

VOLUME 2

PART 4: SITE INFORMATION

Employer:		Contractor	
Witness:		Witness:	

TABLE OF CONTENTS

PAGE (S)

C4 SITE INFORMATION 1

C4.1 .... SITE LOCATION ..... ……2

C4.2 .... ACCESS TO SITE AND RESTRICTIONS 2

C4.3 .... EXISTING SERVICES, SERVITUDES AND WAYLEAVES 2

C4.4 .... SECURITY 2

C4.5 .... NATURE OF GROUND AND SUBSOIL CONDITIONS 2

C4.6 .... HYDROLOGICAL REPORT AND FLOODLINES 2

Employer:		Contractor	
Witness:		Witness:	

C4 site information

C4.1 Site Location

The site is situated in Cosmo City area located within the City of Johannesburg.

C4.1.1 Site Location

The project site stretches from Linbro Park Reservoir to Bhekilanga PRV Station in Alexandra Township with the following coordinates:

Start Coordinates:	-26.102517;	28.132434
End Coordinates:	-26.100971;	28.111319

Refer to the locality map below:



Locality Map - 600 mm ND pipeline from Linbro Park Reservoir to Bhekilanga PRV Station

C4.2 Access to Site and Restrictions

Employer:		Contractor	
Witness:		Witness:	

Although the works are located on sites within the Employer's property and/or reserve, the contractor may have to obtain permission from JRA to excavate road surfaces in order to execute the works required as part of this Contract. Any other permission as may become necessary shall be the responsibility of the Contractor to obtain.
Having been granted access to works areas by the Employer, other service authorities and private owners, the Contractor shall adhere to any agreed conditions of access and ensure the works area is left in a condition similar to when it was first accessed.

C4.3 Existing Services, Servitudes and Wayleaves

No subsurface detection of existing services was carried out. The Contractor shall take all necessary care to protect all existing services which may be present. For detailed specification the Contractor shall refer to clauses PS1.5 (Temporary Works), PS4.5 (Existing services), and PS4.8 (Permits and wayleaves).

The Employer's Agent has applied for wayleaves from various authorities. The Contractor shall re-apply for all wayleaves which may have expired and shall transfer all wayleaves onto his own name. A payment items has been allowed for this activity in the BoQ. The approved wayleaves will be supplied to the successful tenderer after appointment.

C4.4 Security

The Contractor shall be responsible for the security of his personnel, materials, equipment and construction plant on and around the site of the Works and for the security of his camp (if applicable). The Employer in this regard will consider no claims.
Refer to clause PS7.1 (Security)

C4.5 Nature of Ground and Subsoil Conditions

A geotechnical investigation was carried out and the report is appended to this document. It shall be the Contractor's responsibility to acquaint himself with the conditions of the site.

C4.6 Hydrological Report and Floodlines

Hydrological analysis and floodlines investigation will not apply for this contract.

GEOTECHNICAL REPORT

Employer:		Contractor	
Witness:		Witness:	

MMAPHAKA
Trading Services

(t/a) Mmaphaka Engineers

Geotechnical Investigation Report: Proposed Replacement of Johannesburg Water, 600mmØ Bulk Water Steel Pipeline, Alexandra, Gauteng Province.

INTERPRETIVE REPORT

July 2020



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TITLE:	GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED REPLACEMENT OF JOHANNESBURG WATER BULK WATER STEEL PIPELINE, ALEXANDRA, CITY OF JOHANNESBURG MUNICIPALITY, GAUTENG PROVINCE.
Prepared for:	**Lidwala Consulting Engineers** Unit 18 Corner main office park 02 Payne Road, Bryanston 2021
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Contact Person:	T. Letsoale
Mobile:	078 650 2848
Report No.:	MTS-LID-AlexP-05-05-20
Project Team:	Mr T. Letsoale, (Project Leader) Geotechnical Engineer Mr N. Makheda, Principal Engineering. Geologist Mr T. Msengana, Senior Engineering. Geologist
Site Coordinates:	Start: Lat: 26° 6'13.94"S Long: 28° 7'57.30"E End: Lat: 26° 6'3.99"S Long: 28° 6'41.44"E
Location:	Bulk Water Steel Pipeline, Alexandra, Gauteng Province
Date:	July 2020

Compiled by:	***Reviewed by:***	***Approved by:***
		
……..	……	……
T. Msengana ***Senior Engineering Geologist***	*N. Makheda* ***Pr.Sci.Nat.*** ***Principal Geologist***	*T. Letsoale* ***ECSA. MSAICE*** ***Project Leader***

Table of Contents

1.	**INTRODUCTION**		**6**
	1.1	Background	6
	1.2	Purpose	6
	1.3	Proposed Development	7
	1.4	Information Supplied	7
	1.5	Available information	7
2.	**SITE DESCRIPTION**		**7**
	2.1	Location	7
	2.2	Topography and drainage	8
	2.3	Existing Infrastructure	9
	2.4	Climate and Weather	10
3.	**GEOHARZARDS**		**11**
	3.1	Seismicity	11
	3.3	Dolomitic Land	12
	3.4	Undermining	12
	3.5	Steep Slopes	12
	3.6	Flooding	12
	3.7	Geological Fault	12
	3.8	Volcanic Activities	12
4.	**INVESTIGATION PROCEDURE**		**12**
	4.1	Literary Review	12
	4.2	Geotechnical Footprint Investigation	13
4.2.1	Test Pits		13
4.2.2	Dynamic Probe Super Heavy (DPSH) Test		13
4.2.3	Soil Resistivity Survey		14
4.2.4	Rotary Core Drilling		15
4.2.5	Laboratory Testing		15
	4.3	Groundwater	16
5.	**GEOLOGICAL SETTINGS**		**16**
	5.1	Regional Geology	16
	5.2	Site Geology	16

5.2.1 Fill 18
5.2.2 Transported material 18
5.2.3 Pebble Marker 18
5.2.4 Reworked Residual Granite 18
5.2.5 Residual Granite 18
5.2.6 Soft Rock to Medium Hard Rock Granite 19

6. RESULTS OF GEOTECHNICAL INVESTIGATION 19

6.1 Foundation Indicator Tests 19
6.2 Compaction Tests 20
6.3 Compactibility Tests 21
6.4 pH and conductivity Tests 21
6.5 Acid Soluble Sulphate Tests 22
6.6 Basson Index Tests 23
6.7 Conductivity, Total soluble Salts & Total Sulphates 23
6.8 DPSH Test Results 24
6.9 Spangler's Modulus of Soil Reaction (E-Values) 25
6.10 Modulus of Subgrade Reaction 26
6.11 Embedment Classes based on British Standards 27

7. GEOTECHNICAL ASSESMENT 28

7.1 Excavatability 28
7.2 Potentially Active Soils 28
7.3 Erodible Soils 28
7.4 Underground services 29
7.5 Construction material 29

8. RECOMMENDATION 30

8.1 Earthworks 30
8.1.1 Selected Granular Material - Bedding Cradle 30
8.1.2 Selected Fill Material 31
8.1.3 General Backfill 31

8.2 Pipejacking Locations 31
8.2.1 Pipejacking at Clulee Road (Jacking No 1.) 31
8.2.2 Pipejacking at the N3 Off Ramp South (Jacking No 2.) 32
8.2.3 Pipejacking at N3 Highway (Jacking No 3.) 32
8.2.4 Pipejacking at South Africa Boulevard (Jacking No 4.) 32
8.2.5 Pipejacking at Lenin Drive (Jacking No 5.) 32

8.3 Stability of Excavation Sidewalls 33

8.4 Groundwater Management 33
8.5 Construction Problems 33
8.6 Additional Work 33
8.7 General 33
9. CONCLUSIONS 34
11. REFERENCES 35
12. APPENDICES 36
- **APPENDIX A: TEST PIT & DPSH POSITIONS 36**
- **APPENDIX B: TEST PIT PROFILES 36**
- **APPENDIX C: GEOLOGICAL SECTIONS 36**
- **APPENDIX D: DPSH TEST RESULTS 36**
- **APPENDIX E: REPORT ON SOIL RESISTIVITY TESTING 36**
- **APPENDIX F: BOREHOLE PROFILES 36**
- **APPENDIX G: BOREHOLE PHOTOGRAPHS 36**
- **APPENDIX H: LABORATORY TEST RESULTS 36**
- **APPENDIX I: TEST PIT AND SITE PHOTOGRAPHS 36**

List of Tables

Table 1: Underground Services Information 9
Table 2: Summary of Test Pits 13
Table 3: Summary of DPSH Tests Positions and Final depths 14
Table 4: Summary of drilled boreholes 15
Table 5: Summary of geology encountered in test pits 17
Table 6: Summary of foundation Indicator laboratory results 19
Table 7: Summary of moisture/ density relationship & Compaction Characteristics results 20
Table 8: Summary of compactibility characteristics 21
Table 9: Guideline values for interpretation of soil conductivity 22
Table 10: Interpretation of Conductivity Test 22
Table 11: Summary of chloride and soluble sulphate test results 23
Table 12: Summary of Basson test results 23
Table 13: Summary of water tests 23
Table 14: Summary of Blow Count (N Values) from DPSH tests results 24
Table 15: Guide values of Sprangler Modulus of native soils 25
Table 16: Summary of Sprangler's modulus 26
Table 17: Summary of modulus of subgrade reaction 26
Table 18: Embedment classes (BS9295:2010, guide to structural design of buried pipeline) 27
Table 19: Embedment classes 27
Table 20: Contact details of commercial sources for borrow materials 29

List of Figures

Figure 1: Satellite image showing location of the Bulk Water Steel pipeline routes. 8
Figure 2: Extract of the Topographical Map 2628AA Johannesburg 9
Figure 3: Macro Climatic Regions of Southern Africa (Adapted from Weinert, 1980). 10
Figure 4: Seismic Hazard Map of South Africa 11
Figure 5: Extract from the 1:250 000 Geological Map (2628) East Rand. 17

1. INTRODUCTION

1.1 Background

Mmaphaka Engineers were appointed by Lidwala Consulting Engineers on behalf of the Johannesburg Water to carry out a geotechnical Investigation for the proposed replacement of the failed section of the Johannesburg Water (JW) Bulk Water Steel pipeline, located in Alexandra, within the and the City of Johannesburg (CoJ), Gauteng Province The total length of the proposed pipeline is approximately 2.46km.

The field work for the geotechnical investigation comprised of site walkover reconnaissance followed by excavation of nine (9) trial pits using a TLB (CAT 428E) and recovery of selected disturbed soil samples for laboratory testing, DPSH testing and soil resistivity surveys. The geotechnical investigation was carried out to determine the soil and rock profile to refusal or to a maximum depth of machine and to give recommendations for the pipeline bedding.

The investigation was carried out along the proposed pipeline route and in accordance with "SAICE (2009) Site investigation code of practice" requirements.

This report presents comments on the geotechnical Investigation along the proposed pipeline.

1.2 Purpose

The primary objective of the investigation was to assess the prevailing geotechnical condition of the proposed new bulk water supply pipeline route and provide enough detail to establish founding conditions and excavatability of the in-situ soils.

The terms of reference for this investigation are as follows:

- Provide an overview of the geology of the site.
- Discuss the soil profile encountered.
- Present the fieldwork and testing carried out during the geotechnical investigation.
- Provide geotechnical related recommendations, such as the re-use potential of existing materials as selected backfill.
- Assessment of trench sidewall stability.
- Comment on the corrosivity and aggressiveness of soils to buried metals and concrete.
- Provide an excavatability classification for the site as per SANS1200 specification.
- Comment on the suitability of the site for the proposed development; and
- Providing a materials investigation report of the findings.

This interpretive report details the work carried out and provide final recommendations. The contents of this report are intended for use by consulting engineers, contractors, consulting engineering geologists but mainly by lidwala consulting engineers.

1.3 Proposed Development

The proposed development comprises the replacement of the existing Bulk Water Steel pipeline. The new bulk water supply pipeline will be constructed adjacent to the existing pipeline and within the Johannesburg Water pipeline servitude.

The total length of the proposed pipeline is approximately 2.46km and 600mm in diameter. The proposed invert levels rages between 1.67m and 8.59m below current ground level with five (5) pipe jacking location below Clulee Road, N3 Off Ramp South, N3 Highway, South Africa Boulevard and Lenin Drive.

1.4 Information Supplied

The following data was provided by the client: -

- A detailed document, reference. 14007 Rev 0, entitled REQUEST FOR QUOTATION GEOTECHNICAL INVESTIGATION SURVEY - ALEXANDRA 600 mm STEEL SUPPLY PIPELINE, dated 04 September 2019.
- A drawing no. 20008-SP-001, entitled REPLACEMENT OF THE JOHANNESBURG WATER 600mm Ø PIPELINE IN ALEXANDRA – SITE PLAN 1, 1524mm DIA. CONNECTION TO 600mm DIA WATER PIPE, at a scale of 1:2000 and dated 19/04/2020.

1.5 Available information

The following published information was used during this investigation: -

- Geological Map 2628 East Rand 1:250 000.
- Seismic hazard map of South Africa; and
- Topography Map 2628 AA Johannesburg 1:50 000.

2. SITE DESCRIPTION

2.1 Location

The proposed pipeline to be replaced commences from the Linbro Park Reservoir, located on the eastern extent of route and at approximate coordinates – Latitude: 26° 6'13.94"S and Longitude: 28° 7'57.30"E and travels towards the west, parallel the warehouses and crosses the N3 off / on ramp south bound. It than turns north, crosses the N3 on ramp south bound and turns west at the south western edge of the dump site. The pipeline than travels underneath the N3 Highway, parallel to the drainage channel, past Skeen Valve

Chamber and terminate at Bhekilanga Valve Chamber, located on the western end of the pipeline at approximate coordinate, Latitude: 26° 6'3.99"S and Longitude: 28° 6'41.44"E.

Most sections along the pipeline route comprise short vegetation with occasional short trees and shrubs. The location of the site is shown in Figure 1

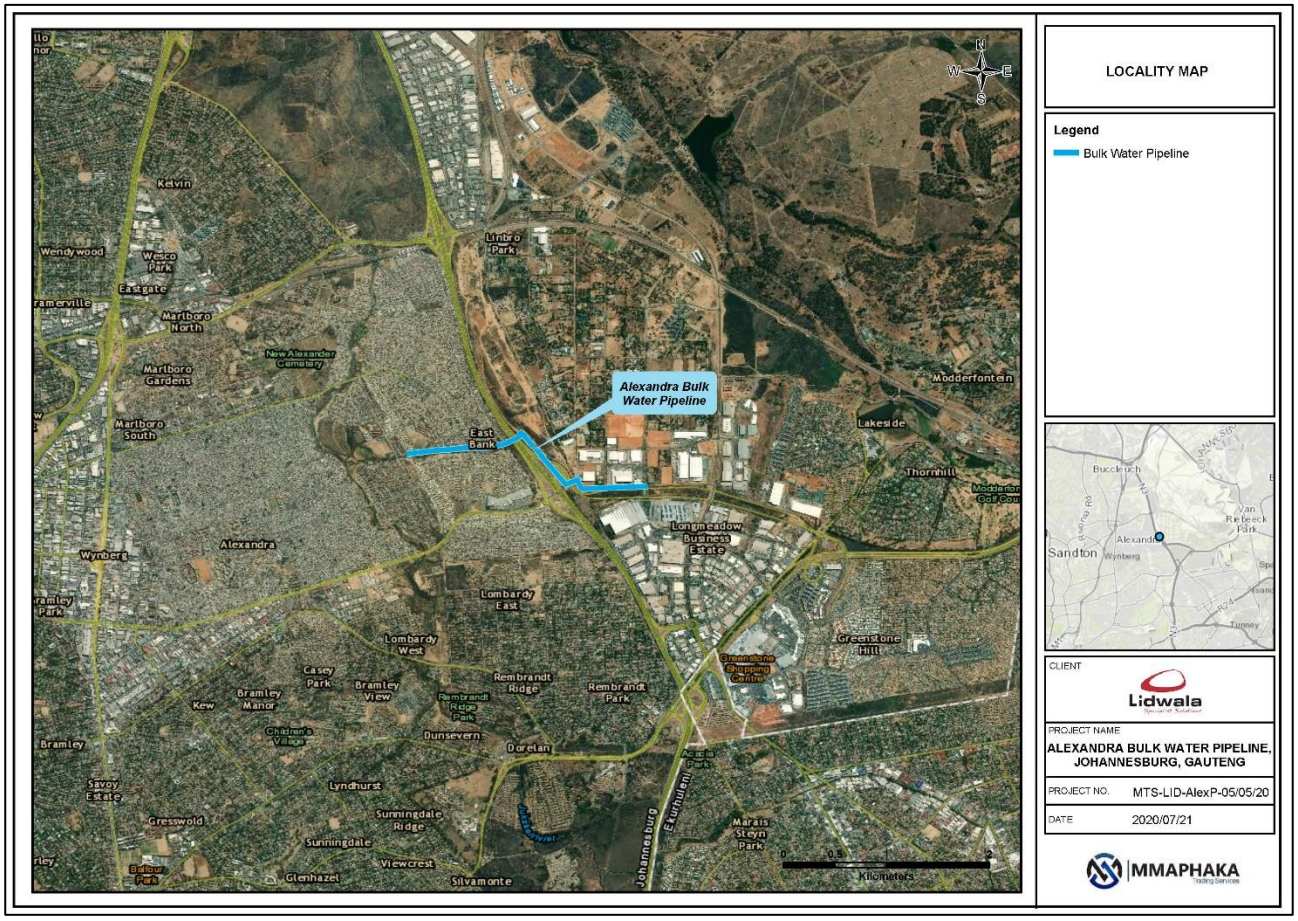


Figure 1: Satellite image showing location of the Bulk Water Steel pipeline routes.

2.2 Topography and drainage

The topography of the proposed pipeline route varies from elevations of between 1618m above mean sea-level (amsl) in the east close to Linbro Park Reservoir to 1527m (amsl) in the west towards Bhekilanga Valve Chamber. The slope gradient of pipeline route is approximately 4% towards the west. Surface runoff, particularly during periods of heavy or prolonged rainfall is expected to be in the form of sheetwash towards the west.

The extract of the topographical map presented in Figure 2. The site elevations were taken from the survey drawing provided by the client.

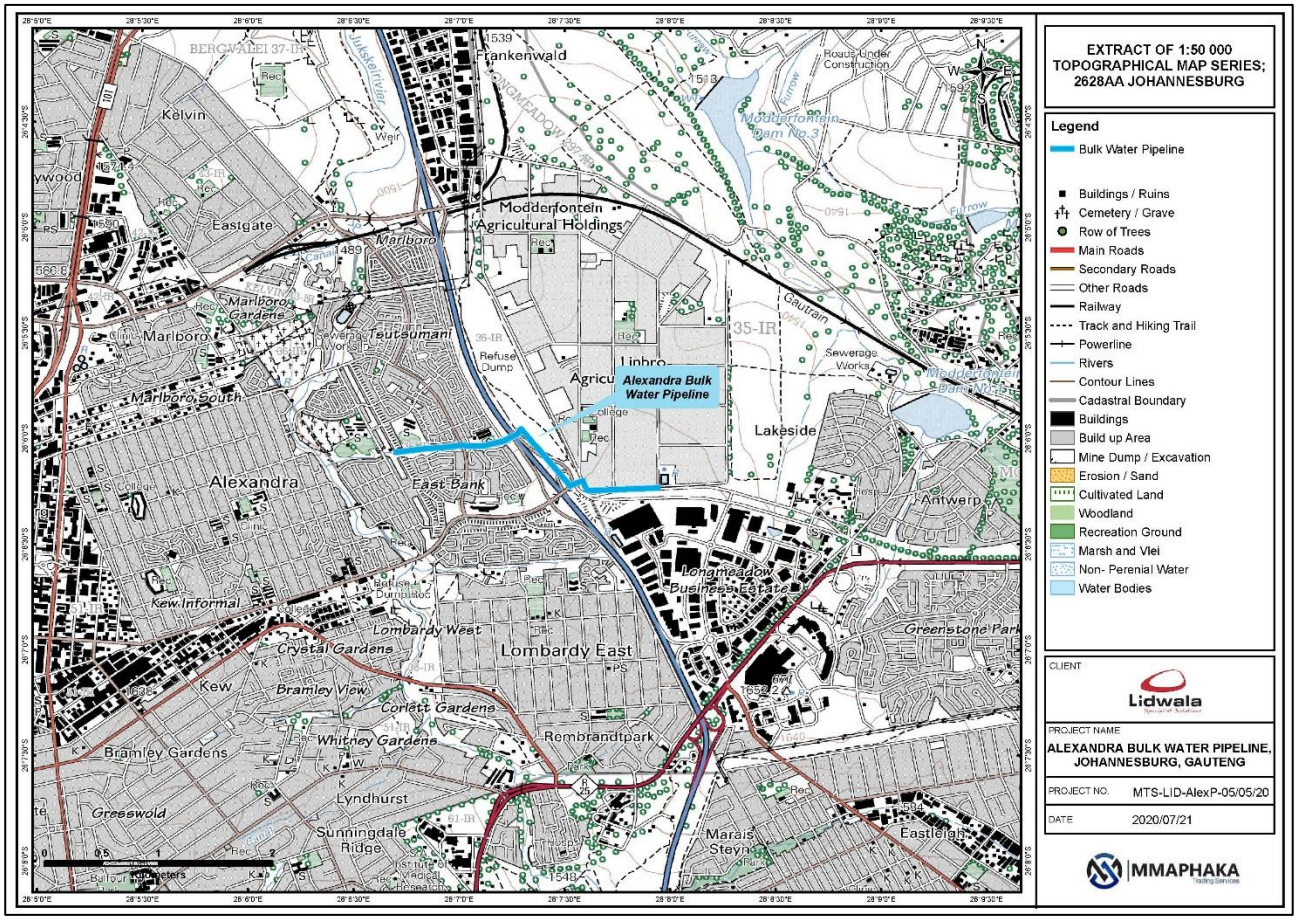


Figure 2: Extract of the Topographical Map 2628AA Johannesburg

2.3 Existing Infrastructure

Site observations indicate several existing underground utility services within the proposed pipeline services corridor. These includes a Johannesburg Water Pipelines, optic fibre, gas pipeline, valve chambers, stormwater lines and electricity cables.

Buried services could be of hindrance during construction. It is therefore recommended that all wayleaves or service detection be obtained prior to any commencement of works/excavation, to avoid service interruption. Wayleaves may be attained as shown below on Table 1.

Table 1: Underground Services Information

Name of Owner	Type of Service
Eskom	Electricity
Sasol	Gas Pipeline
Johannesburg Water	Pipeline
Local Municipality	Electricity
Local Municipality	Water & Sanitation
Local Municipality	Roads, Transport & Civil Works
DFA	Optic Fibre

2.4 Climate and Weather

The climate in Tembisa is warm and temperate. The average annual rainfall in Buccleuch is 707mm per year, most of which occurs in heavy isolated falls between October and April. The greatest amount of rainfall occurs in January with an average of 132mm. The average midday temperatures range from 10°C in July to 21°C in January. Weinert developed an N-value which is the ratio of the annual evaporation versus annual precipitation of a region and has been defined for Southern Africa region (Weinert, 1980). Climatic regime of the present and recent past plays an important role in the soil profile below the earth's surface (A.B.A Brink). The N-values are therefore used to characterise mode of weathering of the rocks within the subcontinent.

Weinert demonstrated that chemical decomposition is the predominant mode of rock weathering in areas where climatic "N-value" is less than 5. In areas where climatic N-value is between 5 and 10, disintegration is the predominant form of weathering, although some chemical decomposition of the primary rock minerals still takes place. Where the climatic N-value is greater than 10, secondary minerals do not develop to an appreciable extent and all weathering takes place by mechanical disintegration of the rock. Weinert's climatic N-value for the investigated area is between 2 and 5 as indicated in Figure 3 below. This implies that rocks are extensively weathered, often to depths of several metres, and decomposition is pronounced.

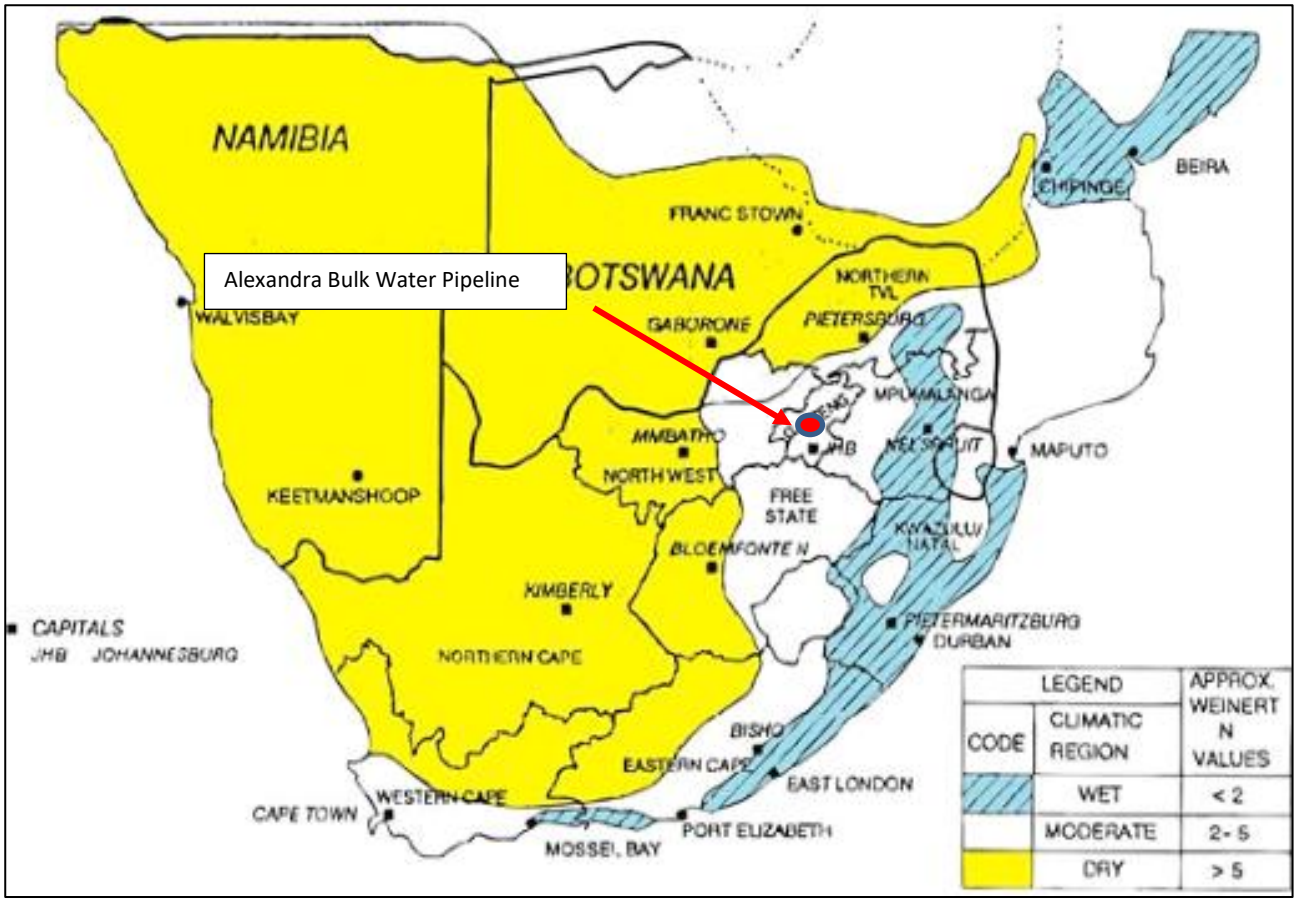


Figure 3: Macro Climatic Regions of Southern Africa (Adapted from Weinert, 1980).

3. GEOHARZARDS

3.1 Seismicity

Seismic hazard can be described as the physical effects of an earthquake or earth tremor. Examples of such phenomenon include surface faulting, ground shaking and ground liquefaction. The seismic hazard map of South Africa (Figure 4) indicates that the proposed site lies within an area where there is a 10% probability that Peak Ground Acceleration (PGA) of between 0.16 and 0.20g will be exceeded in 50 years. The peak ground acceleration is the maximum acceleration of the ground shaking during an earthquake.

Two types of seismic activities occur in South Africa, namely regions of natural seismic activity (Zone I) and regions of mining-induced and natural seismic activity (Zone II). Based on this information, the risk of seismic events for the study area is moderate to high and it falls within both natural and mining induced regions (Zone I and II).

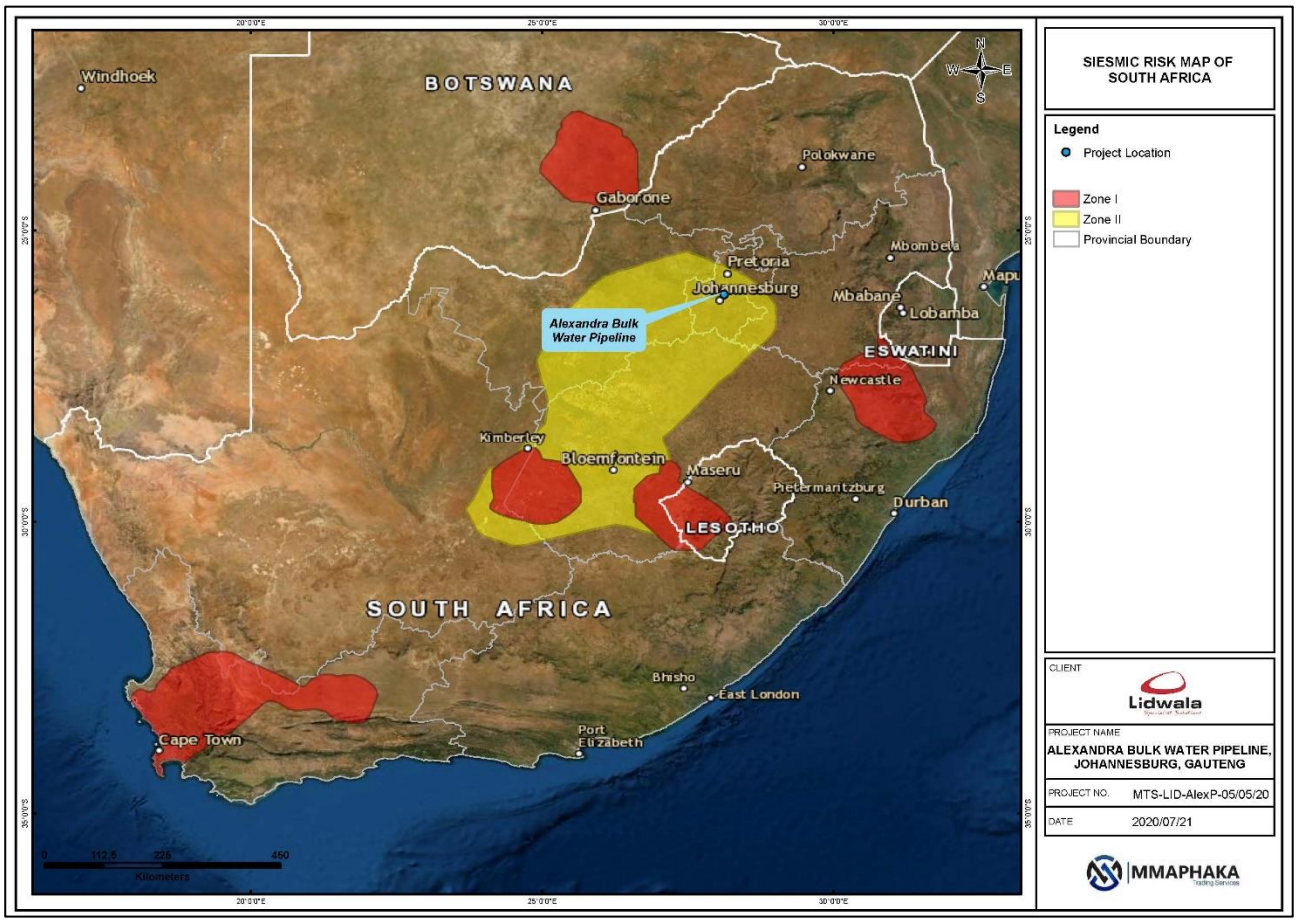


Figure 4: Seismic Hazard Map of South Africa

3.3 Dolomitic Land

The available geological map "No 2628 East Rand" and field observations indicate the pipeline route is not underlain by dolomite rock at surface or at depth (<100m). The site is therefore classified as non-dolomitic land and is at low risk in terms of dolomite related surface subsidence and hence instability associated with this rock type is not anticipated at the study area.

3.4 Undermining

No indication of the presence of undermined ground was found during the desk study or field investigation. It is certain that the site is not shallowly undermined and there is no risk of surface settlements/subsidence that may be caused by mining activities. However, it is advisable for the project engineers to verify this with the Department of Mineral Resources to ascertain if there is any undermined ground in the area.

3.5 Steep Slopes

The site is characterised by relatively flat topography with no major steep slope.

3.6 Flooding

There is no probability of widespread flooding in the area.

3.7 Geological Fault

Our review of geologic literature/geological map "No 2628 East Rand" indicates that there are no known active, potentially active, or inactive faults crossing the proposed site.

3.8 Volcanic Activities

Our review of literature/geological map indicates that there are no known active, potentially active, or inactive volcanic activity with the proposed site.

4. INVESTIGATION PROCEDURE

4.1 Literary Review

Prior to the commencement of any field work, a literary review was conducted on the data obtained from previous investigations by both Mmaphaka Engineers and other consultants in the area.

The 1:250 000 geological map, "No 2628 East Rand" was consulted to determine the regional geology in the vicinity of the site.

4.2 Geotechnical Footprint Investigation

4.2.1 Test Pits

The near surface geotechnical investigation was carried out on the 24th June 2020 and entailed a site reconnaissance followed by excavation of nine (9) test pits along the proposed pipeline route at an interval of one (1) test pit per 250m. Unfortunately, one (1) test pit could not be excavated due to lack of access and presence of existing underground services.

The test pits were excavated to depths of between 2m and 4.3m below current ground level, using a CAT 428E Tractor-Loader Backhoe (TLB), supplied by Maremar Construction. Each trial hole deemed safe to enter, was profiled by an engineering geologist according to the "Guidelines for soil and rock logging in South Africa, 2nd Impression 2002", sampled as necessary and subsequently loosely backfilled.

The positions of the test pits were co-ordinated using a hand-held GPS and are presented in Table 2. The layout drawing, attached in Appendix A, indicates the position of the test pits whilst the detailed soil profiles and geological sections are attached in Appendix B and Appendix C, respectively.

Table 2: Summary of Test Pits

Test Pit ID	Handheld GPS Coordinates		Ground Elevations (mamsl)	Depth to Invert (m) bcgl	Final Depth (m) bcgl	Water Seepage (m)	Comment
	Latitude	Longitude					
AP01	26° 6'3.91"S	28° 6'43.12"E	1526	2.8	2.6	None	Refusal on medium hard rock granite
AP02	26° 6'3.39"S	28° 6'50.32"E	1535	2.41	2.5	None	Refusal on medium hard rock granite
AP03	26° 6'2.36"S	28° 7'0.17"E	1545	3.1	3.4	None	Partial refusal on residual granite
AP04	26° 6'2.51"S	28° 7'4.28"E	1548	3.1	3.7	2.6	Refusal on medium hard rock granite
AP05	26° 5'57.46"S	28° 7'17.32"E	1569	6.3	-	-	Not excavated
AP06	26° 6'4.88"S	28° 7'23.66"E	1574	2.3	2.0	2.0	Refusal on medium hard rock granite
AP07	26° 6'11.02"S	28° 7'29.10"E	1592	2.74	4.0	None	No refusal of TLB
AP08	26° 6'13.02"S	28° 7'32.14"E	1598	3.5	3.9	None	No refusal of TLB
AP09	26° 6'14.99"S	28° 7'37.40"E	1605	3.3	4.3	None	No refusal of TLB
AP10	26° 6'14.61"S	28° 7'50.11"E	1615	2.5	4.0	None	No refusal of TLB

Legend: bcgl = below current ground level; mamsl = meters above mean sea level

4.2.2 Dynamic Probe Super Heavy (DPSH) Test

In addition to the test pits, eleven (11) Dynamic Probing Super Heavy (DPSH) tests were conducted adjacent to all the test pit and selected locations along the pipeline route. The DPSH tests were carried out to depths of between 0.9m and 7.5m below natural ground level and to estimate the density/consistency site soil material.

The DPSH is carried out using a hammer that delivers energy to the rod string by dropping a 63,5kg weight from a height of 762mm. The hammer ran using auxiliary hydraulics on the probing unit. The number of blows required to drive the cone through each successive 300mm penetration is continuously recorded. DPSH 05 was not conduct due to lack of access in the area.

A summary of DPSH locations and final depths is presented in Table 3. The layout drawing attached in Appendix A, indicates DPSH locations, whilst the DPSH results are attached as Appendix D.

Table 3: Summary of DPSH Tests Positions and Final depths

DPSH Pit No.	Site Location	Handheld GPS Coordinates		Final Depth (m)	Comments
		Latitude	Longitude		
DPSH 01	Adjacent to AP 01	26° 6'3.91"S	28° 6'43.12"E	2.4	Refusal
DPSH 02	Adjacent to AP 02	26° 6'3.39"S	28° 6'50.32"E	1.8	Refusal
DPSH 03	Adjacent to AP 03	26° 6'2.36"S	28° 7'0.17"E	1.8	Refusal
DPSH 03A	Across the road from AP 03	26° 6'2.28"S	28° 7'1.07"E	1.5	Refusal
DPSH 04	Adjacent to AP 04	26° 6'2.51"S	28° 7'4.28"E	3.6	Refusal
DPSH 06	Adjacent to AP 06	26° 6'4.88"S	28° 7'23.66"E	2.4	Refusal
DPSH 07	Adjacent to AP 07	26° 6'11.02"S	28° 7'29.10"E	0.9	Refusal
DPSH 08	Adjacent to AP 08	26° 6'13.02"S	28° 7'32.14"E	6.6	Refusal
DPSH 09	Adjacent to AP 09	26° 6'14.99"S	28° 7'37.40"E	5.7	Refusal
DPSH 10	Adjacent to AP 10	26° 6'14.61"S	28° 7'50.11"E	7.5	Refusal
DPSH 11	Centre of Clulee Road	26° 6'13.84"S	28° 7'56.59"E	2.7	Refusal

4.2.3 Soil Resistivity Survey

Soil resistivity surveys was undertaken between the 30th June and the 1st July 2020, to investigate the electrical characteristics of the ground. Thirteen (13) sites were tested with sites positioned along a predefined traverse of the pipeline, were set out in the field by an engineering geologist, to provide broad coverage of the underlying subsoil conditions.

The “Wenner Array” soil resistivity method was employed to gain information on the electrical properties of the selected investigation sites. The method proceeds by emplacing four equidistant electrodes into the ground at a known “a”-spacing. A known current is injected into the outer electrodes (C1, C2) and the resultant potential difference (voltage) is measured between the inner two electrodes (P1, P2). From the known and measured parameters, including the current, voltage and electrode configuration, an indication of how resistive the soil and rock are at depth can be obtained which are Apparent.

Electrode spacings (“a” – spacings) of 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12 and 16 metres were used where possible (see Appendix B for full resistivity dataset). Where the spread length was restricted, the next largest achievable a-spacing was used. An integrated measurement of six (No. 6) readings were taken for each

position with a 1% tolerance filter to ensure repeatability. Location data were obtained using a standard accuracy GPS in GDA94/MGA zone 50 coordinates to +/- 3 m accuracy. The detailed soil resistivity survey report is attached in Appendix E.

4.2.4 Rotary Core Drilling

Two (2) rotary core boreholes were drilled on either side of the N3 Highway, where the proposed pipe jacking is planned. The boreholes were drilled between the 30th June and 3rd July 2020 and positioned on site using a hand-held GPS unit with an accuracy of 3m.

The boreholes were advanced by rotary core drilling methods using an NWD4 double tube core barrel with an inner split tube for recovery of 52mm diameter soil and rock samples. Continuous core recovery was always striven for during the drilling to ensure that the extraction of the core from the core barrel is carried out in such a way to minimize disturbance of the core. Temporary casing was installed, where required, at the discretion of the driller.

SPT tests were carried out in each borehole. The core was logged by an experienced engineering geologist in accordance with "Guidelines for Soil and Rock Logging in South Africa, 2nd Impression, 2002".

The layout drawing, attached in Appendix A, indicates the position of the boreholes whilst the detailed borehole profiles and photographs are attached in Appendix F and Appendix G, respectively. A summary of the drilled boreholes is shown in Table 4.

Table 4: Summary of drilled boreholes

BH ID.	Handheld GPS Coordinates		Ground Elevations (mamsl)	Depth to Invert (m) bcgl	Final Depth Drilled (m)	Comment
	Latitude	Longitude				
BH 01	26° 5'59.40"S	28° 7'13.85"E	1563	7.32	10	Borehole terminated on hard rock granite
BH 02	26° 5'58.80"S	28° 7'16.95"E	1564	5.31	9.0	Borehole terminated on hard rock granite

Legend: bcgl = below current ground level; mamsl = meters above mean sea level

4.2.5 Laboratory Testing

To confirm the visual assessments of the engineering properties, representative disturbed samples were recovered from selected soil for laboratory analysis as per RFQ 14007 document. The following laboratory testing was undertaken: -

- Three (03) Modified AASHTO and California Bearing Ratio tests.
- Five (05) Foundation Indicator tests for Grading, hydrometer, and Atterberg Limits.
- Three (03) Soil pH and conductivity tests.

- Three (03) Acid soluble sulphate tests.
- Three (03) Basson Index tests for Sulphates and Chlorides.
- Four (04) Compactebility tests, and
- One (1) Water Sample for conductivity, total soluble salts, and total sulphates tests.

Testing of samples was undertaken by Civilab Materials Testing Laboratory, a South African National Accreditation System-accredited (SANAS) laboratory. The laboratory test results are included in Appendix H and discussed in section 6 below.

4.3 Groundwater

Groundwater seepage was recorded in two (2) of the nine test pits excavated during this investigation. The water seepage levels were recorded within the residual granite soils at depths of between 2m and 2.6m below current ground level. The seepage was observed to be slight to moderate.

5. GEOLOGICAL SETTINGS

5.1 Regional Geology

According to 1:250 000 geological map, "No 2628 East Rand", the regional geology comprises granitic rocks of the Basement Complex, as exposed in the Johannesburg-Pretoria Dome. Typically, these Archaean intrusive igneous rocks are crosscut by dolerite dykes of various ages. These dykes were not observed during the investigation.

From experience it is known that the depth of weathering in the granitic rocks is highly variable, with the possibility of large corestone remnants and whaleback within a granite profile. Patches of highly collapsible and kaolinised residual soils are possible, particularly in the elevated areas above 1500m above mean sea level. Figure 5 shows the proposed site on the geological map.

5.2 Site Geology

The field investigation revealed that the pipeline route is mainly underlain by a mantle of fill material and minor transported hillwash soils. These fill and transported soils are in-turn underlain by residual granite soils of the Basement Complex indicated as (Zh) on the geological map.

The residual granite soils are underlain by soft rock to hard rock granite at depth. The soil and rock profiles encountered during the site investigation is provided in Table 5 and is discussed below

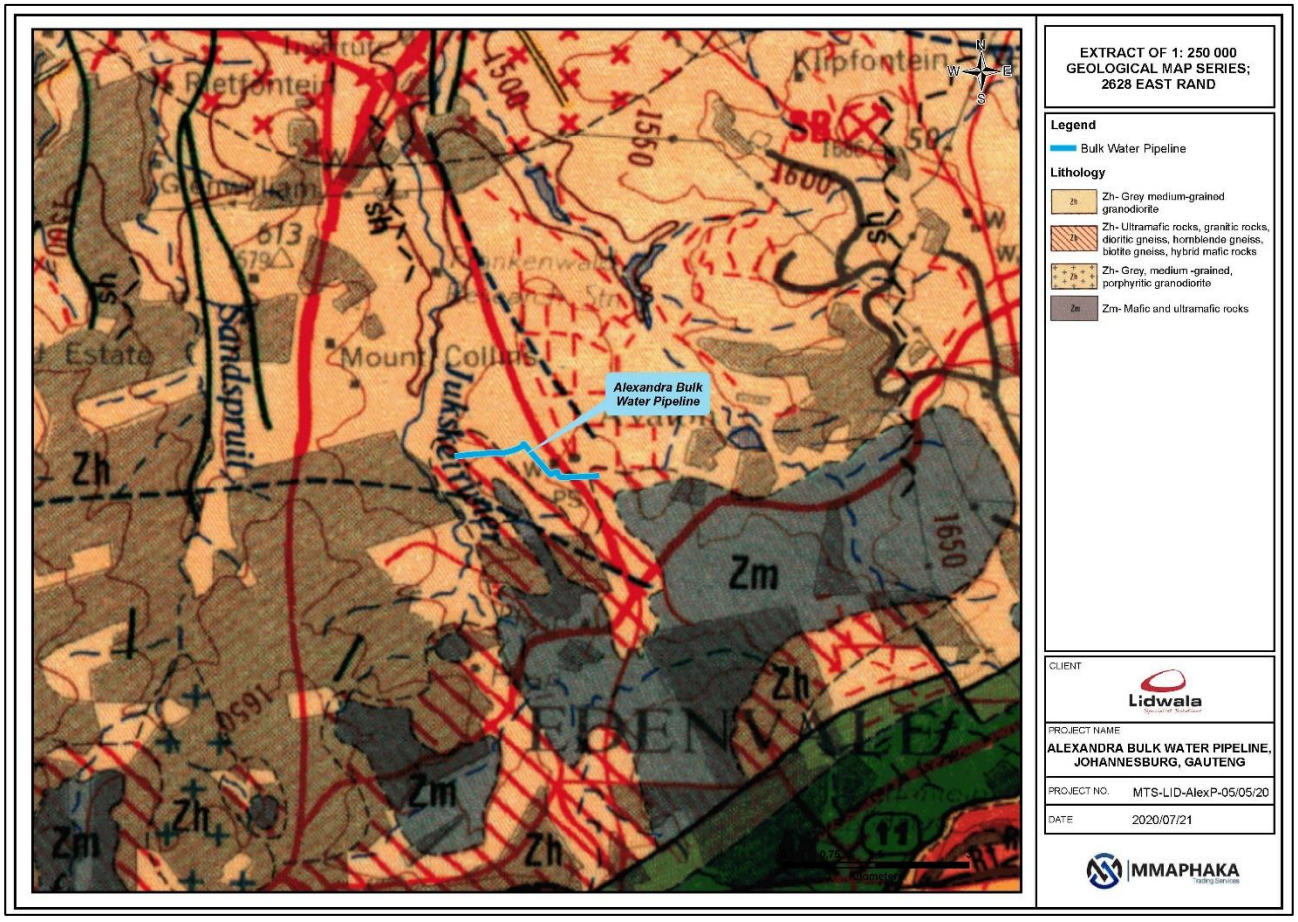


Figure 5: Extract from the 1:250 000 Geological Map (2628) East Rand.

Table 5: Summary of geology encountered in test pits

Test Pit / BH ID	Handheld GPS Coordinates		Fill (m)	Hillwash (m)	Pebble Marker (m)	Reworked Residual Granite (m)	Residual Granite (m)	Granite (m)	Final Depth (m)
	Latitude	Longitude							
AP 01	26° 6'3.91"S	28° 6'43.12"E	0.0 – 0.7	-	-	0.7 – 1.2	1.2 – 2.0	2.0 – 2.6	2.6
AP 02	26° 6'3.39"S	28° 6'50.32"E	0.0 – 0.7	-	-	0.7 – 2.5	-	-	2.5
AP 03	26° 6'2.36"S	28° 7'0.17"E	0.0 – 0.5	-	-	0.5 – 1.6	1.6 – 3.4	-	3.4
AP 04	26° 6'2.51"S	28° 7'4.28"E	0.0 – 1.0	-	-	1.0 – 3.1	3.1 – 3.7	-	3.7
AP 05	26° 5'57.46"S	28° 7'17.32"E	-	-	-	-	-	-	-
AP 06	26° 6'4.88"S	28° 7'23.66"E	-	0.0 – 0.5	-	0.5 – 1.0	1.0 – 2.0	-	2.0
AP 07	26° 6'11.02"S	28° 7'29.10"E	0.0 – 0.2	-	-	-	0.2 – 4.0	-	4.0
AP 08	26° 6'13.02"S	28° 7'32.14"E	0.0 – 3.9	-	-	-		-	3.9
AP 09	26° 6'14.99"S	28° 7'37.40"E	0.0 – 0.5	-	-	-	0.5 – 4.3	-	4.3
AP 10	26° 6'14.61"S	28° 7'50.11"E	0.0 – 1.0	-	1.0 – 1.4	1.4 – 2.8	2.8 – 4.0	-	4.0
BH 01	26° 5'59.40"S	28° 7'13.85"E	0.0 – 1.7	1.7 – 1.9	-	1.9 – 2.5	2.5 – 3.5	3.5 - 10	10
BH 02	26° 5'58.80"S	28° 7'16.95"E	0.0 – 1.5	-	-	-	1.5 – 3.15	3.15 – 9	9.0

5.2.1 Fill

Fill material was encountered in most test pits excavated and includes a layer of transported material contaminated with rubble, plastics and building rubble with moderate organic material. Generally, this horizon is intercepted from surface and extended to depths of between 0.2m and 1m below current ground level. The area around AP 08 however comprises of a thick fill layer greater than 3.9m in depth.

The overall consistency of the fill layer generally comprised “loose through to dense with isolated medium dense zones”.

5.2.2 Transported material

The transported soils (hillwash) are non-cohesive materials which are observed in AP 06 and BH 01 only from surface to depths of between 0.5m and 1.9m below current ground level. This material comprised “wet, grey brown, loose to medium dense, intact, silty sandy gravel”.

5.2.3 Pebble Marker

The pebble marker horizon represents the contact zone between the upper transported soils, and the lower residual materials. This material is observed in one test pits (AP 10) and generally comprises “moist, grey brown to red brown, silty sand with abundant sub-angular fine, medium and coarse quartz and granite gravels with an overall consistency of dense”.

The pebble marker is intersected below the fill material at a depth of 1m below current ground level and is approximately 0.4m thick.

5.2.4 Reworked Residual Granite

The reworked residual granite layer was encountered in most test pits and boreholes on site. This stratum is typically described as “moist, grey brown, blotched orange brown and mottled dark red, medium dense becoming dense to very dense with dept, intact, gravelly sand”. This horizon was encountered below the fill, hillwash and pebble marker soils, at depths of between 0.5m and 1.9m below current ground level. This material extends to depths of between 1.0m and 3.1m (average 2m) below current ground level.

5.2.5 Residual Granite

Residual granite originates from the in-situ weathering of the granite parent rock and underlies the entire pipeline route. This material is encountered at depths of between 0.2m and 3.1m (average 1.5m) below existing ground level and extends to depths of between 2m and 7.5m. The residual granite generally comprises greyish brown blotched orange and stained dark red, clayey gravelly sand. These soils were

generally “moist grading to very moist to wet and dense to very dense in consistency with medium dense zones”.

5.2.6 Soft Rock to Medium Hard Rock Granite

Soft to medium hard rock granite horizon typically described as orange brown, stained black, very highly weathered, coarse grained, jointed, soft rock to medium hard rock. The soft to medium hard rock granite is encountered below the residual soils at depths of between 2m and 4.3m below current ground level. Refusal of the TLB and DPSH occurred on medium hard to hard rock at depths of between 2.0m and 7.5m below current ground level.

6. RESULTS OF GEOTECHNICAL INVESTIGATION

Representative samples were retrieved during the field investigation and submitted to Civilab Materials Testing Laboratory; a South African National Accreditation System-accredited (SANAS) laboratory based in Johannesburg. The following tests were scheduled.

6.1 Foundation Indicator Tests

Five (5) disturbed samples were submitted to the laboratory and subjected to foundation indicator testing (as per SANS 3001 test methods) to determine the basic engineering properties of the in-situ materials the results are attached in Appendix H and summarized in Table 6.

Table 6: Summary of foundation Indicator laboratory results

Test Pit ID.	Depth (m)	Description	Soil Composition				GM	Atterberg Limits			MC	Activity	USCS	AASHTO
			Clay (%)	Silt (%)	Sand (%)	Gravel (%)		LL (%)	PI (%)	LS (%)				
Reworked Residual Granite														
AP10	1.4 – 2.8	Clayey gravelly sand	27	14	41	18	1.25	41	18	8.5	10.1	Low	SC	A-7-6(4)
Residual Granite														
AP02	0.7 – 2.5	Gravelly silty sand	8	13	56	23	1.54	33	19	9.5	16.6	Low	SC	A-2-6(1)
AP03	1.6 – 3.4	Gravelly silty sand	4	10	56	30	1.80	23	10	4.0	6,6	Low	SC	A-2-4(0)
AP04	1.0 – 3.1	Clayey silty sand	16	9	68	7	1.30	29	16	6.0	14.8	Low	SC	A-2-6(1)
AP07	0.2 – 4.0	Gravelly silty sand	10	11	61	18	1.59	41	17	7.0	10.5	Low	SC	A-2-7(1)

Legend: GM=Grading Modulus; LL = Liquid Limit; PI = Plasticity Index; LS = Linear Shrinkage; MC = Natural Moisture Content; SC = clayey sands, poorly-graded-sand-clay mixtures; SM = Silty sand, poorly graded sand-silt mixtures; USCS = Unified Soil Classification System; AASHTO = American Association of State Highway Officials.

The **reworked residual granite** soils generally consist of clayey sands, poorly-graded-sand-clay mixtures **(SC)** according to the Unified Soils Classification System (USCS). This material exhibits medium plasticity with a liquid limit of 41% and a plasticity index of 18%.

The sample tested indicate a low potential of expansiveness according to the method proposed by Van der Merwe (1973). The drainage characteristic of the material is good and are reasonably medium in texture, with moderate grading modulus of 1.25. The reworked residual granite material classifies as A-7-6 according to the AASHTO Classification System, which rates as poor quality for use as subgrade layers.

The PI for the reworked residual granite soils is not acceptable for Stage 1 backfilling. The material also has a Coefficient of Uniformity, Cu = 0 and the Coefficient of Curvature (Cc) of 0, the reworked residual soils does not meet these criteria.

The **residual granite** soils generally consist of clayey sands, poorly-graded-sand-clay mixtures **(SC)** according to the Unified Soils Classification System (USCS). This material exhibits medium plasticity with a liquid limit of 41% and a plasticity index of 18%.

This material exhibits medium plasticity with a liquid limit ranging between 23% and 41% and a plasticity index ranging from 10% to 19%. The samples tested indicate a low potential of expansiveness according to the method proposed by Van der Merwe (1973). The drainage characteristic of the material is good and are reasonably medium in texture, with moderate grading modulus of between 1.3 to 1.8.

The PI for the residual granite soils is not acceptable for Stage 1 backfilling with an exception to material from AP03. However, in terms of the Unified Soil Classification System, the soil for Stage 1 backfill shall be well graded with the Coefficient of Uniformity, Cu > 5 and the Coefficient of Curvature (Cc) in the range 1 < Cc < 3, the residual soils does not meet these criteria with exception to AP03.

6.2 Compaction Tests

Three (3) bulk sample was taken for moisture/ density relationship and compaction (MOD and CBR) testing to determine the compaction characteristics of the in-situ material. The result is included in Appendix H and summarized in Table 7 below.

Table 7: Summary of moisture/ density relationship & Compaction Characteristics results

Test Pit ID.	Depth (m)	Description	OMC (%)	MDD (kg/m³)	Max Swell (%)	CBR at Mod. AASHTO Compaction Effort				TRH14
						90 (%)	93 (%)	95 (%)	98 (%)	
Residual Granite										
AP02	0.7 – 2.5	Gravelly silty sand	8.2	2046	0.7	3	3	4	5	**<G10**
AP04	1.0 – 3.1	Clayey silty sand	8.2	2035	0.6	3	3	4	4	**<G10**
AP07	0.2 – 4.0	Gravelly silty sand	11	1963	0.2	7	11	14	20	**G9**

Legend: OMC = Optimum Moisture Content; MDD = Maximum Dry Density; CBR = California Bearing Ratio; TRH = Technical Recommendations for Highways; Mod = Modified AASHTO = American Association of State Highway Officials.

The moisture/density test conducted on the **residual granite** soils determined maximum dry density at the Modified AASHTO compaction effort of between 1963kg/m^3 and 2046kg/m^3 at optimum moisture content of between 8.2% and 11% with low swell value of between 0.2% and 0.7%. This material suggests low CBR values of between 3% and 11% at compaction densities of 93% and 95% Modified AASHTO respectively. These results classify residual granite as G9 to worse than G10 quality, according TRH14 classification system.

Generally, the maximum dry density of the soil for Stage 1 backfill determined from the Modified AASHTO - test shall be greater than 1950kg/m^3. The residual soils meet the minimum, maximum dry density.

6.3 Compactibility Tests

Four (4) samples were submitted for compatibility tests to determine its suitability as a selected granular material or a selected fill blanket. The results are summarized in Table 8.

Table 8: Summary of compactibility characteristics

TP ID.	Depth (m)	Material Type	Compatibility Factor	Moisture Content (%)
Reworked Residual Granite				
AP10	1.4 – 2.8	Clayey gravelly sand	0.333	5.7
Residual Granite				
AP03	1.6 – 3.4	Gravelly silty sand	0.433	12.9
AP04	1.0 – 3.1	Clayey silty sand	0.367	4.7
AP07	0.2 – 4.0	Gravelly silty sand	0.333	7.7

The results of the compatibility test suggest compatibility factor raging between 0.333 and 0.433 at moisture content of between 4.7 and 12.9. These materials meet the criteria for the compactibility factor (<0.4) for a selected granular material, based on SABS 1200LB-1983 standard.

6.4 pH and conductivity Tests

Three (3) samples were submitted for chemical tests to determine the pH and conductivity characteristics of the in-situ material.

Corrosion of buried metallic elements is a complex problem which is influenced by factors such as.

- The electrical conductivity of the soil.
- Chemical properties of the soil.
- Ability of the soil to support sulphate reducing bacteria.
- The heterogeneity of the soil (long-line currents).
- Differential aeration.

- Stay currents in the soil; and
- Bacterial attack.

Corrosion is an electrochemical process whereby metals are charged, and electrical energy is released. The conductivity of the soil therefore has a profound influence on the rate of corrosion of buried metallic objects. Table 9 provide the evaluation of the conductivity of soil and the results are attached in Appendix H and summarized in Table 10.

Table 9: Guideline values for interpretation of soil conductivity

Soil Conductivity (mS/m)	Resistivity-(R) Ohm/cm	Degree Corrosion	pH	Degree of Acidity
			< 4.0	Extremely acidic
			4 - 5.4	Strongly acidic
More than 50	0 – 2 000	Extremely corrosive	5.5 - 6.4	Moderately Acidic
25 - 50	2 000 – 4 000	Very Corrosive	6.5 - 7.0	Slightly Acidic
20 - 25	4 000 – 5 000	Corrosive	7.1 - 7.4	Slightly Alkaline
10 - 20	5 000 – 10 000	Mildly corrosive	7.5 - 8.5	Moderately Alkaline
Less than 10	>10 000	Not generally corrosive	>8.4	Strongly Alkaline

Table 10: Interpretation of Conductivity Test

TP ID.	Depth (m)	Description	Conductivity mS/m	Corrosiveness	pH	Degree of Acidity
Reworked Residual Granite						
AP10	1.4 – 2.8	Clayey gravelly sand	20	Mildly corrosive	6.1	Moderately Acidic
Residual Granite						
AP03	1.6 – 3.4	Gravelly silty sand	18	Mildly corrosive	6.9	Slightly Acidic
AP07	0.2 – 4.0	Gravelly silty sand	6	Not generally corrosive	5.6	Moderately Acidic

The results of the chemical testing carried out on samples taken site, indicate that the **reworked residual granite** materials are mildly corrosive towards steel and the degree of acidity is moderately acidic. Whilst the **residual granite** soils ranges from generally not corrosive to mildly corrosive and slightly to moderately acidic with regards to degree of acidity.

The in-situ soils would be deleterious to the pipe. Appropriate allowance should be made in the design of the pipeline to withstand the anticipated corrosive environment.

6.5 Acid Soluble Sulphate Tests

Three (3) sample was submitted for chloride and soluble sulphate tests. The results are summarized in Table 11.

Table 11: Summary of chloride and soluble sulphate test results

Test Pit ID.	Depth (m)	Description	Soluble SO_3 (%)
Reworked Residual Granite			
AP10	1.4 – 2.8	Clayey silty sand	<0.01
Residual Granite			
AP02	0.7 – 2.5	Gravelly silty sand	<0.01
AP03	1.6 – 3.4	Gravelly silty sand	<0.01

The presence of sulphate content tends to decrease soil resistivity and thus increasing corrosivity. Laboratory results suggest the residual soils to have less than 0.01% sulphate and considered to be mildly corrosive toward steel.

6.6 Basson Index Tests

Three (3) Basson Index testing was undertaken to determine the aggressiveness and corrosivity of the soils to buried concrete and metal. The results are provided in Table 12.

Table 12: Summary of Basson test results

Test Pit ID.	Depth (m)	Material Type	Aggressiveness Index	Langelier Index	Basson Index
Reworked Residual Granite					
AP10	1.4 – 2.8	Clayey silty sand	1589	-1.2	Aggressive
Residual Granite					
AP02	0.7 – 2.5	Gravelly silty sand	1015	-0.5	Aggressive
AP03	1.6 – 3.4	Gravelly silty sand	1032	-0.3	Aggressive

Results obtained from the Basson Index test suggest the residual granite soil to be corrosive towards metals and generally aggressive towards concrete.

6.7 Conductivity, Total soluble Salts & Total Sulphates

One (1) water sample was taken to determine the total soluble salts and sulphate within the water together with its conductivity. The results are provided in Table 13.

Table 13: Summary of water tests

Sample ID.	Location	Conductivity mS/m	Total Suspended Solids, TSS (mg/L)	Sulphate (mg/L)
Water Sample	Drainage channel	22	8	20.56

The results indicate the water is generally corrosive with sulphate within the limit of the 400mg/L stipulated under south Africa's drinking water standards.

6.8 DPSH Test Results

The DPSH results typically indicates dense horizon of transported soil material with an average "N values" ranging between 30 and 42 from surface to a depth of 0.9m below ground level. Transported soil is underlain by the in-situ soils, generally medium dense and dense to a depth of 2.7m below the ground level with an average "N values" ranging between 28 and 38. DPSH results shows refusal of the equipment at a depth varying between 0.9m and 6.6m below ground level with consistency of dense becoming very dense with depth.

The estimated allowable bearing capacity (EABC) for shallow foundations is based on the empirical correlation for EABC = 10 x SPT N based on Terzaghi. Table 14 indicates the summary of Blow Count (N Values) from DPSH tests results, while DPSH test results are attached in Appendix D.

Table 14: Summary of Blow Count (N Values) from DPSH tests results

Depth (m)	Equivalent SPT N Values (80% of DPSH Blow Count Values)												EABC (kPa)	Consistency
	DPSH Test No.											Average		
	1	2	3	3A	4	6	7	8	9	10	11			
-0.3	14	5	19	2	5	4	42	37	15	7	14	15	149	medium dense
-0.6	9	6	32	4	7	8	78	34	11	18	37	22	222	medium dense
-0.9	5	11	10	25	3	21	80	46	10	16	33	24	236	medium dense
-1.2	13	19	8	14	2	10		31	7	6	59	17	169	medium dense
-1.5	46	49	69	80	2	6		26	6	11	38	33	333	dense
-1.8	75	80	80		2	8		28	2	10	14	33	332	dense
-2.1	73				2	34		20	3	6	14	22	217	medium dense
-2.4	80				6	80		10	5	4	36	32	316	dense
-2.7					6			7	6	6	80	21	210	medium dense
-3					13			6	6	6		8	78	loose
-3.3					34			5	7	5		13	128	medium dense
-3.6					80			6	14	6		27	265	medium dense
-3.9								7	14	6		9	90	loose
-4.2								6	17	6		10	97	loose
-4.5								9	23	6		13	127	medium dense
-4.8								14	23	3		13	133	medium dense
-5.1								16	28	6		17	167	medium dense
-5.4								19	38	9		22	220	medium dense
-5.7								21	80	7		36	360	dense
-6								42		11		27	265	medium dense

Depth (m)	Equivalent SPT N Values (80% of DPSH Blow Count Values)												EABC (kPa)	Consistency
	DPSH Test No.											Average		
	1	2	3	3A	4	6	7	8	9	10	11			
-6.3								58		10		34	340	dense
-6.6								80		11		46	455	dense
-6.9										17		17	170	medium dense
-7.2										30		30	300	medium dense
-7.5										80		80	800	very dense
Legend - Equivalent SPT N Values - Consistency Description														
< 4 – Very loose														
5 - 10 – Loose														
11 - 30 – Medium dense														
31 - 50 - Dense														
> 50 – Very dense														

6.9 Spangler's Modulus of Soil Reaction (E-Values)

The Spangler's modulus of soil reaction, denoted E values (and other parameters) for pipe thickness design and design requirements are taken from the standard BS EN 1295 Table NA.1 and indicated in Table 15.

Table 15: Guide values of Sprangler Modulus of native soils

Table NA.1 Guide values of Spangler modulus for native soils					
Soil type	**Spangler modulus for soils in various conditions** (MN/m^2)				
	Very dense	**Dense**	**Medium dense**	**Loose**	**Very loose**
Gravel	Over 40	15 to 40	9 to 15	5 to 9	3 to 5
Sand	15 to 20	9 to 15	4 to 9	2 to 4	1 to 2
Clayey, silty sand	10 to 15	6 to 10	2.5 to 6	1.5 to 2.5	0.5 to 1.5
Clay	Very hard	11 to 14			
	Hard	10 to 11			
	Very stiff	6 to 10			
	Stiff	4 to 6			
	Firm	3 to 4			
	Soft	1.5 to 3			
	Very soft	0 to 1.5			

The Spangler Modulus MN/m^2 for soils conditions excavated on site are provided in Table 16 below:

Table 16: Summary of Sprangler's modulus

Test Pit No.	Inverts Level (m)	Soil Type	Consistency	E-Values (MN/m²)
AP 01	2.8	Gravelly silty sand (rock)	Soft rock	>40
AP 02	2.41	Gravelly silty sand	Very dense	15 – 20
AP 03	3.1	Gravelly silty sand	Very dense	15 – 20
AP 04	3.1	Gravelly silty sand	dense	9 – 15
AP 05	6.3			
AP 06	2.3	Gravelly silty sand (rock)	Soft rock	>40
AP 07	2.74	Gravelly silty sand	Dense	9 – 15
AP 08	3.5	Gravelly silty sand	Medium dense	4 – 9
AP 09	3.3	Gravelly silty sand	Medium dense-	4 – 9
AP 10	2.5	Silty sand	Loose	2 – 4
BH 01	7.32			2.5 - 6
BH 02	5.31			

6.10 Modulus of Subgrade Reaction

For a 600mm diameter pipe, the following modulus of subgrade reaction should be adopted, based on an average soil modulus below the average invert level from DPSH probes.

Table 17: Summary of modulus of subgrade reaction

DPSH ID.	Invert Levels (m)	Average Spangler's Modulus (MN/m²)	*SPT-N*	Modulus of Subgrade Reaction (MPa/m)
DPSH 01	2.8	17	80	133,333
DPSH 02	2.41	17	80	133,333
DPSH 03	3.1	17	80	88,889
DPSH 03A	3.01	17	80	88,889
DPSH 04	3.1	12	34	37,778
DPSH 05	6.3	-	-	-
DPSH 06	2.3	17	80	88,889
DPSH 07	2.74	12	31	37,778
DPSH 08	3.5	3	6	6,667
DPSH 09	3.3	3	7	7,778
DPSH 10	2.5	3	6	6,667
DPSH 11	3.24	17	80	40

6.11 Embedment Classes based on British Standards

Embedment classes tables for ductile iron pipe are defined in BS EN 1295-1:1997and presented in Table 18.

Table 18: Embedment classes (BS9295:2010, guide to structural design of buried pipeline)

Class	Component	Materials
S1	Bed and sidefill	Gravel (single size)
S2		Gravel (graded)
S3		Sand and coarse grained soil with <12% fines
S4		Coarse grained soil with >12% fines OR Fine grained soil, liquid limit <50%, medium to no plasticity and >25% coarse grained material
S5		Fine grained soil, liquid limit <50%, medium to no plasticity and <25% coarse grained material
D	Bed	Trench bottom with joint holes to ensure that the barrel is fully supported
	Sidefill	S3 to S5

Based on the laboratory test results of the in-situ soils, the embedment classes are presented in Table 19.

Table 19: Embedment classes

Material Type	Class
Reworked residual granite	S4
Residual granite	S4

7. GEOTECHNICAL ASSESMENT

7.1 Excavatability

The excavation characteristics of the different soil horizons have been evaluated according to the South African Bureau of Standards standardised excavation classification for earthworks (SABS – 1200D) and earthworks (small works – SABS 1200DA). In terms of this classification and the in-situ soil/rock consistencies as profiled, the relationships given below are generally applicable. For specific excavation requirements refer to the soil profiles in Appendix B.

1. "Soft excavation" - very loose/very soft through to dense or stiff.
2. "Intermediate excavation" - very dense/very stiff through to very soft rock.
3. "Hard excavation" - soft rock or better.

Soft excavation, material which can be efficiently removed or loaded, without prior ripping, by any of the following plant; a bulldozer or a track type front end loader having an approximate mass of 22 tonne and a fly wheel power of 145kw and a tractor-scraper unit having an approximate mass of 20 tonne and a fly wheel power of 245kw, pushed during loading by a bulldozer equivalent to that described above (SABS 1200D). These materials were observed on topsoil/fill, hillwash and residual granite in all test pits excavated during site investigation.

The Intermediate/Hard excavations, these are material that can be efficiently ripped by a bulldozer having an appropriate mass of 35 tonne and a fly wheel power of 220kw. The medium hard rock to hard rock granite may require the use of pneumatic tools, large excavation equipment and the possibility of drilling and blasting process.

Based on the test pits, borehole profiles and DPSH tests, it is anticipated that the site would classify as "soft excavation" to a depth of between 2m and 7.5m below current ground level in accordance with SANS 1200 DA classification, using similar plant as employed during this investigation.

7.2 Potentially Active Soils

From visual observations during the site investigation and laboratory test results, the residual granite materials recovered from the laboratory test results are characterised by low potential expansiveness.

7.3 Erodible Soils

Due to the flat to slightly steep slopes from east towards west on the site, problems with erosion are unlikely expected in spite of the slight of a vegetation cover and infrastructure. Protective measures against flooding and erosion must be implemented adjacent to all water courses and drainage lines.

7.4 Underground services

Underground services exist along the proposed site; this includes bulk water pipelines, sewer lines, reticular water pipes, stormwater drainage channels, communication, and electric cables. The proposed pipeline will be constructed in remarkably close proximity to existing pipelines and other services. This may be problematic during construction, particularly were trench instability will be encountered, as the proximity of the nearby pipelines will prevent battering back of the trench sidewalls to a stable angle. Potential loss of support to the adjacent pipelines during trenching must be taken into consideration during construction and planning.

7.5 Construction material

No existing borrow pits in proximity to site/ study area were identified. The selected granular material and selected fill blanket should be imported.

A list of commercial sources located close to the site, from which borrow materials may be sourced is provided in Table 20.

Table 20: Contact details of commercial sources for borrow materials

Name	Address	Contact Details
Rossway Quarry	Midrand, Gauteng	012 652 0107
SPH Sand,	Midrand, Gauteng	012 657 1521
Pavement Material Group	546, 16th Road, Midrand, Johannesburg	010 442 9535
Raumix Crushco Quarry	Kempton Park NU, Kempton Park, 1501	086 122 2345.
Witfontein Sand Quarry	Witfontein 15 Ir 33, Kempton Park	011 391 7380

8. RECOMMENDATION

8.1 Earthworks

The findings of the geotechnical investigation show that suitable founding conditions, comprising dense, very dense through to soft rock granite, can typically be expected at the following depths:

- At depths of approximately 2m and 7.5m where soft to medium hard rock are encountered.
- Corestones within the residual material should also be anticipated.

In terms of the SANS 1200LB (1983), bedding material for buried flexible pipelines comprise "selected granular material", selected fill material" and “main fill” is used to blanket the buried pipeline.

8.1.1 Selected Granular Material - Bedding Cradle

Stage 1 or selected granular material is the zone that is placed beneath the pipe and extends up the sides to a specified thickness and must comprise a selected granular material of non-cohesive material that is singularly graded between 0.6mm and 19mm, is free draining and has a compatibility factor not exceeding 0.4, or other values specified under the project specifications.

Singularly graded is defined as a material in which over 90 % by mass of the grains is retained on a single sieve of any specified size aperture between stated limits.

Generally, “selected granular material for Stage 1 backfill shall comprise loose fine soil being mainly sandy or clayey material with a plasticity index not exceeding 15. Selected granular material shall contain no ouklip or materials chemically deleterious to the pipe and shall be free of pebbles, stones, and fragments of shattered rock with maximum dimensions exceeding 10mm.

In terms of the Unified Soil Classification System, the soil for Stage 1 backfill shall be well graded with the Coefficient of Uniformity, Cu > 5 and the Coefficient of Curvature (C_c) in the range 1 < Cc < 3

The maximum dry density of the soil for Stage 1 backfill determined from the Modified AASHTO - test shall be greater than 1950kg/m^3.

Selected granular material shall be compacted to 90% of Modified AASHTO density in 200mm maximum thick layers.

If the trench is excavated in hard rock material, then the Stage 1 material should be foam cement mortar or soilcrete”.

For an 600mm diameter pipe placed in a 1.2m wide trench, with a 150mm thick compacted bedding cradle, and selected granular material placed between the sides of the trench and the pipeline, approximately 2450m^3 of material will be required.

Based on the results of the sieve analysis of the soils encountered on site, the in-situ materials meet the criteria with regards to compatibility factor and dry density, however the high PI on the material dispossess the encountered soil to meet the criteria. It is recommended that selected granular material is imported. The PI could be reduced by addition of lime and cement; however, this would need to be tested.

8.1.2 Selected Fill Material

Stage 2, or the selected fill blanket is the material extending from above the bedding, which is placed and compacted around and above the pipe. This material shall have a plasticity index (PI) not exceeding 6, a maximum particle size not exceeding 30mm and be free of vegetation according to SABS 1200LB.

Generally, stage 2 backfill should be compacted to 85% of Modified AASHTO density in 300mm maximum thick layers which have varying thicknesses throughout the length of the pipe. For a 1.6m wide trench, approximately 7000m^3 of material will be required.

The in-situ residual granite soils on site are not suitable for use as selected fill due to the high plastic index.

8.1.3 General Backfill

This material, also known as “main fill”, is an approved filling material placed in the pipe trench on top of the “selected fill material” up to ground level and normally consists of material originally removed from the trench for the pipe excavation. It has no specific stipulations in respect of material quality, other than that it must be free of excessively large boulders.

All the subsoils encountered on site may be used as general backfill provided boulder size fractions (>200mm) are removed.

8.2 Pipejacking Locations

The individual pipejacking locations are discussed below based on test pits, DPSH and boreholes undertaken.

8.2.1 Pipejacking at Clulee Road (Jacking No 1.)

Pipejacking is proposed across Clulee Road, along the existing pipeline alignment with invert levels ranging between 3.2m and 3.24m. A tests pit could not be excavated in this area due to the extent of buried services. However, based on the DPSH probing conducted on an island of this road, refusal was attained at a depth of

2.7m below current ground level. Residual granite is anticipated to be encountered at this depth and It is also possible that medium hard rock cobbles and boulders can occurs within the residual material.

Provision should be made for excavation/ pipe jacking through medium dense to dense residual granite with possible cobbles and boulders along the pipeline alignment to depth of 3.3m below current ground level.

8.2.2 Pipejacking at the N3 Off Ramp South (Jacking No 2.)

The proposed pipejacking across the N3 Off Ramp South with invert levels ranging between 3.1m and 3.3m below current ground level will possibly go through fill or residual granite soils (on the eastern extent). Based on the DPSH probing and test pits carried in this area, medium dense to dense consistencies are anticipated within these horizons.

8.2.3 Pipejacking at N3 Highway (Jacking No 3.)

Pipejacking is proposed across the N3 Highway and along the existing pipeline alignment comprise invert levels ranging between 5.31m (eastern extent) and 7.33m (western extent). Based on the boreholes drilled, the medium hard to hard rock pegmatitic granite are anticipated at these depths. This material is moderately weathered with occasional highly weathered zones. The jointed and highly fractured natured of this material makes drilling difficult. This is illustrated in BH2 were poor core recoveries were obtained on this material.

Provision should be made for drilling through difficult hard rock conditions.

8.2.4 Pipejacking at South Africa Boulevard (Jacking No 4.)

Invert levels ranging between 3.0m and 3.3m are proposed at pipejacking point 4, across South Africa Boulevard. According to DPSH4 and test pit AP4, carried out close to this area, the residual granite soils with dense to very dense consistencies are anticipated at these depths. It is also possible that medium hard rock cobble and boulders may occurs within the residual material. This was however not observed on the test pits.

8.2.5 Pipejacking at Lenin Drive (Jacking No 5.)

Pipejacking is proposed across Lenin Drive, with invert levels ranging between 3.0m and 3.1m below current ground level. Based on the test pits and DPSH probing carried out in this area, residual granite with is anticipated to be encountered at these depths. It is also possible that medium hard rock cobble and boulders can occurs within the residual material.

Provision should be made for excavation/ pipe jacking through medium dense to dense residual granite with possible cobbles and boulders along the pipeline alignment.

8.3 Stability of Excavation Sidewalls

All test pits excavated during the investigation of the proposed site were reported as having stable sidewalls and stood vertically, unsupported whilst profiling was carried out. It is recommended that the sides of any excavations deeper than 1.5m should be battered to 1:1.5, to ensure enough slope stability to prevent collapse of the sidewalls. During periods of heavy rainfall however, the sides of the excavations should be regularly examined, to ensure the safety of the excavation for personnel and equipment working in them.

8.4 Groundwater Management

Slight to moderate groundwater seepage was recorded in two (2) test pits excavated during this investigation at depths of between 2m and 2.6m below current ground level.

Precautions will need to be taken with damp proofing around structures in cut. In addition, suitable drainage may need to be installed along the pipeline to avoid potential saturation of the layer work.

8.5 Construction Problems

The following general construction problems are envisaged during construction: -

- Availability of suitable material for an engineering fill.
- Safety for workers and pedestrians, along deep excavations, must be adequately addressed prior to the commencement of the project.
- Existing underground services may require detection to avoid damage during construction.
- Excavations need to be located such that it does not impinge into the backfill of the adjacent pipeline; and
- Attention must be paid to ensure a uniform surface and compaction of bedding material.

8.6 Additional Work

No additional investigations are considered necessary for the assessment of the near surface soils.

8.7 General

As indicated in section 4.3 all test pits were loosely backfilled upon completion of the fieldwork. To avoid the possibility of localized settlement occurring below the site due to consolidation settlement of this loose backfill, it is recommended that any test holes be adequately backfilled in 150mm layers, to at least 90% Mod AASHTO.

9. CONCLUSIONS

This report details the findings of the geotechnical investigation carried out for the proposed refurbishment of the old existing Bulk Water Steel Pipeline in Alexandra, Gauteng Province. Based on the results of the fieldwork and laboratory test results undertaken during investigation, it is considered that the site is generally stable and suitable for the proposed development; all buried services are to be taken into consideration during construction. The comments and recommendations contained within this report are based on a number of trial pits. It is, therefore also recommended that during construction stage of the project all excavations and foundation trenches be inspected by a geotechnical engineer or engineering geologist to verify that the recommended backfill materials are not at variance with those described herein.

The geotechnical conditions referred to in this report are specifically those observed from excavated trial pits. Probably, variant conditions with those discussed above can be encountered elsewhere due to change in geological formations. Any change from the expected ground conditions should then be taken into account during design and construction; hence construction supervision by a competent person is advised.

11. REFERENCES

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4. South African Institution of Civil Engineering (SAICE) – Geotechnical Division. **Site investigation code of practice**. 1st Ed, 2009.
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9. 1:50 000 Topographical Map, **2628AA Johannesburg** (1996 – 4th Edition) published by the Chief Directorate: Surveys and Mapping.
10. SANS 10160-4:2011, Seismic actions and general requirements. Edition
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12. APPENDICES

- APPENDIX A: TEST PIT & DPSH POSITIONS
- APPENDIX B: TEST PIT PROFILES
- APPENDIX C: GEOLOGICAL SECTIONS
- APPENDIX D: DPSH TEST RESULTS
- APPENDIX E: REPORT ON SOIL RESISTIVITY TESTING
- APPENDIX F: BOREHOLE PROFILES
- APPENDIX G: BOREHOLE PHOTOGRAPHS
- APPENDIX H: LABORATORY TEST RESULTS
- APPENDIX I: TEST PIT AND SITE PHOTOGRAPHS

Appendix A (Test Pits & DPSH Positions)



GEOTECHNICAL LAYOUT PLAN

Legend

- Test Pit
- Borehole
- DPSH Test
- Alexandra Bulk Water Pipeline
- Other Pipeline

CLIENT

Lidwala
Specialist Solutions

PROJECT NAME

ALEXANDRA BULK WATER PIPELINE, JOHANNESBURG, GAUTENG

PROJECT NO.	MTS-LID-AlexP-05/05/20
DATE	2020/07/21

MMAPHAKA
Trading Services

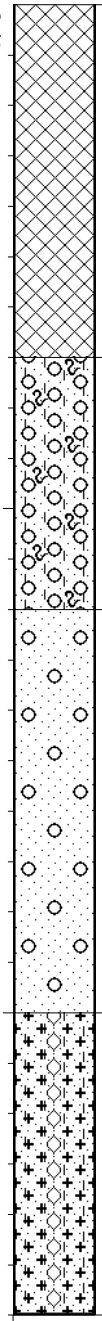
Appendix B (Soil Profiles)

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP01
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:15



0.00

Moist to very moist, grey brown, medium dense, intact, silty SAND with abundant fine roots: **FILL**.

0.70

Moist to very moist, yellow brown, speckled orange brown, medium dense, intact, gravelly silty SAND, with occasional fine roots: **REWORKED RESIDUAL GRANITE**.
Note:
1. Occasional ferruginised gravels.

1.20

Moist, orange brown, stained dark red brown and grey, very dense, intact, gravelly SAND: **RESIDUAL GRANITE**.

2.00

Orange brown, stained black, very highly weathered, coarse grained, jointed, very soft rock: **GRANITE**.
Note:
1. Joints filled with grey silty sand.

2.60

NOTES

1) Refusal of TLB at 2.6m on soft rock to medium hard rock.

2) No water seepage observed.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM

INCLINATION : Vertical
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020

ELEVATION : 1526m
X-COORD : 26° 6'3.91"S
Y-COORD : 28° 6'43.12"E

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

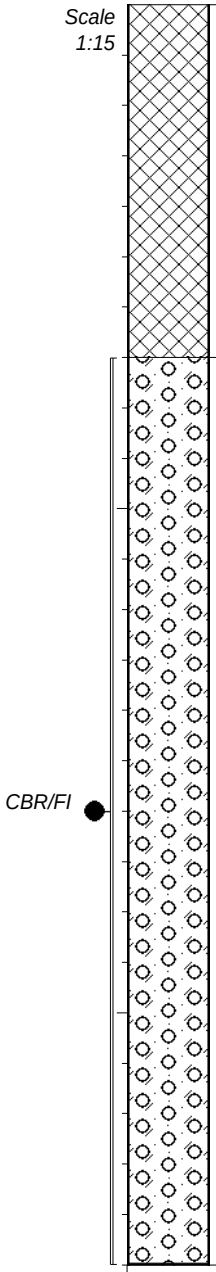
HOLE No: AP01

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP02
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:15



0.00 Very moist, grey, loose, intact, silty SAND with occasional plastic: **FILL**.

0.70 Wet, grey, mottled orange brown, medium dense, intact, clayey sandy GRAVEL, with occasional granite cobbles towards base: **REWORKED RESIDUAL GRANITE**.

Note:
1. Material possibly leached.

2.50

NOTES

1) Refusal of TLB at 2.5m on medium hard rock to hard rock.
2) No water seepage observed.
3) Disturbed sample CBR/FI at 0.7--2.5m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020
DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

ELEVATION : 1535m
X-COORD : 26° 6'3.39"S
Y-COORD : 28° 6'50.32"E

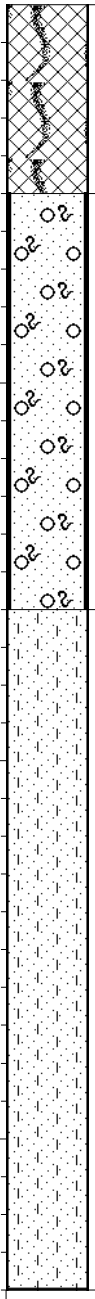
HOLE No: AP02

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP03
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:20



0.00

Slightly moist, orange brown to grey brown, dense with occasional loose pockets, intact, gravelly silty SAND: **FILL**.
Note:
1. Termite workings at 0.4m.

0.50

Moist, grey brown, blotched orange brown and mottled dark red, medium dense becoming dense to very dense below 1.2m, intact, gravelly SAND, with occasional fine roots: **REWORKED RESIDUAL GRANITE**.
Note:
1. Occasionally well cemented ferruginised.

1.60

Moist, orange brown, blotched yellow brown and grey, dense to very dense below 2.7m, intact, silty SAND: **RESIDUAL GRANITE**.
Note:
1. Occasional soft rock fragments.

COM/FI

3.40

NOTES

1) Partial refusal of TLB at 3.4m.
2) No water seepage observed.
3) Disturbed sample COM/FI at 1.6--3.4m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020

ELEVATION : 1545m
X-COORD : 26° 6'2.36"S
Y-COORD : 28° 7'0.17"E

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

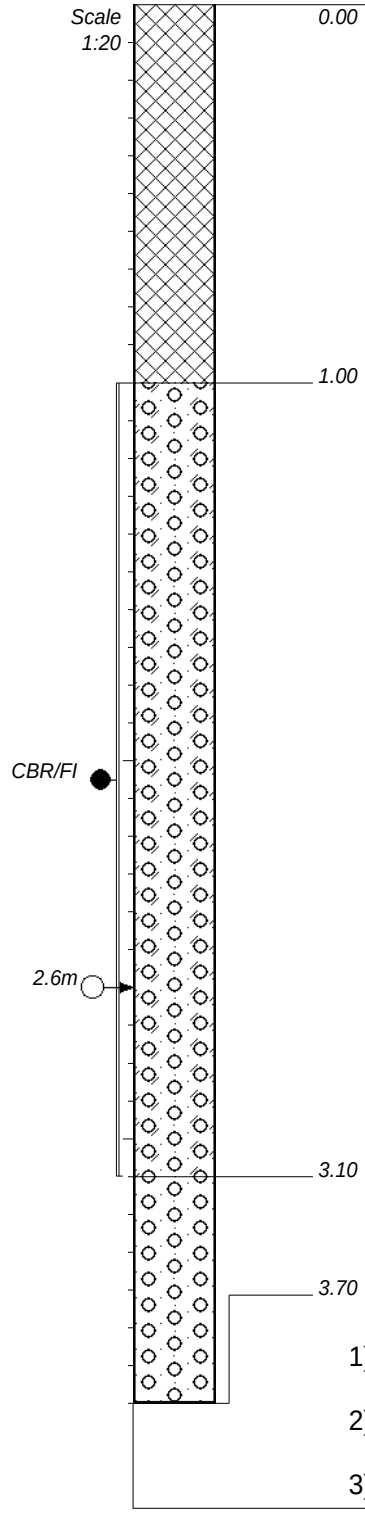
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HOLE No: AP03

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP04
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



0.00

Very moist, grey, loose, intact, silty SAND with abundant plastic: **FILL**.

1.00

Wet, grey, mottled orange brown, medium dense, intact, clayey sandy GRAVEL, with occasional granite cobbles towards base: **REWORKED RESIDUAL GRANITE**.
Note:
1. Material possibly leached.

3.10

Wet, orange, blotched grey, dense, intact, sandy GRAVEL: **RESIDUAL GRANITE**.

3.70

NOTES

1) Refusal of TLB at 3.7m on medium hard rock.
2) Slight water seepage observed at 2.6m.
3) Disturbed sample CBR/FI at 1.0--3.1m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020
DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

ELEVATION : 1548m
X-COORD : 26° 6'2.51"S
Y-COORD : 28° 7'4.28"E

HOLE No: AP04

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP06
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



Wet, grey brown, loose to medium dense, intact, silty sandy GRAVEL: **HILLWASH**.

Wet, grey, mottled orange brown and dark red, medium dense becoming dense to very dense, intact, gravelly SAND, with occasional fine roots: **REWORKED RESIDUAL GRANITE**.
Note:
1. Occasionally well cemented ferruginised.

Moist, orange brown, stained dark red brown and grey, dense becoming very dense below 1.60m, intact, gravelly SAND: **RESIDUAL GRANITE**.

NOTES

1) Refusal of TLB at 2.0m on medium hard rock.
2) Slight water seepage observed at 2m.
3) Water pipe observed at 0.5m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020
DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

ELEVATION : 1574m
X-COORD : 26° 6'4.88"S
Y-COORD : 28° 7'23.66"E

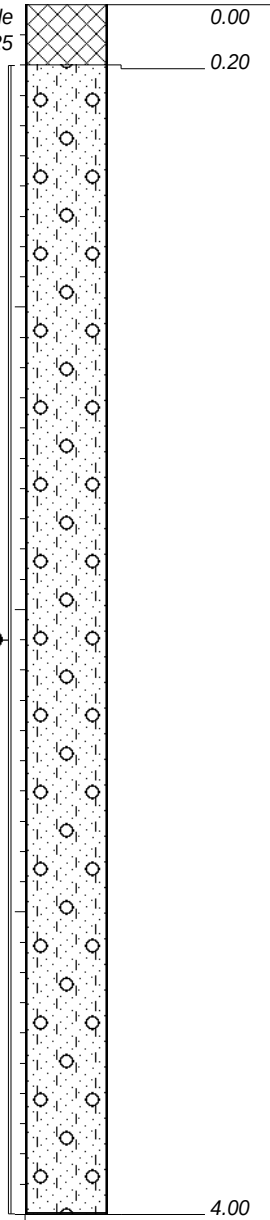
HOLE No: AP06

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Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP07
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:25



0.00 Slightly moist, grey brown, dense, intact, silty SAND: **FILL**.

0.20 Slightly moist to moist, orange brown and slightly mottled yellow brown, medium dense, intact, gravelly silty SAND: **RESIDUAL GRANITE**.

4.00

NOTES

1) No refusal of TLB at 4m.
2) No water seepage observed.
3) Disturbed sample CBR/FI at 0.2--4m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020
DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

ELEVATION : 1592m
X-COORD : 26° 6'11.02"S
Y-COORD : 28° 7'29.10"E

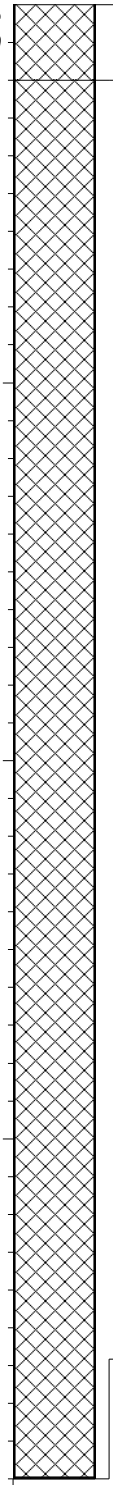
HOLE No: AP07

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP08
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:20



0.00 Slightly moist, grey brown, dense, intact, silty SAND: **FILL**.

0.20 Slightly moist to moist, orange brown and slightly mottled yellow brown, medium dense to dense, intact, gravelly silty SAND wit scattered quartz gravels and cobble (possible quartz vein): **FILL**.

3.90

NOTES

1) No refusal of TLB at 3.9m.

2) No water seepage observed.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020

ELEVATION : 1598m
X-COORD : 26° 6'13.02"S
Y-COORD : 28° 7'32.14"E

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

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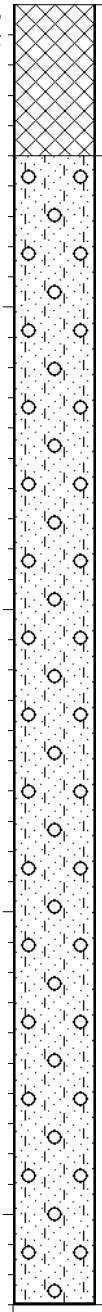
HOLE No: AP08

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP09
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

Scale 1:25



0.00 Slightly moist, orange brown, medium dense, intact, silty SAND: **FILL**.

0.50 Slightly moist, orange brown and slightly mottled yellow brown, medium dense, intact, gravelly silty SAND: **RESIDUAL GRANITE**.

4.30

NOTES

1) No refusal of TLB at 4.3m.

2) No water seepage observed.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020

ELEVATION : 1605m
X-COORD : 26° 6'14.99"S
Y-COORD : 28° 7'37.40"E

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

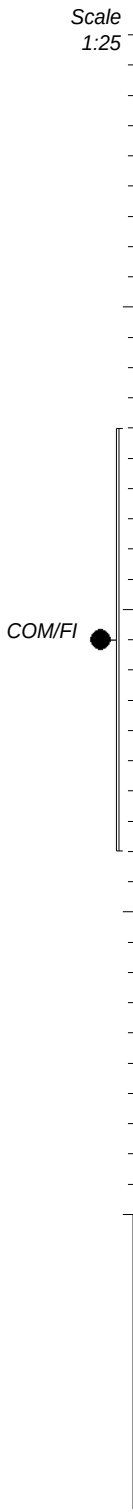
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HOLE No: AP09

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: AP10
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



0.00 Slightly moist, orange brown to grey brown, dense, intact, silty SAND with abundant fine roots: **FILL**.

1.00 Slightly moist, red brown, speckled white, dense, intact, silty SAND with abundant subrounded quartz gravels: **PEBBLE MARKER**.

1.40 Slightly moist, red brown, medium dense, intact, silty SAND with scattered fine roots: **REWORKED RESIDUAL GRANITE**.

2.80 Slightly moist, orange brown, dense, intact, silty SAND with occasional very soft rock fragments: **RESIDUAL GRANITE**.

4.00

NOTES

1) No refusal of TLB at 4m.
2) No water seepage observed.
3) Disturbed sample COM/FI at 1.4--2.8m.

CONTRACTOR : Maremar Construction
MACHINE : CAT 428E
DRILLED BY : Petrus
PROFILED BY : TM
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Pit
DATE : 24/06/2020
DATE : 24/06/2020
DATE : 21/07/2020 09:49
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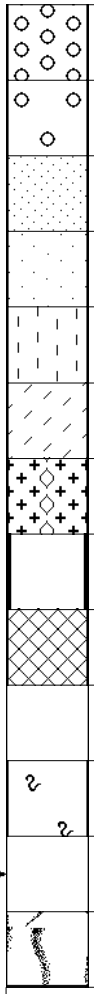
ELEVATION : 1615m
X-COORD : 26° 6'14.61"S
Y-COORD : 28° 7'50.11"E

HOLE No: AP10

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

LEGEND
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



	GRAVELS/gravel	{SA02}
	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	SILTY	{SA07}
	CLAYEY	{SA09}
	GRANITE	{SA17}{SA44}
	WELL CEMENTED	{SA29}
	FILL	{SA32}
Name	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}
11.5	WATER SEEPAGE/water strike	{CH50}
	POCKETS	{SA60}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

DATE : 21/07/2020 09:49
TEXT : ..raPipelineTPProfiles.txt

LEGEND
SUMMARY OF SYMBOLS

Appendix C (Geological Sections)

COORDINATES - Lo 29, South African Survey Grid, WGS84 datum; 28 to 30d E

Name	Ylo	Xlo	Latitude	Longitude	Description
AP1	88 832.619	2 888 336.735	26° 06' 03.9124" S	28° 06' 43.1237" E	TEST PIT
AP3	88 359.261	2 888 285.636	26° 06' 02.3568" S	28° 07' 00.1696" E	TEST PIT
AP2	88 632.636	2 888 319.321	26° 06' 03.3909" S	28° 06' 50.3241" E	TEST PIT
AP5	87 883.592	2 888 131.676	26° 05' 57.4591" S	28° 07' 17.3235" E	TEST PIT
AP4	88 245.027	2 888 289.675	26° 06' 02.5131" S	28° 07' 04.2792" E	TEST PIT
BH1	87 979.756	2 888 192.155	26° 05' 59.4030" S	28° 07' 13.8485" E	BOREHOLE
BH2	87 893.752	2 888 173.066	26° 05' 58.8017" S	28° 07' 16.9479" E	BOREHOLE
AP6	87 705.948	2 888 358.933	26° 06' 04.8516" S	28° 07' 23.6607" E	TEST PIT
AP7	87 553.593	2 888 546.741	26° 06' 11.0169" S	28° 07' 29.0977" E	TEST PIT
AP8	87 468.669	2 888 607.690	26° 06' 13.0156" S	28° 07' 32.1390" E	TEST PIT
AP9	87 322.051	2 888 667.595	26° 06' 14.9940" S	28° 07' 37.4006" E	TEST PIT
AP10	86 968.936	2 888 653.297	26° 06' 14.6062" S	28° 07' 50.1110" E	TEST PIT
DPSH1	88 830.475	2 888 336.892	26° 06' 03.9180" S	28° 06' 43.2008" E	DPSH
DPSH2	88 630.824	2 888 315.765	26° 06' 03.2757" S	28° 06' 50.3903" E	DPSH
DPSH3	88 358.286	2 888 287.660	26° 06' 02.4227" S	28° 07' 00.2042" E	DPSH
DPSH3A	88 334.389	2 888 283.221	26° 06' 02.2838" S	28° 07' 01.0652" E	DPSH
DPSH4	88 247.468	2 888 288.779	26° 06' 02.4835" S	28° 07' 04.1916" E	DPSH
DPSH6	87 701.148	2 888 358.821	26° 06' 04.8791" S	28° 07' 23.8335" E	DPSH
DPSH7	87 550.412	2 888 552.040	26° 06' 11.1897" S	28° 07' 29.2109" E	DPSH
DPSH8	87 470.106	2 888 606.678	26° 06' 12.9825" S	28° 07' 32.0875" E	DPSH
DPSH9	87 319.836	2 888 668.557	26° 06' 15.0257" S	28° 07' 37.4801" E	DPSH
DPSH10	86 969.170	2 888 655.442	26° 06' 14.6758" S	28° 07' 50.1020" E	DPSH
DPSH11	86 788.981	2 888 628.473	26° 06' 13.8386" S	28° 07' 56.5927" E	DPSH

BENCHMARKS WGS84 (Lo 29)

BM4	88971.283	2888350.068	1522.431
BM5	88272.781	2888285.742	1548.282
BM6	86791.309	2888643.695	1618.427

LEGEND

- TELKOM MANHOLE
- NETWORK MANHOLE
- BLOCKED MANHOLE
- SEWER MANHOLE
- STORMWATER MANHOLE
- MANHOLE
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- POWER POLE
- LIGHT POLE
- ELECTRIC BOX
- BENCHMARKS
- TREE
- BOTTOM OF KERB
- TOP OF KERB EDGE
- OF TAR ROAD
- PEDESTRIAN WALKWAY
- BOUNDARY FENCE / WALL
- VALVE CHAMBER
- BUILDING
- PARKHOMES
- STORMWATER CATHCPIT
- ELECTRIC TRANSFORMER BOX
- 200mm PIPE NEW
- 600mm PIPE-EXISTING
- 1500mm PIPE-EXISTING
- SEWER LINE

CLIENT:

Johannesburg Water

17 Harrison Street
Marshalltown
Johannesburg
2000
Tel: 0860 562 874

PROJECT:

REPLACEMENT OF THE JOHANNESBURG WATER 600mmØ PIPELINE IN ALEXANDRA: GEOTECHNICAL INVESTIGATION

DESIGN COORDINATOR APPROVAL:
SIGNATURE _____ DATE _____
PROJECT MANAGER APPROVAL:
SIGNATURE _____ DATE _____
CLIENT APPROVAL:
SIGNATURE _____ DATE _____

REV	DATE	DESCRIPTION	DRAWN

REVISIONS

DRAWN: ML. MATHEGA | CHECKED: N. MAKHEDA | DESIGNED: T. MSENGANA
SCALES: AS SHOWN | DATE: JULY 2020
DRAWING TITLE: WATER 600mmØ PIPELINE IN ALEXANDRA: TEST PIT LAYOUT PLAN
SIZE: A1 | PROJECT No.
REV No. 00 | DRAWING No. MTS-300-01-01

SUB-CONSULTANTS:

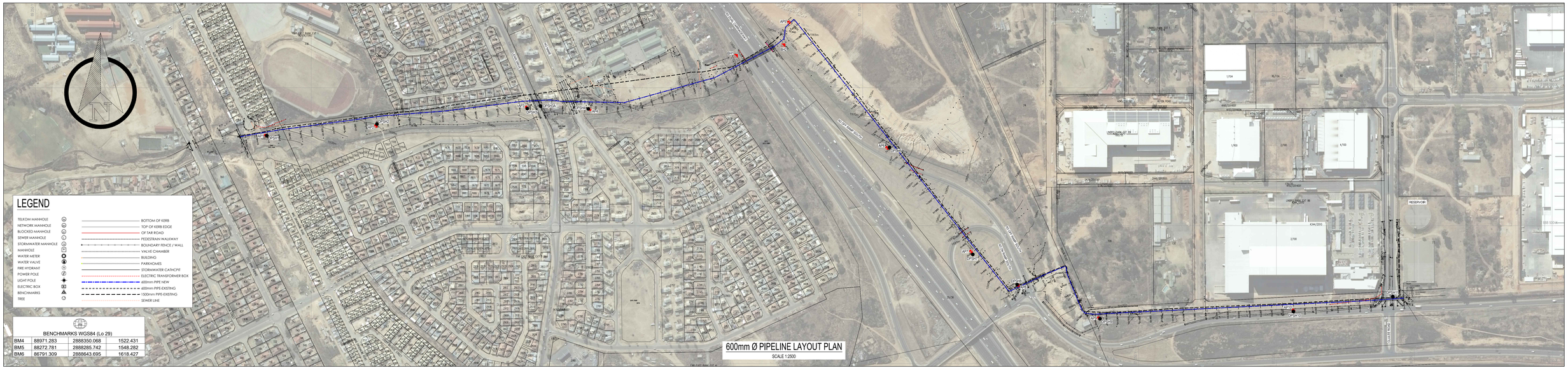
MMAPHAKA Engineers

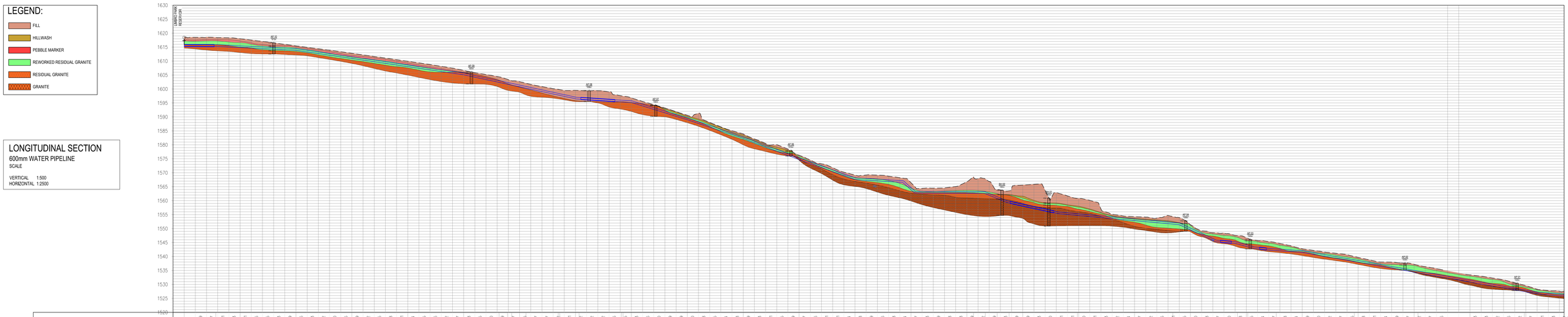
726 MORTIMER AVENUE
MAYVILLE
0084
CELL: 073 180 0465
Email:info@mmaphaka.co.za

MAIN CONSULTANTS:

Lidwala

Unit 18, Block B, 1st Floor
Corner Main Office Park
2 Payne Road
Bryanston
TEL: 011 793 5486
Email:info@lidwala.com

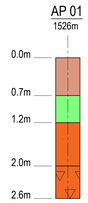

LEGEND
TELKOM MANHOLE
NETWORK MANHOLE
BLOCKED MANHOLE
SEWER MANHOLE
STORMWATER MANHOLE
MANHOLE
WATER METER
WATER VALVE
FIRE HYDRANT
POWER POLE
LIGHT POLE
ELECTRIC BOX
BENCHMARKS
TREE
BOTTOM OF KERB
TOP OF KERB EDGE
CF TAR ROAD
PEDESTRAIN WALKWAY
BOUNDARY FENCE / WALL
VALVE CHAMBER
BUILDING
PARKHOMES
STORMWATER CATHCPIT
ELECTRIC TRANSFORMER BOX
600mm PIPE NEW
600mm PIPE-EXISTING
1500mm PIPE-EXISTING
SEWER LINE
BENCHMARKS WGS84 (Lo 29)
BM4 88971.283 2888350.068 1522.431
BM5 88272.781 2888285.742 1548.282
BM6 86791.309 2888643.695 1618.427
600mm Ø PIPELINE LAYOUT PLAN
SCALE 1:2500
RESERVOIR
CRESTA PARK

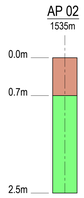

LEGEND:
FILL
HILLWASH
PEBBLE MARKER
REWORKED RESIDUAL GRANITE
RESIDUAL GRANITE
GRANITE
LONGITUDINAL SECTION
600mm WATER PIPELINE
SCALE
VERTICAL 1:500
HORIZONTAL 1:2500
LYNDHURST PARK RESERVOIR
1630
1625
1620
1615
1610
1605
1600
1595
1590
1585
1580
1575
1570
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1520

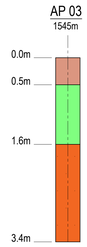
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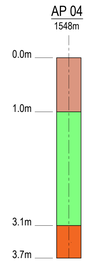
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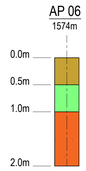
- FILL
- HILLWASH
- PEBBLE MARKER
- REWORKED RESIDUAL GRANITE
- RESIDUAL GRANITE
- GRANITE

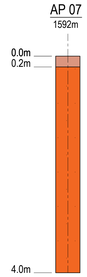


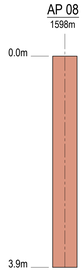


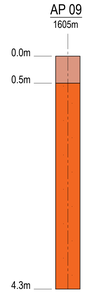


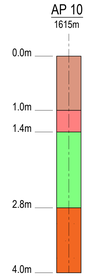


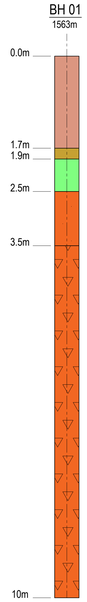


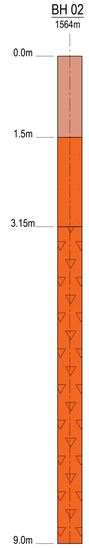












TEST PIT AND BOREHOLE PROFILES

SCALE = NTS

CLIENT:

Johannesburg Water

17 Harrison Street
Marshalltown
Johannesburg
2000
Tel: 0860 562 874

PROJECT:

REPLACEMENT OF THE JOHANNESBURG WATER 600mmØ PIPELINE IN ALEXANDRA: GEOTECHNICAL INVESTIGATION

DESIGN COORDINATOR APPROVAL:

SIGNATURE _____ DATE _____

PROJECT MANAGER APPROVAL:

SIGNATURE _____ DATE _____

CLIENT APPROVAL:

SIGNATURE _____ DATE _____

REV	DATE	DESCRIPTION	DRAWN

REVISIONS

DRAWN: ML MATHEGA | CHECKED: N. MAKHEDA | DESIGNED: T. MSENGANA

SCALES: AS SHOWN | DATE: JULY 2020

DRAWING TITLE: WATER 600mmø PIPELINE IN ALEXANDRA: TEST PIT AND BOREHOLE PROFILES

SIZE: A1 | PROJECT No.

REV No. 00 | DRAWING No. MTS-300-01-03

SUB-CONSULTANTS:

MMAPHAKA Engineers

726 MORTIMER AVENUE
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MAIN CONSULTANTS:

Lidwala

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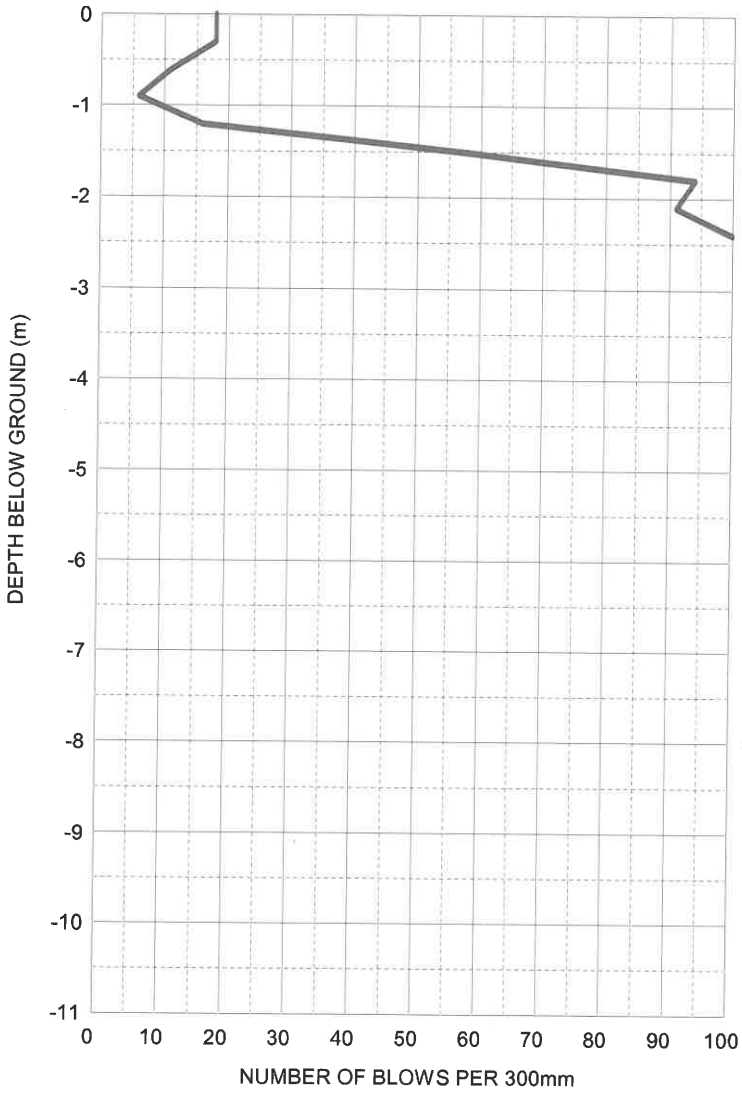
Appendix D (DPSH Test Results)

Geopractica
SOILS & MATERIALS TESTING
P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 1
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	18
0,6	11
0,9	6
1,2	16
1,5	58
1,8	94
2,1	91
2,4	100
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

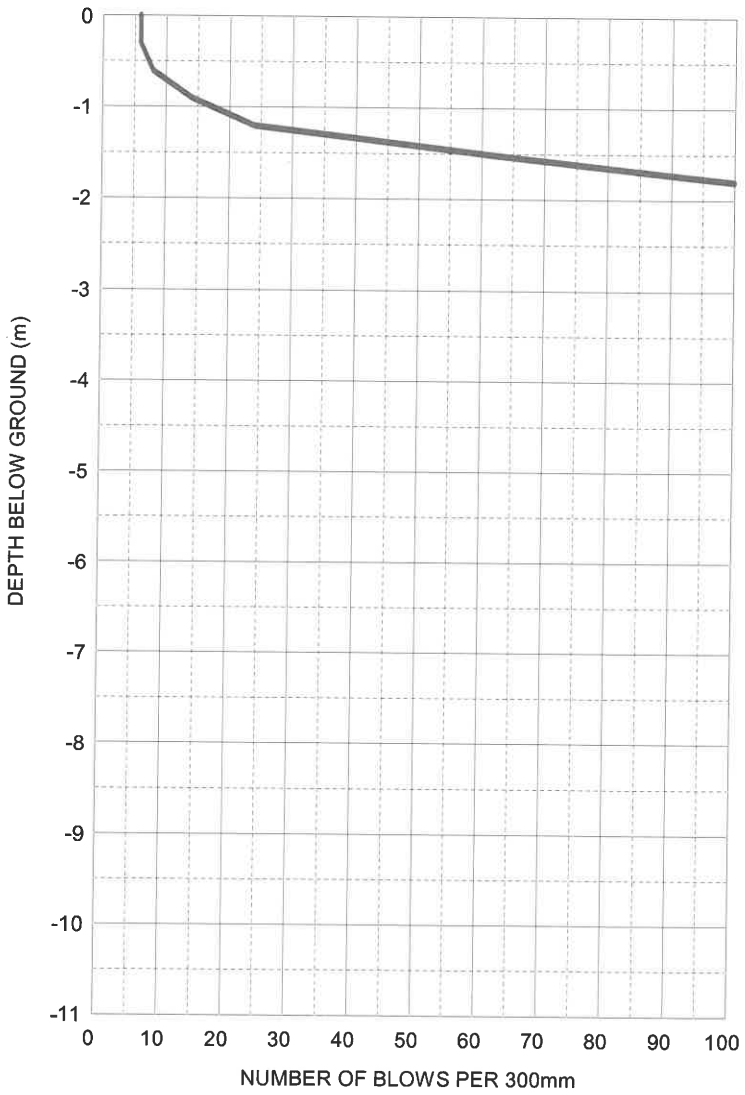
CHECKED BY
2020-07-20
T SODAWE

Geopractica
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TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 2
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	6
0,6	8
0,9	14
1,2	24
1,5	61
1,8	100
2,1	
2,4	
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

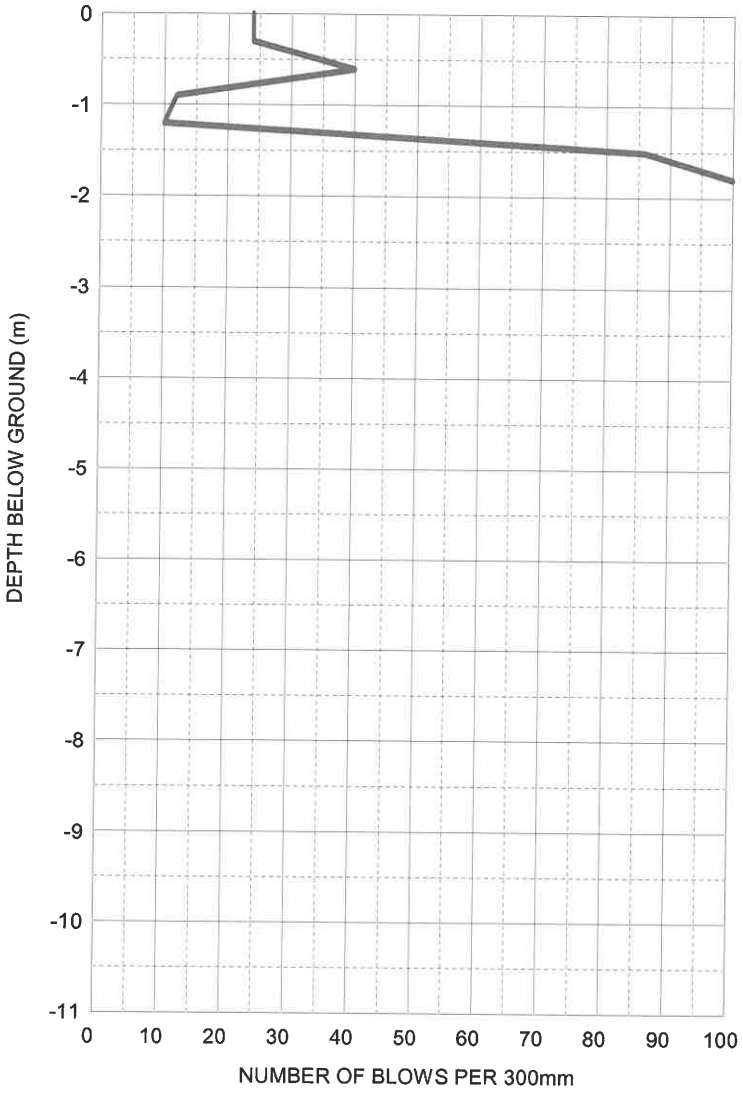
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2020-07-20
T. DAWE

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FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 3
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	24
0,6	40
0,9	12
1,2	10
1,5	86
1,8	100
2,1	
2,4	
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

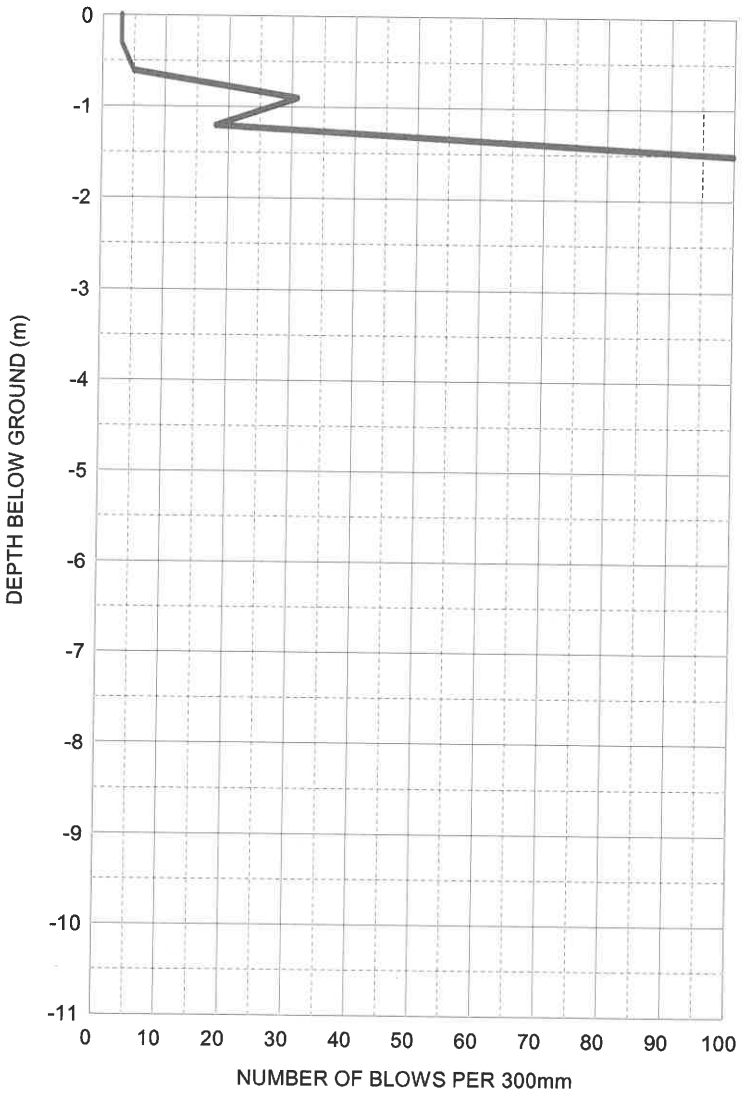
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2020-07-20
T.S DAWE

Geopractica
SOILS & MATERIALS TESTING
P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 3A
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	3
0,6	5
0,9	31
1,2	18
1,5	100
1,8	
2,1	
2,4	
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

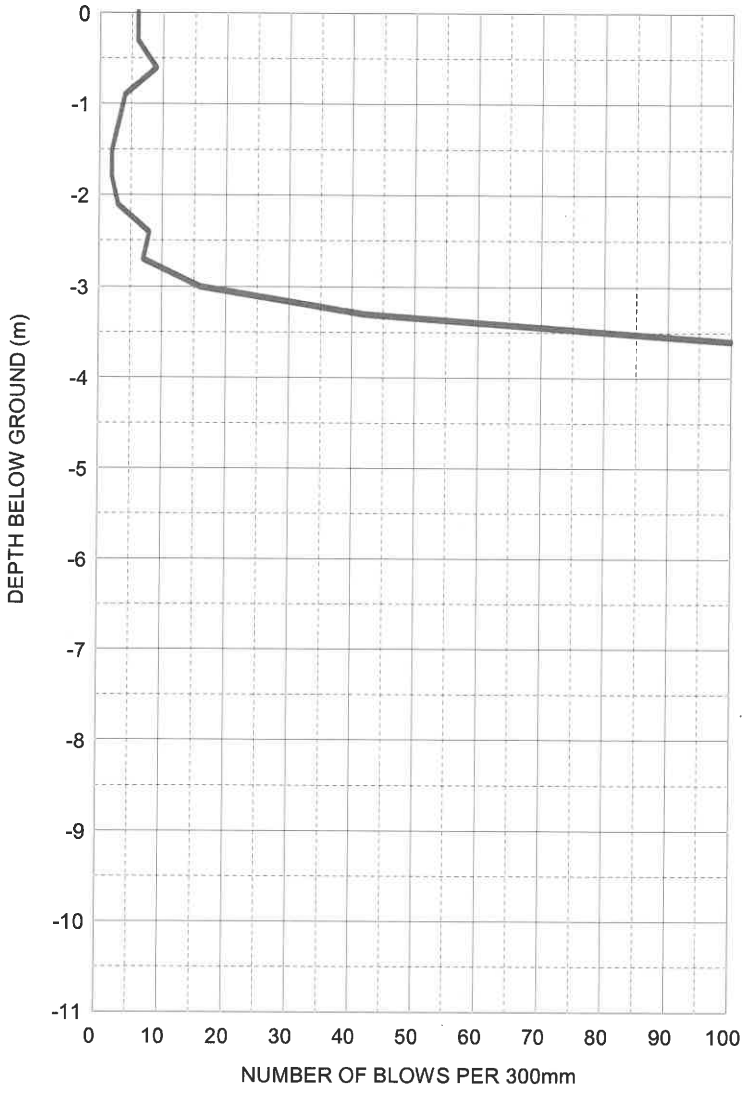
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2020 -07- 20
T SODAWE

Geopractica
SOILS & MATERIALS TESTING
P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 4
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	6
0,6	9
0,9	4
1,2	3
1,5	2
1,8	2
2,1	3
2,4	8
2,7	7
3,0	16
3,3	42
3,6	100
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm	1	Blows
	300-600mm	2	Blows

Programe Data
Revision No 2 (19/04/2002)

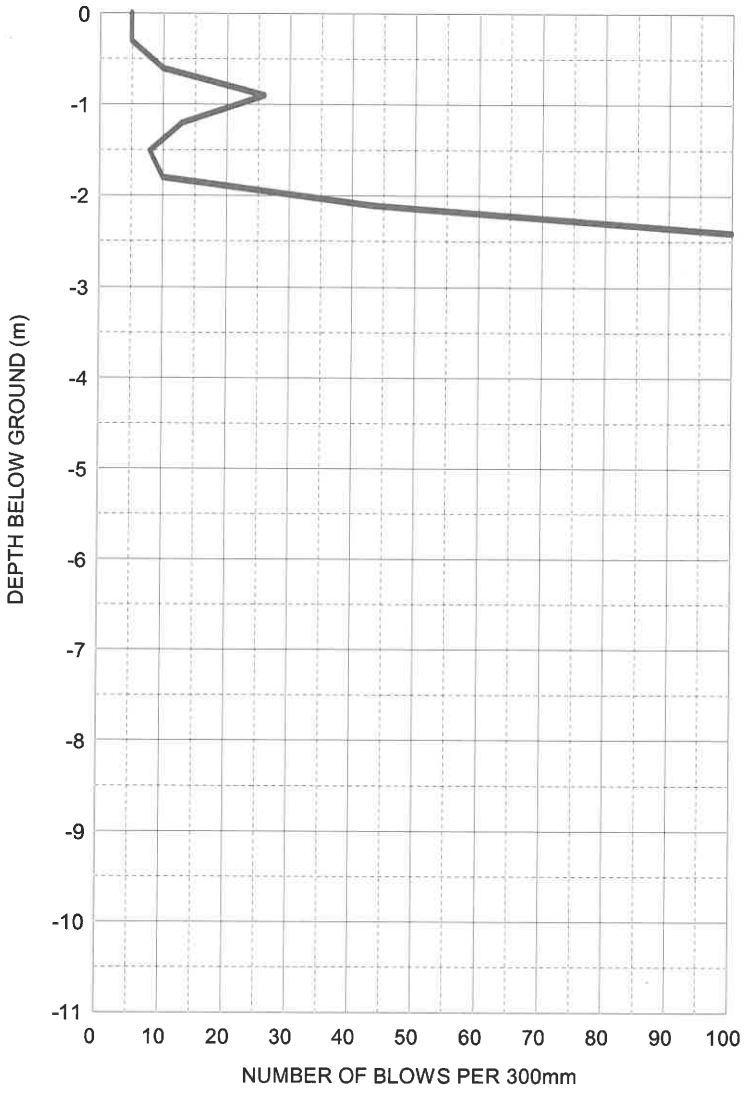
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T.SODAWE

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TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 6
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	5
0,6	10
0,9	26
1,2	13
1,5	8
1,8	10
2,1	43
2,4	100
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

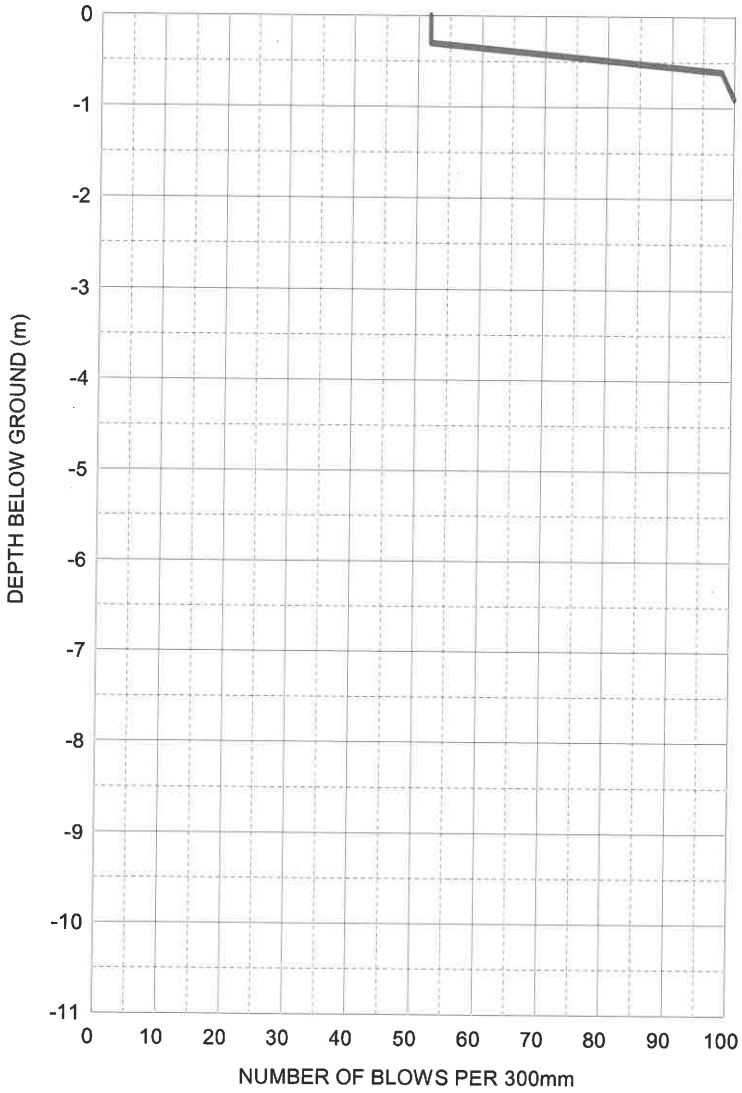
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TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 7
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	52
0,6	98
0,9	100
1,2	
1,5	
1,8	
2,1	
2,4	
2,7	
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

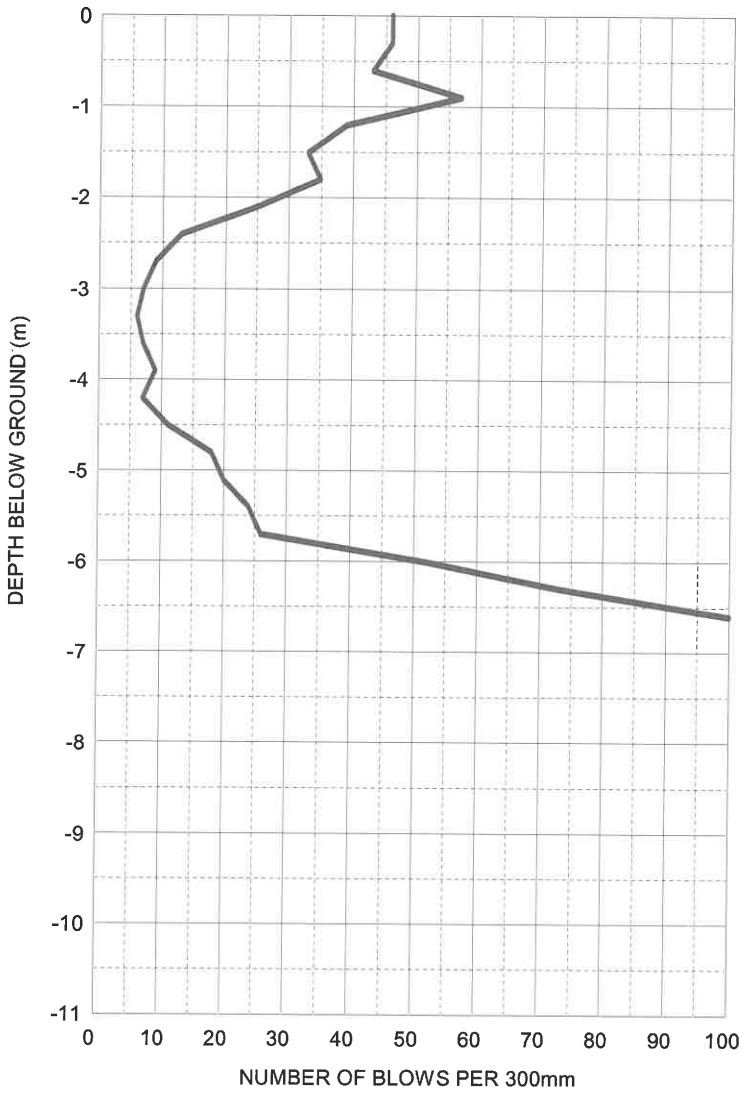
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2020-07-20
TSODAWE

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P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 8
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	46
0,6	43
0,9	57
1,2	39
1,5	33
1,8	35
2,1	25
2,4	13
2,7	9
3,0	7
3,3	6
3,6	7
3,9	9
4,2	7
4,5	11
4,8	18
5,1	20
5,4	24
5,7	26
6,0	52
6,3	73
6,6	100
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm	4	Blows
	300-600mm	8	Blows

Programe Data
Revision No 2 (19/04/2002)

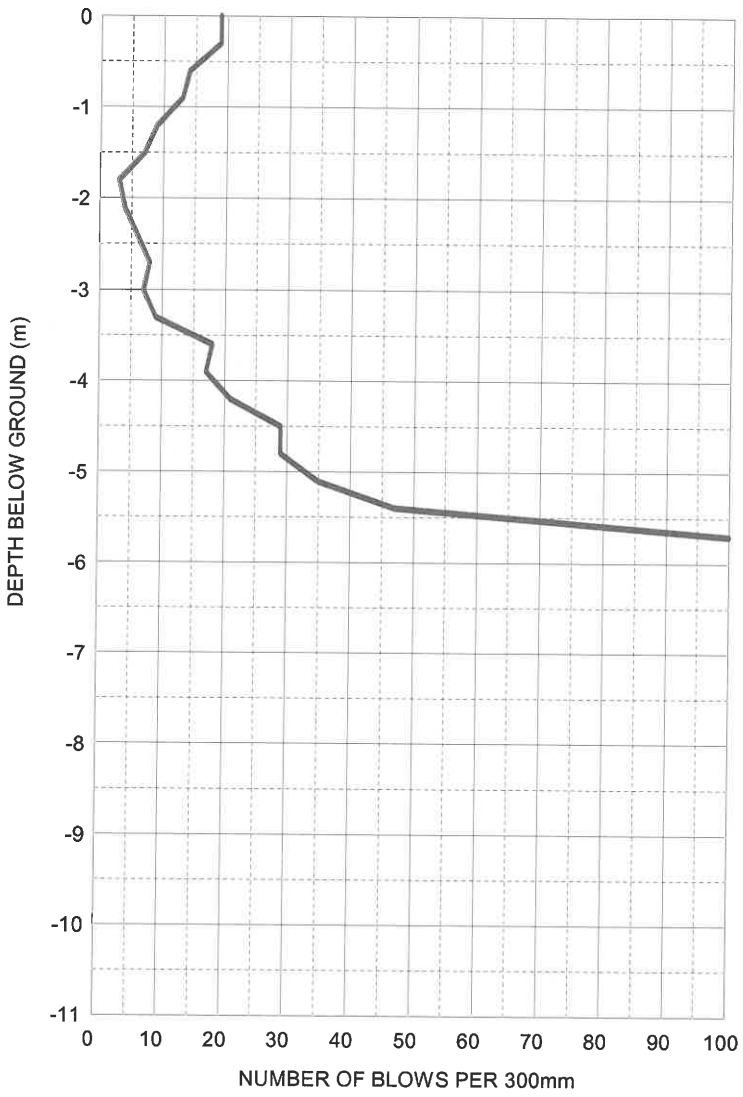
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2020-07-20
T. DAWE

Geopractica
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TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 9
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	19
0,6	14
0,9	13
1,2	9
1,5	7
1,8	3
2,1	4
2,4	6
2,7	8
3,0	7
3,3	9
3,6	18
3,9	17
4,2	21
4,5	29
4,8	29
5,1	35
5,4	47
5,7	100
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm	9	Blows
	300-600mm	7	Blows

Programe Data
Revision No 2 (19/04/2002)

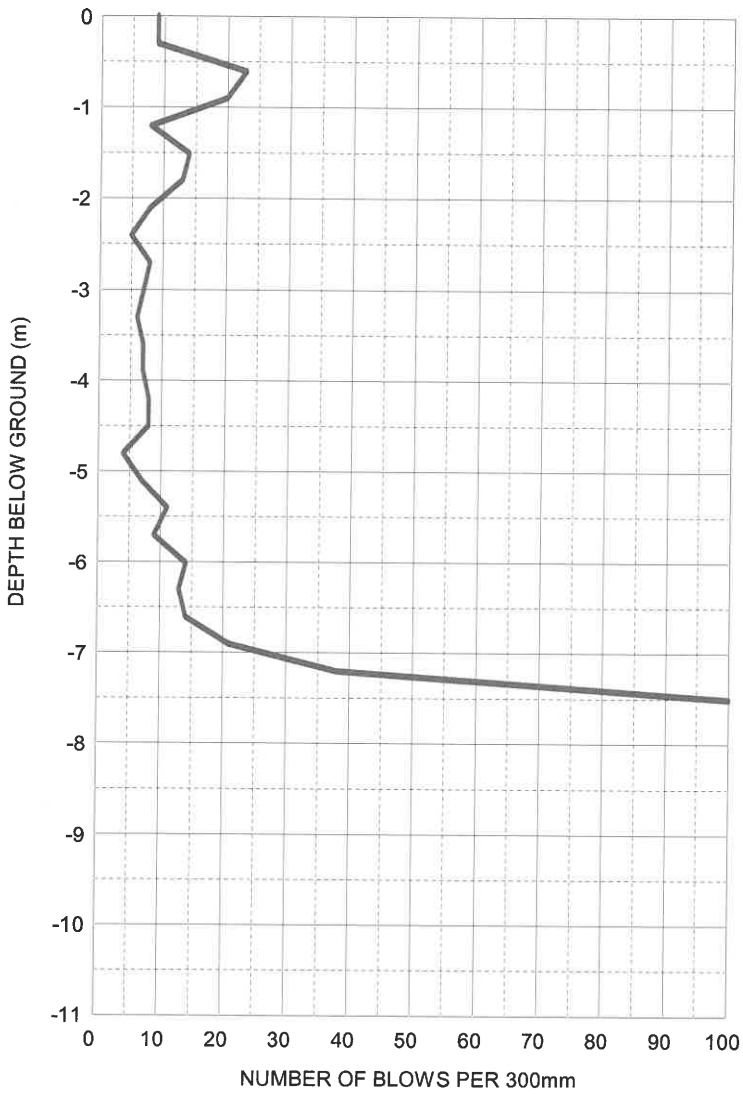
CHECKED BY
2020-07-20
T.SODAWE

Geopractica
SOILS & MATERIALS TESTING
P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 10
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	9
0,6	23
0,9	20
1,2	8
1,5	14
1,8	13
2,1	8
2,4	5
2,7	8
3,0	7
3,3	6
3,6	7
3,9	7
4,2	8
4,5	8
4,8	4
5,1	7
5,4	11
5,7	9
6,0	14
6,3	13
6,6	14
6,9	21
7,2	38
7,5	100
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm	3	Blows
	300-600mm	5	Blows

Programe Data
Revision No 2 (19/04/2002)

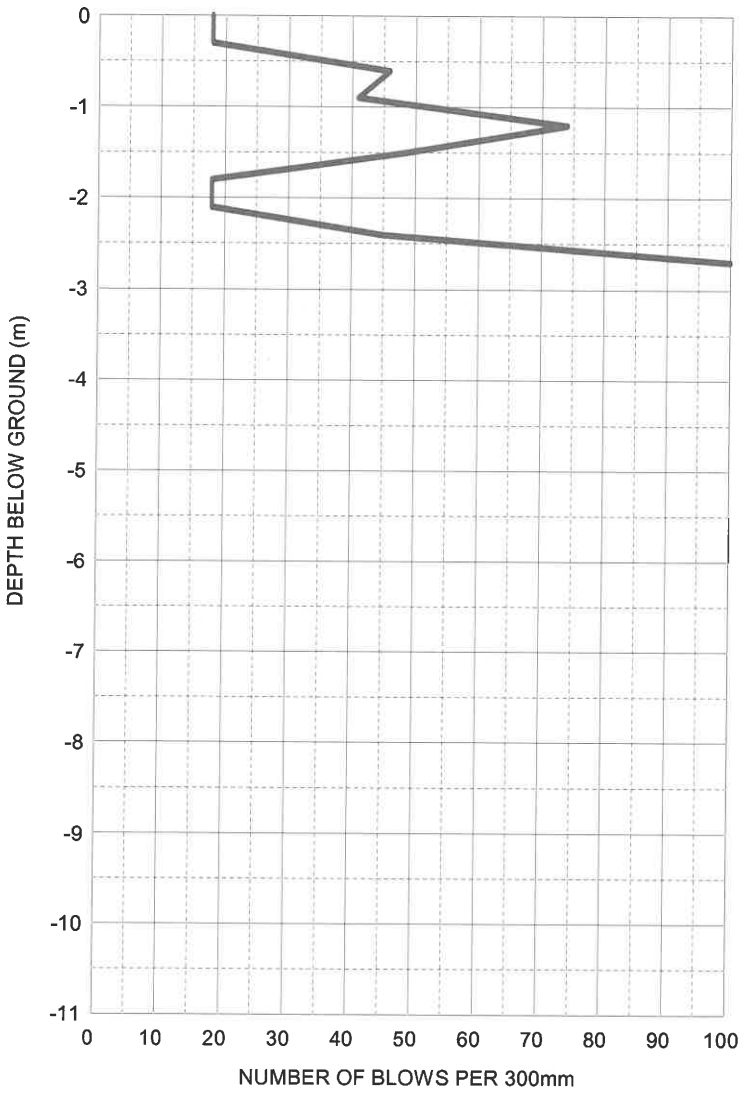
CHECKED BY
2020-07-20
T.SODAWE

Geopractica
SOILS & MATERIALS TESTING
P.O.BOX 227, MARAISBURG, 1700
TEL: (011) 674 1325
FAX: (011) 674 4513
e mail: lab@geopractica.co.za

DYNAMIC PROBE SUPER HEAVY (DPSH)

Client	MMAPHAKA ENGINEERS		
Location	REPLACEMENT OF ALEXANDRA 600mm WATERLINE		
Date	25 JUNE 2020	Test No	DPSH 11
Job No	200147	Checked By	MM

DEPTH (m)	BLOWS PER 300mm
0,0	
0,3	18
0,6	46
0,9	41
1,2	74
1,5	48
1,8	18
2,1	18
2,4	45
2,7	100
3,0	
3,3	
3,6	
3,9	
4,2	
4,5	
4,8	
5,1	
5,4	
5,7	
6,0	
6,3	
6,6	
6,9	
7,2	
7,5	
7,8	
8,1	
8,4	
8,7	
9,0	
9,3	
9,6	
9,9	
10,2	
10,5	
10,8	
11,1	



Re-drive	0-300mm		Blows
	300-600mm		Blows

Programe Data
Revision No 2 (19/04/2002)

CHECKED BY
2020-07-20
T SODAWE

Appendix E (Report on Soil Resistivity Testing)

Applied Scientific Services and Technologies
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email: gpxgeo@asstgroup.com ■ skype: asstptyltd ■ www.asstgroup.com

A REPORT ON SOIL RESISTIVITY TESTING FOR THE WATER PIPELINE NEAR ALEXANDRA, GAUTENG, SOUTH AFRICA

Report submitted to

Mmaphaka Engineers

34 Dwabba Berry Street,

Pretoria,

0084

South Africa

Compiled by

Riaan Mouton

Principal Geophysicist

1 July 2020

Table of Contents

1. INTRODUCTION 3

2. SCOPE OF WORK 3

3. SURVEY METHODOLOGY 3

4. RESULTS 5

5. REFERENCES 5

APPENDIX A: SURVEY LOCATION MAP 6

APPENDIX B: RESISTIVITY PLOTS 12

APPENDIX C: ABEM TERRAMETER LS2 CALIBRATION CERTIFICATE 25

1. INTRODUCTION

ASST Pty Ltd was commissioned by Mmaphaka Engineers (Pty) Ltd to conduct Soil Electrical Resistivity testing, also referred to as Vertical Electrical Soundings (VES), along the 600mm diameter water supply pipeline near Alexandra, Gauteng, South Africa. The surveys were carried out between the 30th of June and the 1st of July 2020.

2. SCOPE OF WORK

The purpose of the soil resistivity surveys was to investigate the electrical characteristics of the ground. Test locations for thirteen (13) sites were provided by Mmaphaka. Site placement follows the original alignment provided unless limited access required realignment of the lines. The surface conditions on site consisted of grass fields with gravely sand soils.

A series of maps including a regional orientation map and final layouts for VES traverses along the pipeline are shown in Appendix A.

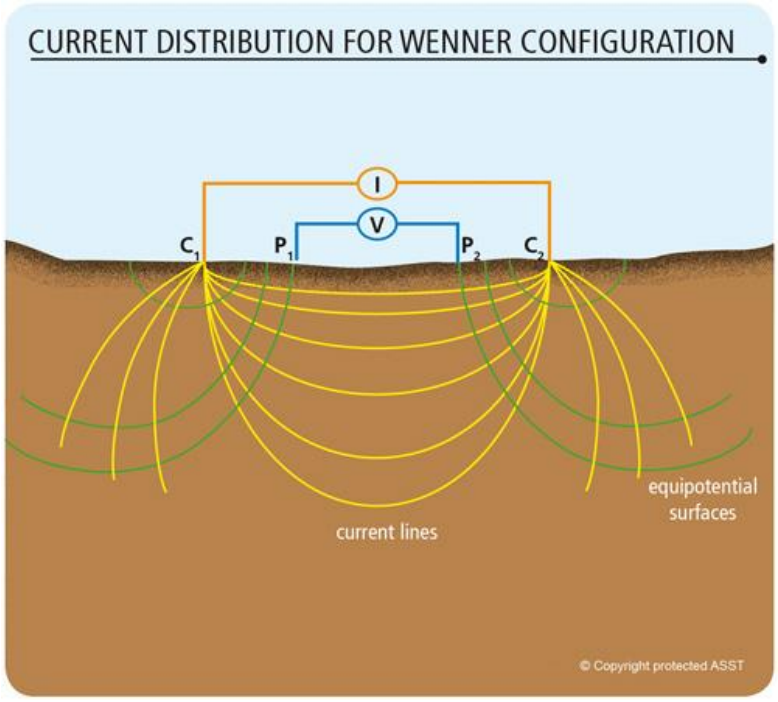
3. SURVEY METHODOLOGY

The "Wenner Array" soil resistivity method was employed to gain information on the electrical properties across the site under investigation. The method proceeds by emplacing four equidistant electrodes into the ground at a known "a"-spacing (refer to Figure 3-1). A known current is injected into the outer electrodes (C1, C2) and the resultant potential difference (voltage) is measured between the inner two electrodes (P1, P2). From the known and measured parameters, including the current, voltage and electrode configuration, an indication of how resistive the soil and rock are at depth can be obtained (i.e. apparent resistivity).

Electrode spacings ("a" – spacings) of 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12 and 16 metres were used where possible (see Appendix B for full resistivity dataset). Where the spread length was restricted, the next largest achievable a-spacing was used.

An integrated measurement of six (No. 6) readings were taken for each position with a 1% tolerance filter to ensure repeatability.

Figure 3-1: Electrode configuration for soil resistivity surveys (Wenner Array).



Location data were obtained using a standard accuracy GPS in WGS84 / South African Grid LO29 coordinates to +/- 3 m accuracy. See Table 3-1 below for equipment details and specifications.

Table 3-1: Equipment details and specifications for VES survey.

Instrumentation	ABEM Terrameter LS 12 channel system with 12V external battery
Array	Wenner, 4 electrode method
"a"-spacings (m)	0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12 and 16
Power Output	250W (600V or 2.5A maximum voltage/current)
Standard	ASTM 57G

4. RESULTS

The results for each of the sites covered with electrical resistivity measurements are presented in Appendices B1 to B13. Locations for the test sites are shown in the series of maps presented in Appendix A.

The data for all sites are smooth with low levels of noise. Contact resistance was kept below 5 kOhm for nearly all measurements.

Calculated resistivities range between 0,6 Ohm.m and 1390 Ohm.m. This range of resistivities is consistent with prevailing conditions on site, namely organic soils with gravel in places.

Sites L2 to L7 exhibit the lowest resistivities measured along the pipeline route.

The estimated maximum penetration depth is approximately 8m b.g.l. Given the shallow penetration requirement, the monotonic sounding curves observed for Sites L1, L2, L3, L8, L10 and L11 suggest single layered earth models. For the remainder of the sites two-layered earth models can be expected.

5. REFERENCES

i. Van Zijl, J.S.V., *A practical manual on the resistivity method*, National Physical Research Laboratory CSIR Report FIS 142, 1977.

DISCLAIMER

The interpretations contained in this report are based on the training and experience of the author and information acquired during the course of the investigation. As with all geophysical data, multiple interpretations are possible. The client is advised to consider information from all available sources prior to making a decision on how to proceed. ASST cannot be held responsible for errors or any consequences arising from the use of the information and ASST's liability to the Client for or in connection with any indirect, economic, special or consequential loss or damage as a result of the services provided by ASST will be limited to ASST rectifying any errors in the services in question. The Client indemnifies ASST from any liability it may have to the Client or any third party as a result of any information supplied to ASST by the Client or any of its agents, consultants, where such information and documentation is false, misleading or incomplete in a material respect.

The Client is not entitled to the report and/or any other documentation to be supplied by ASST and cannot rely on any such report or documentation, until all outstanding amounts are paid.

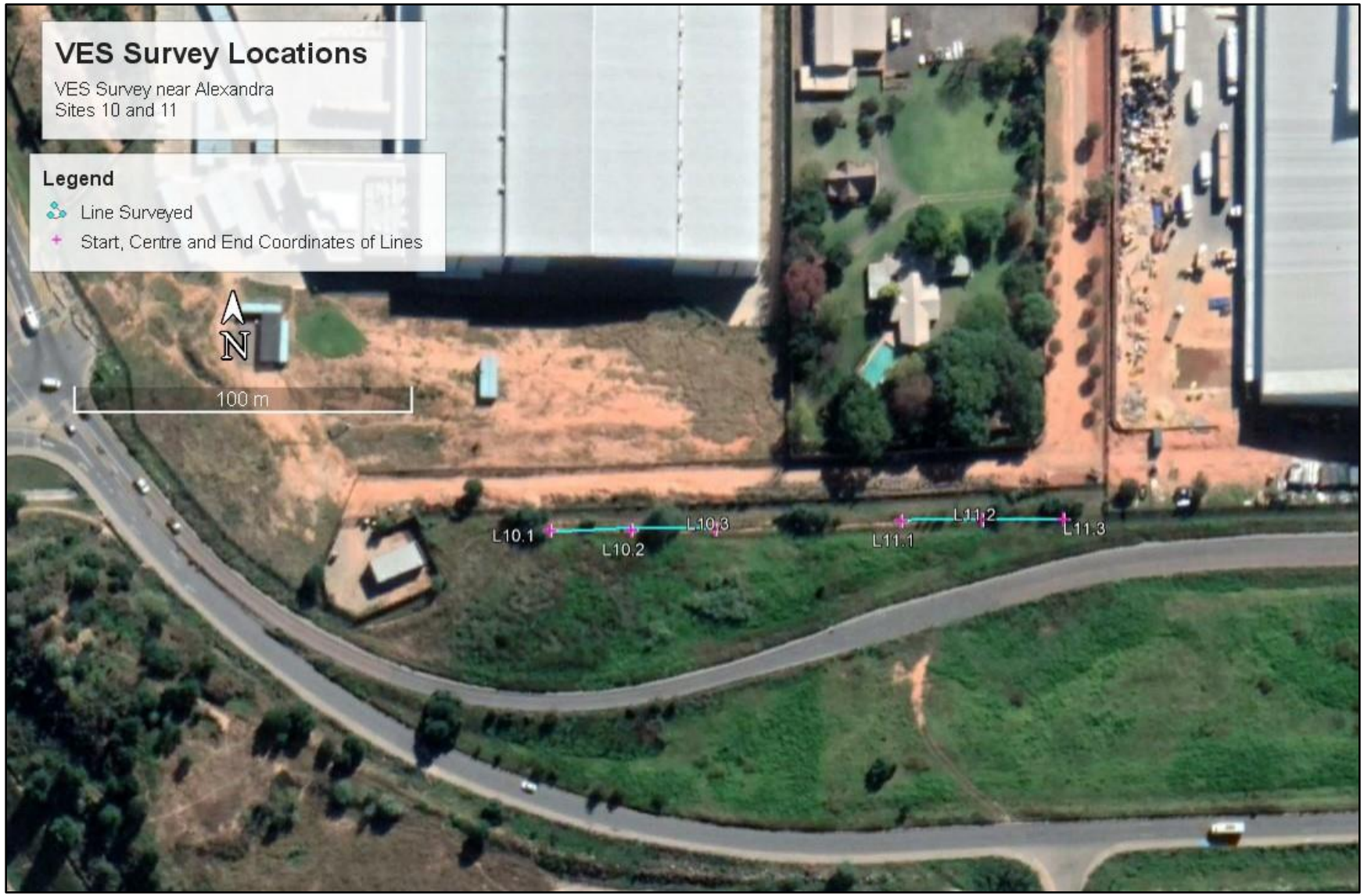
APPENDIX A: SURVEY LOCATION MAP




VES Survey Locations
VES Survey near Alexandra
Sites 1-3
Legend
Line Surveyed
Start, Centre and End Coordinates of Lines
N
100 m
L1.1
L1.2
L1.3
L2.1
L2.2
L2.3
L3.1
L3.2
L3.3


VES Survey Locations
VES Survey near Alexandra
Sites 4-7
Legend
Line Surveyed
Start, Centre and End Coordinates of Lines
N
100 m
L4.3
L4.2
L4.1
L5.1
L5.2
L5.3
L6.1
L6.2
L6.3
L7.1
L7.2
L7.3


VES Survey Locations
VES Survey near Alexandra
Sites 8 and 9
Legend
Line Surveyed
Start, Centre and End Coordinates of Lines
N
100 m
L8.1
L8.2
L8.3
L9.1
L9.2
L9.3


VES Survey Locations
VES Survey near Alexandra
Sites 10 and 11
Legend
Line Surveyed
Start, Centre and End Coordinates of Lines
N
100 m
L10.1
L10.2
L10.3
L11.1
L11.2
L11.3


VES Survey Locations
VES Survey near Alexandra
Sites 12 and 13
Legend
Line Surveyed
Start, Centre and End Coordinates of Lines
N
100 m
L13.1
L13.2
L13.3
L12.1
L12.2
L12.3

EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	711.532	711.532	711.532	1117.672				0.1	
	0.75	0.50	189.515	189.515	189.515	595.378				0.3	
	1.125	0.75	103.082	103.082	103.082	485.764				0.4	
	1.5	1.00	50.529	50.529	50.529	317.481				0.5	
	2.25	1.50	25.697	25.697	25.697	242.191				0.8	
	3	2.00	10.879	10.879	10.879	136.706				1.0	
	4.5	3.00	5.566	5.566	5.566	104.915				1.6	
	6	4.00	4.564	4.564	4.564	114.700				2.1	
	9	6.00	3.714	3.714	3.714	140.013				3.1	
	12	8.00	3.184	3.184	3.184	160.066				4.2	
	18	12.00	2.098	2.098	2.098	158.160				6.2	
	24	16.00	1.329	1.329	1.329	133.575				8.3	

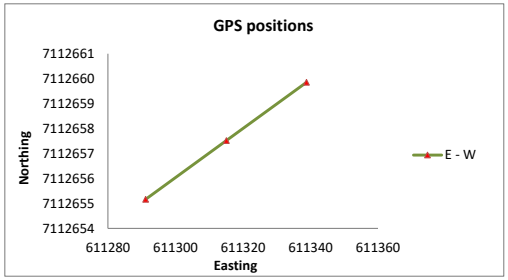
NOTES No Problems

Coordinate System: WGS84/UTM 35J

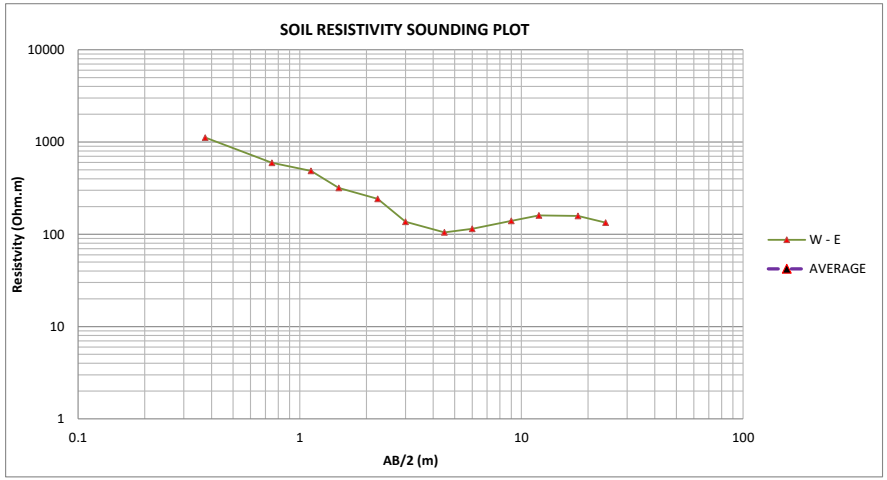
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611291	7112655	
Centre	611315	7112658	
East	611339	7112660	48



Site1



No photo



Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	54.765	54.765	54.765	86.024				0.1	
	0.75	0.50	28.356	28.356	28.356	89.083				0.3	
	1.125	0.75	14.030	14.030	14.030	66.116				0.4	
	1.5	1.00	9.507	9.507	9.507	59.732				0.5	
	2.25	1.50	5.333	5.333	5.333	50.266				0.8	
	3	2.00	3.337	3.337	3.337	41.938				1.0	
	4.5	3.00	2.285	2.285	2.285	43.070				1.6	
	6	4.00	1.609	1.609	1.609	40.432				2.1	
	9	6.00	1.416	1.416	1.416	53.373				3.1	
	12	8.00	1.371	1.371	1.371	68.909				4.2	
	18	12.00	1.077	1.077	1.077	81.227				6.2	
	24	16.00	1.127	1.127	1.127	113.256				8.3	

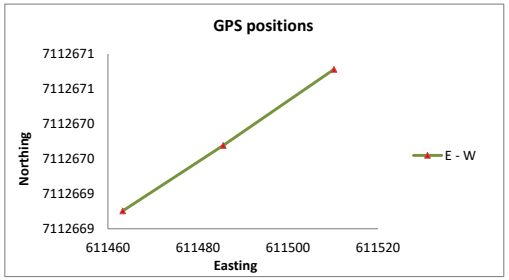
NOTES No Problems

Coordinate System: WGS84/UTM 35J

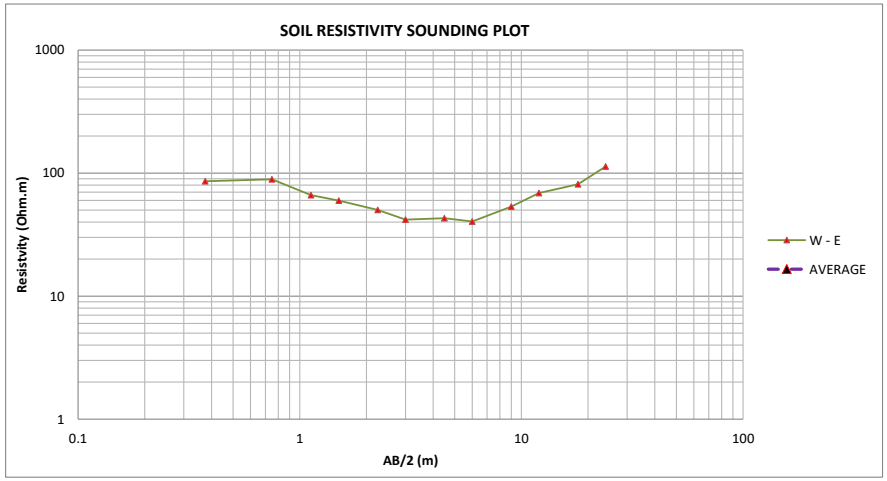
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611463	7112669	
Centre	611486	7112670	
East	611510	7112671	47



Site 2



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	13.169	13.169	13.169	20.686				0.1	
	0.75	0.5	9.354	9.354	9.354	29.388				0.3	
	1.125	0.75	8.400	8.400	8.400	39.585				0.4	
	1.5	1	7.080	7.080	7.080	44.483				0.5	
	2.25	1.5	5.805	5.805	5.805	54.716				0.8	
	3	2	5.532	5.532	5.532	69.513				1.0	
	4.5	3	4.667	4.667	4.667	87.974				1.6	
	6	4	3.502	3.502	3.502	88.027				2.1	
	9	6	2.639	2.639	2.639	99.493				3.1	
	12	8	2.342	2.342	2.342	117.742				4.2	
	18	12	1.431	1.431	1.431	107.886				6.2	
	24	16	1.317	1.317	1.317	132.364				8.3	

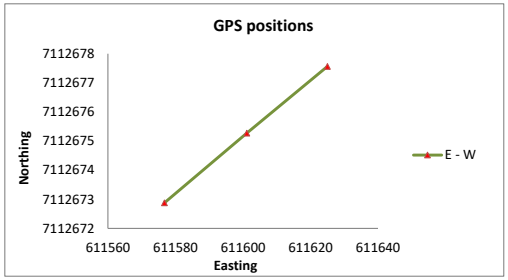
NOTES No Problems

Coordinate System: WGS84/UTM 35J

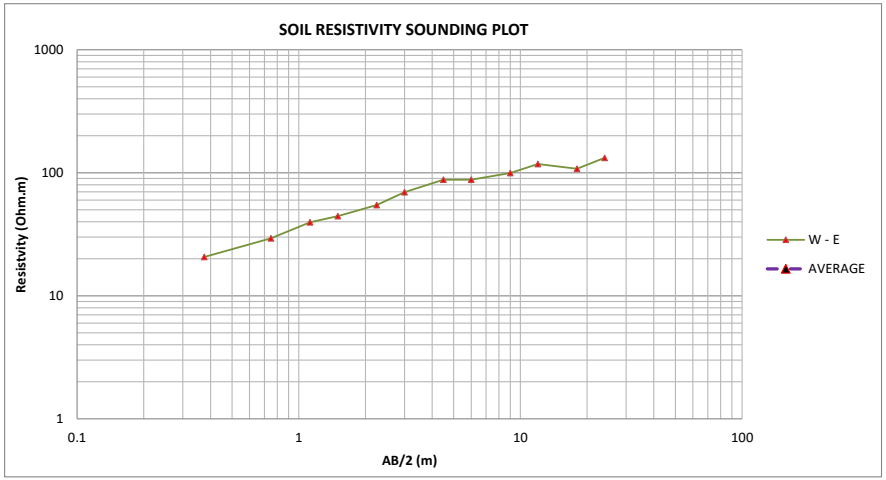
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611577	7112673	
Centre	611601	7112675	
East	611625	7112678	48



Site 3



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

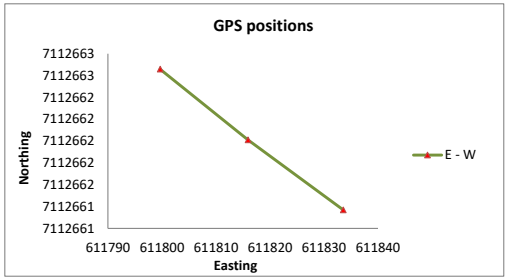
Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	50.601	50.601	50.601	79.484				0.1	
	0.75	0.50	14.285	14.285	14.285	44.877				0.3	
	1.125	0.75	6.458	6.458	6.458	30.430				0.4	
	1.5	1.00	3.103	3.103	3.103	19.496				0.5	
	2.25	1.50	1.514	1.514	1.514	14.265				0.8	
	3	2.00	1.030	1.030	1.030	12.949				1.0	
	4.5	3.00	0.855	0.855	0.855	16.108				1.6	
	6	4.00	0.888	0.888	0.888	22.330				2.1	
	9	6.00	0.891	0.891	0.891	33.574				3.1	
	12	8.00	0.859	0.859	0.859	43.163				4.2	
	18	12.00	0.641	0.641	0.641	48.335				6.2	
										0.0	

NOTES Could only fit a spread length of 36 meters.

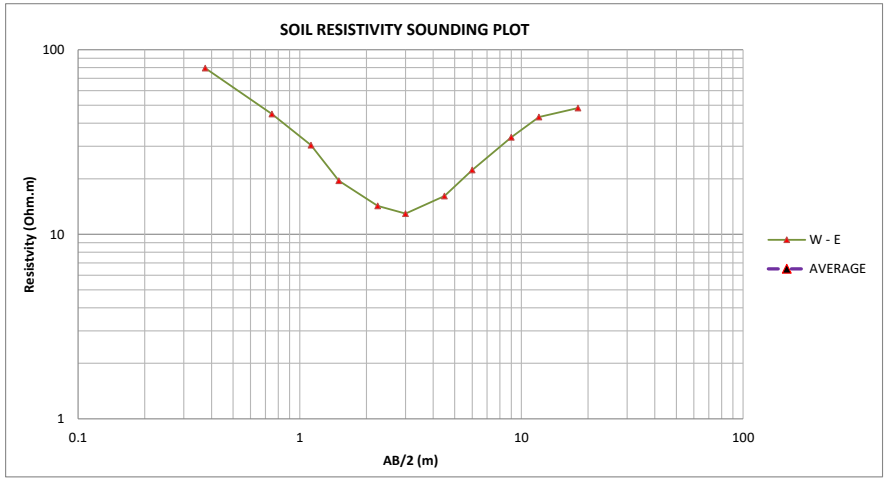
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GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611834	7112661	
Centre	611816	7112662	
East	611800	7112663	34

No photo



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	0.756	0.756	0.756	1.187				0.1	
	0.75	0.50	0.363	0.363	0.363	1.141				0.3	
	1.125	0.75	0.273	0.273	0.273	1.286				0.4	
	1.5	1.00	0.311	0.311	0.311	1.954				0.5	
	2.25	1.50	0.308	0.308	0.308	2.905				0.8	
	3	2.00	0.530	0.530	0.530	6.666				1.0	
	4.5	3.00	0.775	0.775	0.775	14.602				1.6	
	6	4.00	0.956	0.956	0.956	24.027				2.1	
	9	6.00	1.144	1.144	1.144	43.114				3.1	
	12	8.00	1.255	1.255	1.255	63.078				4.2	
	18	12.00	1.206	1.206	1.206	90.934				6.2	
	24	16.00	1.149	1.149	1.149	115.547				8.3	

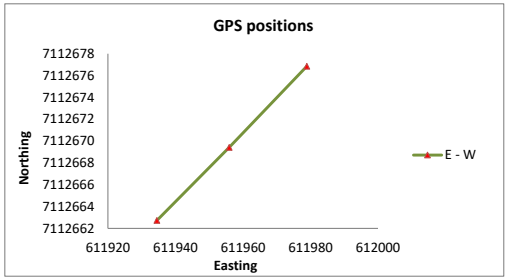
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Coordinate System: WGS84/UTM 35J

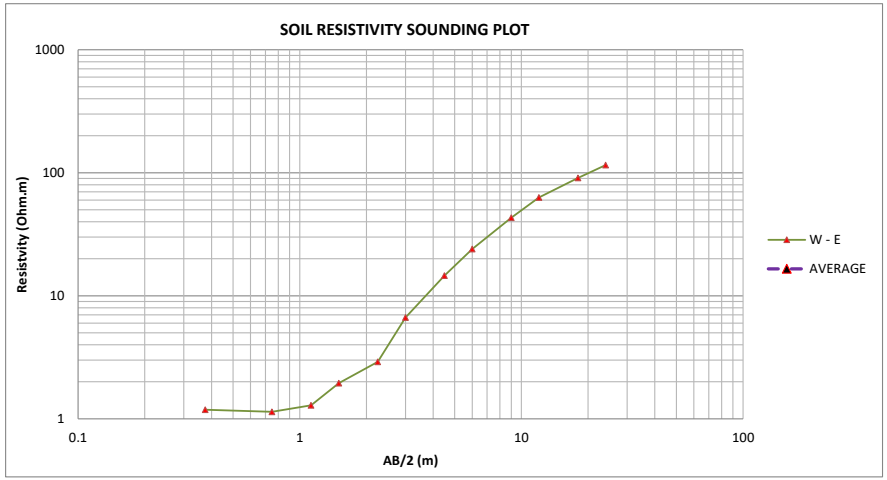
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611934	7112663	
Centre	611956	7112669	
East	611979	7112677	47



Site 5



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	0.618	0.618	0.618	0.971				0.1	
	0.75	0.50	0.513	0.513	0.513	1.612				0.3	
	1.125	0.75	0.539	0.539	0.539	2.538				0.4	
	1.5	1.00	0.495	0.495	0.495	3.110				0.5	
	2.25	1.50	0.585	0.585	0.585	5.513				0.8	
	3	2.00	0.843	0.843	0.843	10.595				1.0	
	4.5	3.00	0.814	0.814	0.814	15.352				1.6	
	6	4.00	0.727	0.727	0.727	18.261				2.1	
	9	6.00	0.773	0.773	0.773	29.123				3.1	
	12	8.00	0.937	0.937	0.937	47.087				4.2	
	18	12.00	1.023	1.023	1.023	77.115				6.2	
	24	16.00	0.817	0.817	0.817	82.097				8.3	

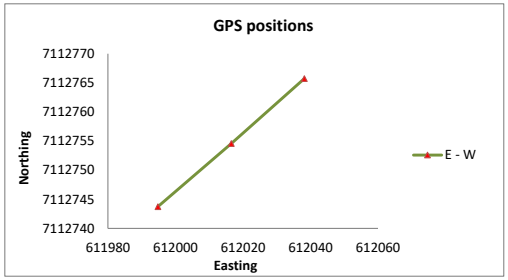
NOTES

Coordinate System: WGS84/UTM 35J

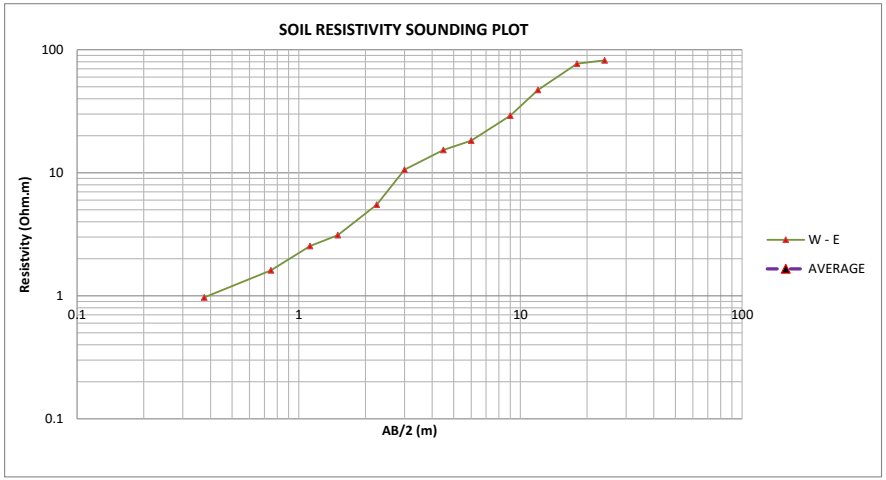
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	611995	7112744	
Centre	612017	7112755	
East	612038	7112766	49



Site 6



No photo



Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS	0.375	0.25	1.969	1.969	1.969	3.092				0.1	
	0.75	0.50	1.179	1.179	1.179	3.703				0.3	
	1.125	0.75	0.891	0.891	0.891	4.200				0.4	
	1.5	1.00	0.795	0.795	0.795	4.997				0.5	
	2.25	1.50	0.632	0.632	0.632	5.957				0.8	
	3	2.00	0.527	0.527	0.527	6.624				1.0	
	4.5	3.00	0.390	0.390	0.390	7.346				1.6	
	6	4.00	0.301	0.301	0.301	7.571				2.1	
	9	6.00	0.296	0.296	0.296	11.157				3.1	
	12	8.00	0.287	0.287	0.287	14.439				4.2	
	18	12.00	0.218	0.218	0.218	16.400				6.2	
	24	16.00	0.193	0.193	0.193	19.372				8.3	
EW											

Soil is not In Situ and differs from surounding site.

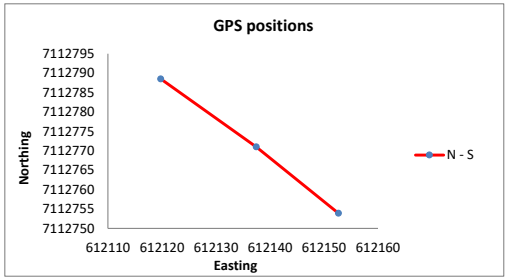
NOTES

Coordinate System: WGS84/UTM 35J

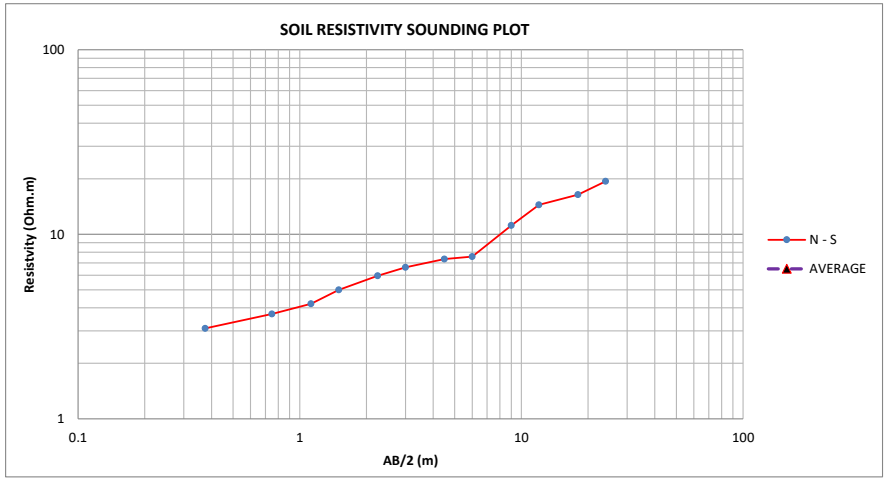
GPS Positions	Easting	Northing	Length
North	612120	7112789	
Centre	612137	7112771	
South	612153	7112754	48
West			
Centre			
East			



Site 7



No photo



Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS	0.375	0.25	421.351	421.351	421.351	661.856				0.1	
	0.75	0.50	212.881	212.881	212.881	668.786				0.3	
	1.125	0.75	105.674	105.674	105.674	497.977				0.4	
	1.5	1.00	70.016	70.016	70.016	439.925				0.5	
	2.25	1.50	54.189	54.189	54.189	510.721				0.8	
	3	2.00	41.216	41.216	41.216	517.937				1.0	
	4.5	3.00	21.034	21.034	21.034	396.486				1.6	
	6	4.00	15.191	15.191	15.191	381.794				2.1	
	9	6.00	10.944	10.944	10.944	412.597				3.1	
	12	8.00	9.449	9.449	9.449	474.982				4.2	
	18	12.00	5.814	5.814	5.814	438.379				6.2	
	24	16.00	4.805	4.805	4.805	483.086				8.3	
EW											

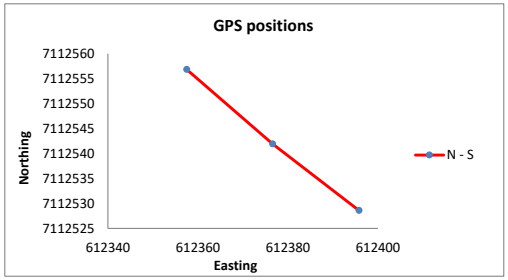
NOTES No Problems

Coordinate System: WGS84/UTM 35J

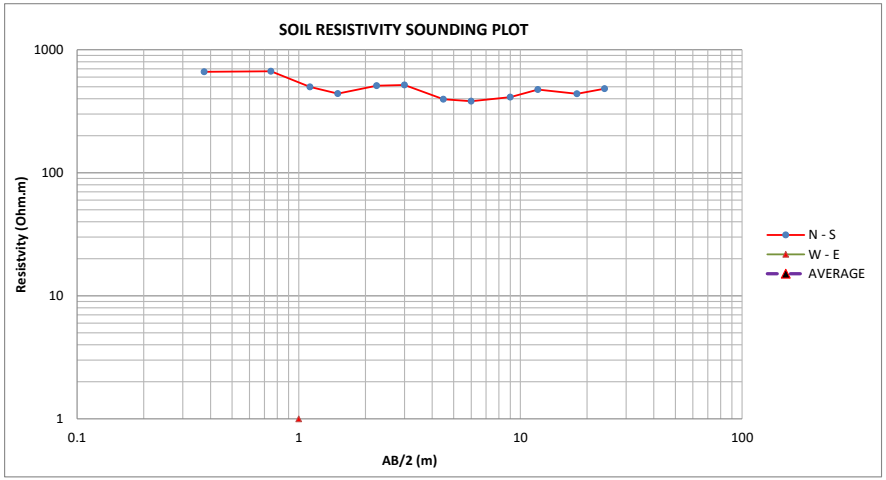
GPS Positions	Easting	Northing	Length
North	612358	7112557	
Centre	612377	7112542	
South	612396	7112529	48
West			
Centre			
East			



Site 8



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS	0.375	0.25	414.270	414.270	414.270	650.733				0.1	
	0.75	0.50	92.288	92.288	92.288	289.933				0.3	
	1.125	0.75	41.911	41.911	41.911	197.503				0.4	
	1.5	1.00	35.450	35.450	35.450	222.741				0.5	
	2.25	1.50	41.870	41.870	41.870	394.618				0.8	
	3	2.00	39.981	39.981	39.981	502.416				1.0	
	4.5	3.00	30.878	30.878	30.878	582.042				1.6	
	6	4.00	24.880	24.880	24.880	625.313				2.1	
	9	6.00	15.298	15.298	15.298	576.739				3.1	
	12	8.00	10.677	10.677	10.677	536.660				4.2	
	18	12.00	5.529	5.529	5.529	416.849				6.2	
	24	16.00	3.712	3.712	3.712	373.209				8.3	
EW											

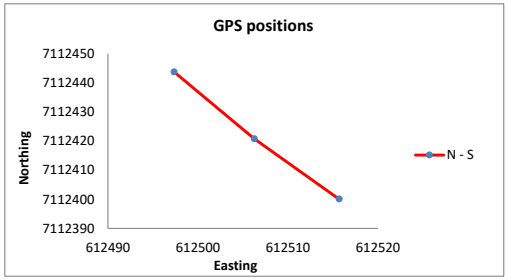
NOTES No Problems

Coordinate System: WGS84/UTM 35J

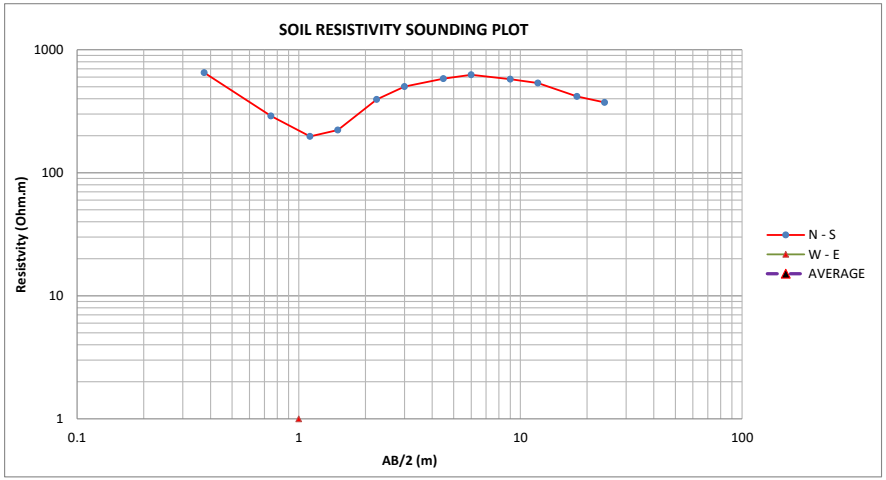
GPS Positions	Easting	Northing	Length
North	612497	7112444	
Centre	612506	7112421	
South	612516	7112400	47
West			
Centre			
East			



Site 9



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	49.951	49.951	49.951	78.463				0.1	
	0.75	0.50	45.521	45.521	45.521	143.007				0.3	
	1.125	0.75	30.656	30.656	30.656	144.461				0.4	
	1.5	1.00	26.226	26.226	26.226	164.785				0.5	
	2.25	1.50	22.772	22.772	22.772	214.623				0.8	
	3	2.00	24.646	24.646	24.646	309.712				1.0	
	4.5	3.00	19.627	19.627	19.627	369.959				1.6	
	6	4.00	17.869	17.869	17.869	449.088				2.1	
	9	6.00	14.080	14.080	14.080	530.821				3.1	
	12	8.00	10.531	10.531	10.531	529.327				4.2	
	18	12.00	5.901	5.901	5.901	444.904				6.2	
	24	16.00	4.070	4.070	4.070	409.189				8.3	

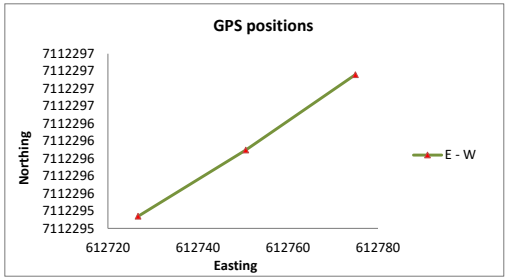
NOTES No Problems

Coordinate System: WGS84/UTM 35J

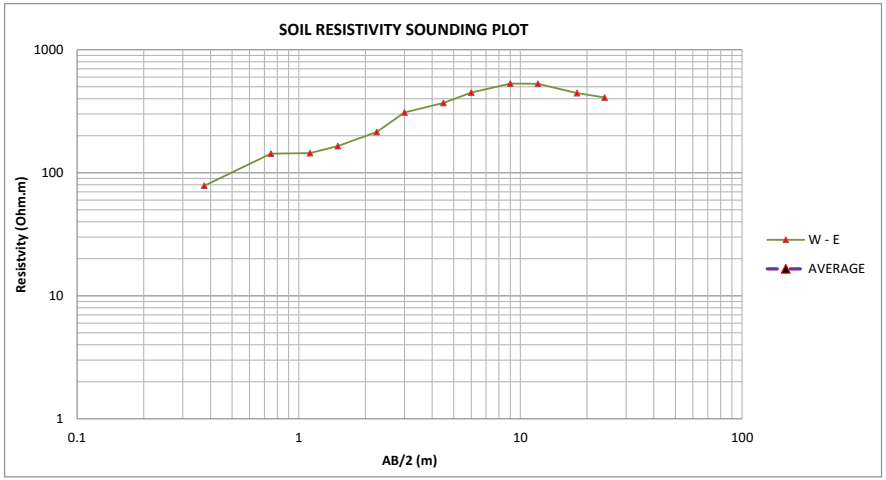
GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	612727	7112295	
Centre	612751	7112296	
East	612775	7112297	48



Site 10



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

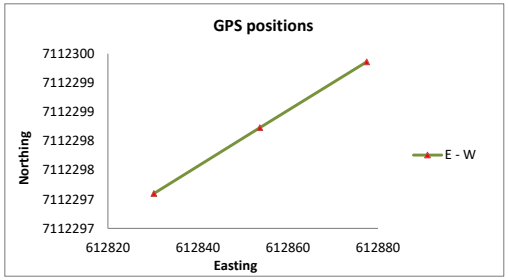
Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	98.011	98.011	98.011	153.956				0.1	
	0.75	0.50	64.169	64.169	64.169	201.593				0.3	
	1.125	0.75	43.648	43.648	43.648	205.688				0.4	
	1.5	1.00	33.489	33.489	33.489	210.417				0.5	
	2.25	1.50	28.313	28.313	28.313	266.844				0.8	
	3	2.00	20.129	20.129	20.129	252.950				1.0	
	4.5	3.00	14.684	14.684	14.684	276.792				1.6	
	6	4.00	10.502	10.502	10.502	263.946				2.1	
	9	6.00	6.427	6.427	6.427	242.299				3.1	
	12	8.00	4.033	4.033	4.033	202.733				4.2	
	18	12.00	2.331	2.331	2.331	175.758				6.2	
	24	16.00	1.522	1.522	1.522	152.995				8.3	

NOTES No Problems

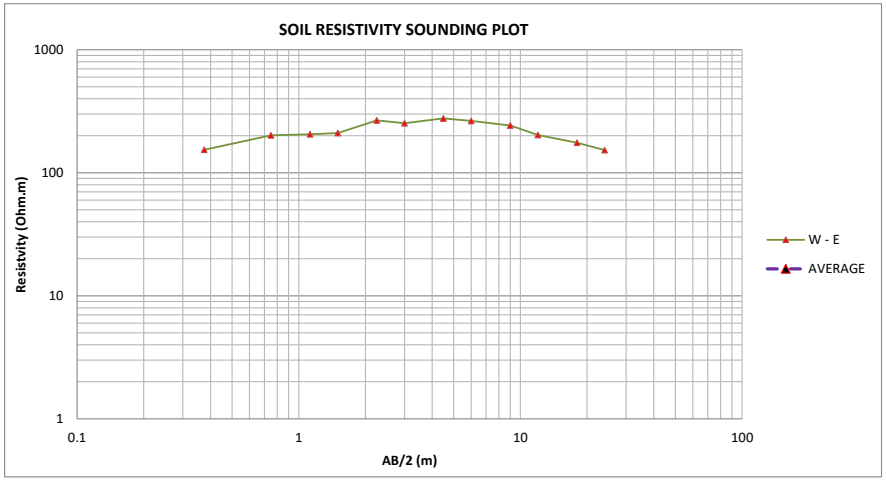
Coordinate System: WGS84/UTM 35J

GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	612830	7112297	
Centre	612854	7112298	
East	612877	7112299	47

No photo



No photo



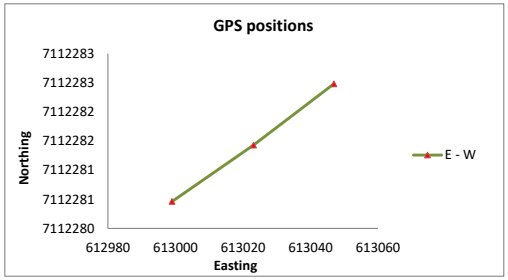
Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	59.961	59.961	59.961	94.187				0.1	
	0.75	0.50	78.565	78.565	78.565	246.818				0.3	
	1.125	0.75	89.008	89.008	89.008	419.443				0.4	
	1.5	1.00	68.360	68.360	68.360	429.516				0.5	
	2.25	1.50	34.375	34.375	34.375	323.979				0.8	
	3	2.00	15.280	15.280	15.280	192.015				1.0	
	4.5	3.00	6.623	6.623	6.623	124.842				1.6	
	6	4.00	4.626	4.626	4.626	116.255				2.1	
	9	6.00	1.966	1.966	1.966	74.132				3.1	
	12	8.00	1.309	1.309	1.309	65.815				4.2	
	18	12.00	0.771	0.771	0.771	58.162				6.2	
	24	16.00	0.595	0.595	0.595	59.818				8.3	

NOTES No Problems

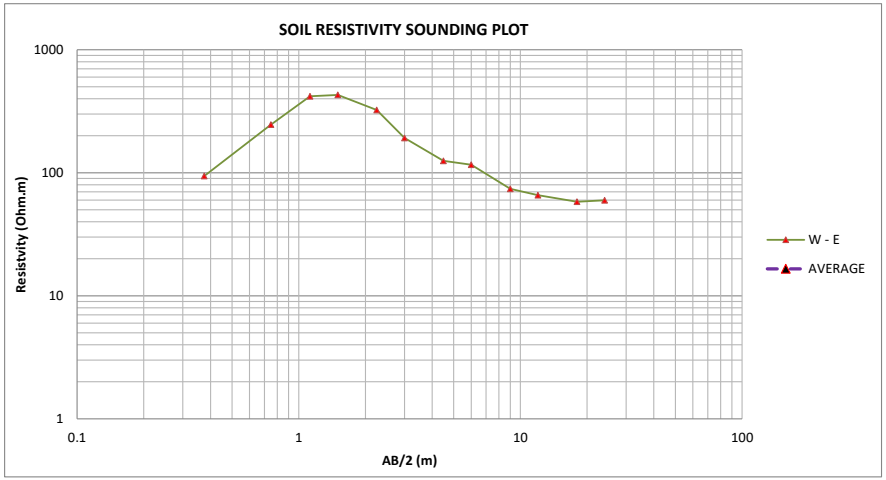
Coordinate System: WGS84/UTM 35J

GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	612999	7112280	
Centre	613023	7112281	
East	613047	7112282	48

No photo



No photo



EXPERIENCE. QUALITY. RELIABILITY. ASST

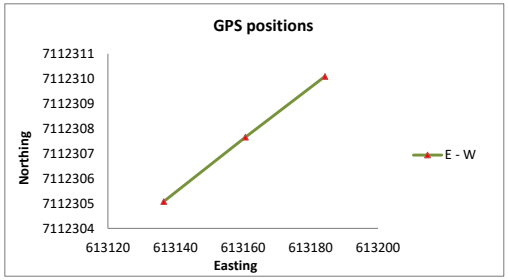
Direction	AB/2	"a"-spacing (m)	Measured Resistance Re (1) (Ω)	Measured Resistance Re (2) (Ω)	Measured Resistance Re (3) (Ω)	Calculated Resistivity ρ (Ω.m)	Modelled Apparent Resistivity Of Single Spread	Average Resistivity Of Orthogonal Spreads ρ (Ω.m)	Layered Earth Model (Ω.m)	Est. Depth Of Investigation (m)	Lithological Log (w = water)
NS											
EW	0.375	0.25	884.935	884.935	884.935	1390.053				0.1	
	0.75	0.50	206.085	206.085	206.085	647.435				0.3	
	1.125	0.75	106.386	106.386	106.386	501.333				0.4	
	1.5	1.00	66.837	66.837	66.837	419.952				0.5	
	2.25	1.50	28.137	28.137	28.137	265.187				0.8	
	3	2.00	13.008	13.008	13.008	163.459				1.0	
	4.5	3.00	5.386	5.386	5.386	101.523				1.6	
	6	4.00	3.728	3.728	3.728	93.692				2.1	
	9	6.00	2.629	2.629	2.629	99.104				3.1	
	12	8.00	1.606	1.606	1.606	80.707				4.2	
	18	12.00	1.249	1.249	1.249	94.149				6.2	
	24	16.00	1.529	1.529	1.529	153.723				8.3	

NOTES No Problems

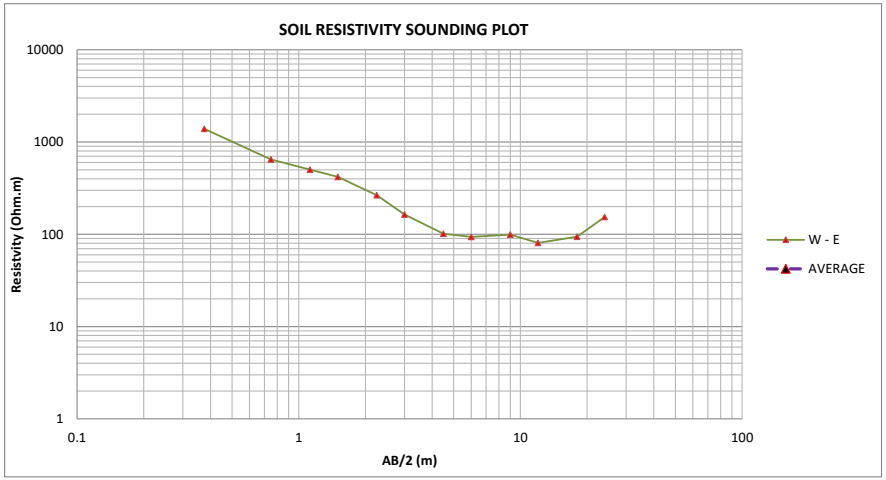
Coordinate System: WGS84/UTM 35J

GPS Positions	Easting	Northing	Length
North			
Centre			
South			
West	613137	7112305	
Centre	613161	7112308	
East	613184	7112310	48

No photo



No photo



Manual test

Test nr	Test case	Comments	Initials
2.1	Control power consumption		RkA
2.2	SNr , channels and software		RkA
2.3	Control of internal battery		RkA
2.4	Control of battery readings		RkA
2.5	Relay test		RkA
2.6.1	Calibration of RX channels (LOW)		RkA
2.6.2	Calibration of RX channels (HIGH)		RkA
2.6.3	Calibration of TX voltage (Monitor U)		RkA
2.6.4	Calibration of TX ampere (Monitor I)		RkA
2.7	SP-test (HIGH)		RkA
2.8	SP-test (LOW)		RkA
2.9	TX-test (High Current)		RkA
2.10	RES-test		RkA
2.11	Controlling data exportation		RkA
2.13	Ethernet		RkA
2.13.1	Wi-Fi		RkA
2.13.2	GPRS		RkA
2.14	GPS		RkA
5.1	Cold test (-20°C)		RkA
5.2	Heat test (45°C)		RkA
2.15	Quality check assembly		RkA
			—
3	Verification of test result		RkA
			—
4.1	Cleanup after test		RkA
4.2	Delivery configuration		RkA

Date : 170619

Sign : RkA

ABEM	Dokumentnamn Terrameter LS 2 - Delivery Testing	Page 1(2)

Reg nr:	Rev: v1.0 (2016-08-05)
Valid from:	
Produced by: AK/BÅ	
Revised by: AHo	

Instrument serial #: 2 1 7 0 6 0 4 1 6

Installed software

Build number	2.0.4

Hardware

CPU Module	9G45 Revision:
Micro SD	16 GB ATP
TX ver.	3.7.1
LINUX ver.	
Connection board	Revision:
Installed protocols	Standard

Delivery configuration (logistic department)

Installed time zone	
Model configuration (Mark specified)	Basic 2/48 | Standard 2/48 | Standard 2/81 Advanced 4/48 | Advanced 10/48 | Advanced 4/81 Advanced 8/81 | Advanced 12/81 | Other
Other modification	

Appendix F (Borehole Profiles)

HOLE No: BH01
Sheet 1 of 1

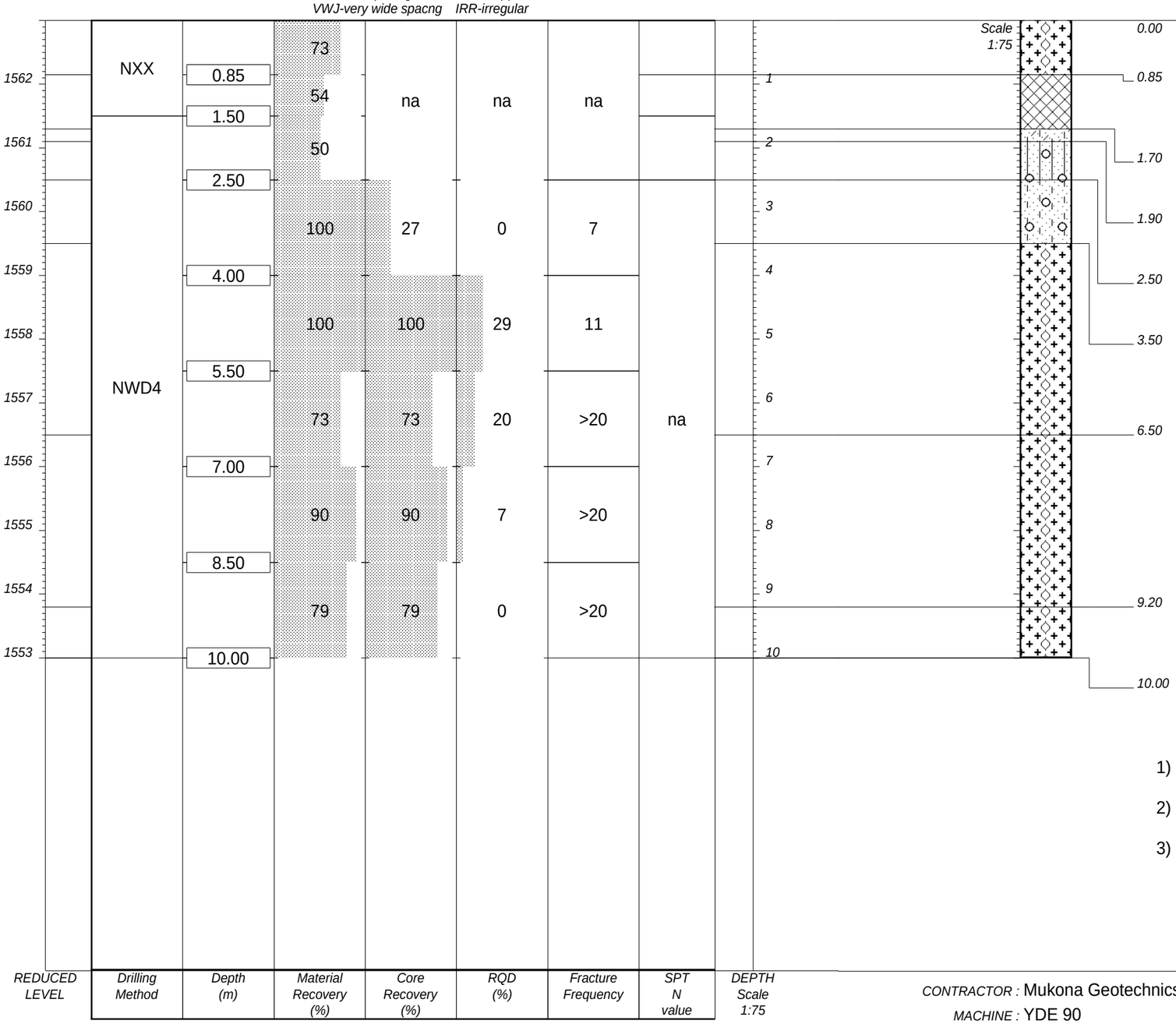
JOB NUMBER: MTS-LID-AlexP-05-05-20

ROCK FABRIC	GRAIN SIZE	JOINT ROUGHNESS	ROCK HARDNESS
MF -massive	FG -fine grained	SLJ-slickensided	EHR-extremely hard rock
BF -bedded	MG -medium grain	SJ -smooth	VHR-very hard rock
FF -foliated	CG -coarse grain	RJ -rough	HR -hard rock
CF -cleaved			MHR-medium hard rock
SF -schistose	JOINT SPACING	JOINT SHAPE	SR -soft rock
GF -gneissose	VCJ-very close spacg	CUR-curvilinear	VSR-very soft rock
LF -laminated	CJ -close spacing	PLA-planar	
	MJ -medium spacing	UND-undulating	
	WJ -wide spacing	STE-stepped	
	VWJ-very wide spacng	IRR-irregular	

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: BH01
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



Grey, speckled dark green, unweathered, coarse grained, hard rock :**GRANITE BOULDER**.

Moist, orange brown, blotched black, medium dense to dense, intact silty SAND, with abundant sub-angular granite coarse gravels, scattered rubble: **FILL**.

Moist, dark grey to black, medium dense to dense, intact, slightly clayey silty SAND: **HILLWASH**.

Red brown, blotched orange brown and grey, intact, gravelly silt SAND: **REWORKED RESIDUAL GRANITE**.

Orange brown, blotched grey, dense to very dense, intact, gravelly silty SAND with occasional soft rock fragments: **RESIDUAL GRANITE**.

Orange brown, blotched grey brown, highly weathered, coarse grained, highly fractured, soft rock becoming medium hard rock below 5.1m: **GRANITE**.

Light pink to off-white, moderately weathered, with highly weathered zones, coarse grained, highly fractured, hard rock with medium rock zones: **PEGMATITIC GRANITE**.

yellow brown to orange brown, and stained black, highly weathered, coarse grained, highly fractured, soft rock to medium hard rock: **GRANITE**.

End of hole.

NOTES

1) End of borehole at 10m.
2) Drilling medium: EZEE Mix used throughout.
3) Casing installed to 4.5m.

REDUCED LEVEL	Drilling Method	Depth (m)	Material Recovery (%)	Core Recovery (%)	RQD (%)	Fracture Frequency	SPT N value	DEPTH Scale 1:75

CONTRACTOR : Mukona Geotechnics
MACHINE : YDE 90
DRILLED BY : Sunnyboy
PROFILED BY : T M
TYPE SET BY : NB
SETUP FILE : STANDARD.SET

INCLINATION : 90°
DIAM : N size
DATE : 3/02/020
DATE : 22/07/2020
DATE : 22/07/2020 13:35
TEXT : ..lineBoreholeProfiles.txt

ELEVATION : 1563m
X-COORD : 26° 5'59.40"S
Y-COORD : 28° 7'13.85"E

HOLE No: BH01

HOLE No: BH02
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

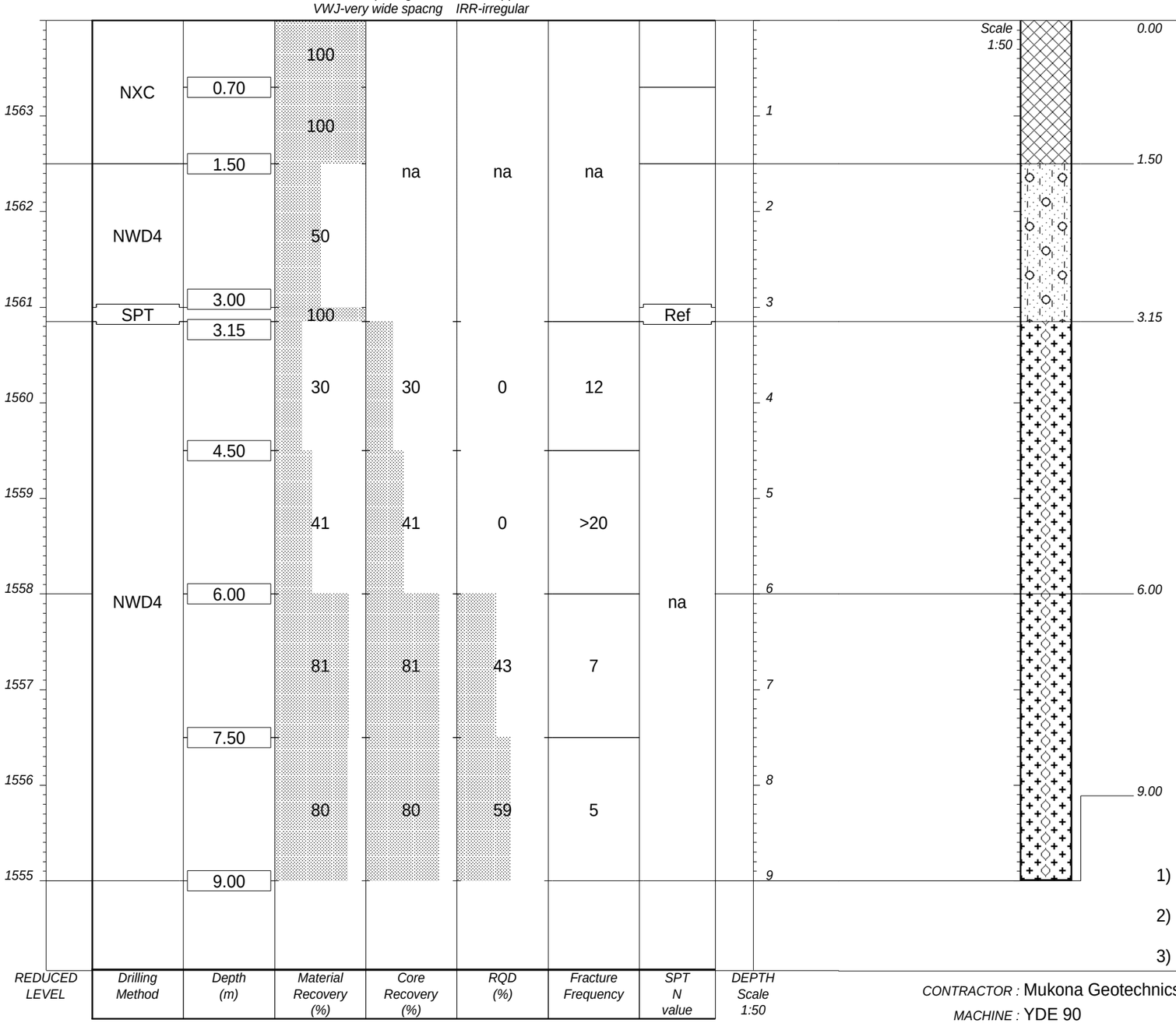
ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

MMAPHAKA Engineers

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

HOLE No: BH02
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20



0.00 – 1.50: Moist, orange brown, blotched black, medium dense to dense, intact silty SAND, with abundant sub-angular granite coarse gravels, scattered rubble: **FILL**.

1.50 – 3.15: Orange brown, blotched grey, dense to very dense, intact, gravelly silty SAND with occasional soft rock fragments towards base: **RESIDUAL GRANITE**.

3.15 – 6.00: Light pink to off-white, moderately weathered, with highly weathered zones, coarse grained, highly fractured, hard rock with medium rock zones: **PEGMATITIC GRANITE**.

6.00 – 9.00: yellow brown to light orange brown, and stained black, moderately weathered, coarse grained, highly fractured, medium hard rock to hard rock: **GRANITE**.

9.00: End of hole.

NOTES

1) End of borehole at 9.
2) Drilling medium: EZEE Mix used throughout.
3) Casing installed to 3m.

CONTRACTOR : Mukona Geotechnics
MACHINE : YDE 90
DRILLED BY : Sunnyboy
PROFILED BY : T M

INCLINATION : 90°
DIAM : N size
DATE : 30/06 to 01/07/2020
DATE : 22/07/2020

ELEVATION : 1564m
X-COORD : 26° 5’58.80"S
Y-COORD : 28° 7’16.95"E

TYPE SET BY : NB
SETUP FILE : STANDARD.SET

DATE : 22/07/2020 13:35
TEXT : ..lineBoreholeProfiles.txt

HOLE No: BH02

Lidwala Consulting Engineers
Proposed Johannesburg Water
Bulk Water Pipeline Replacement
Alexandra
Gauteng Province

LEGEND
Sheet 1 of 1

JOB NUMBER: MTS-LID-AlexP-05-05-20

	GRAVELLY	{SA03}
	SAND	{SA04}
	SILT	{SA06}
	SILTY	{SA07}
	CLAYEY	{SA09}
	GRANITE	{SA17}{SA44}
	FILL	{SA32}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : NB
SETUP FILE : STANDARD.SET

DATE : 22/07/2020 13:35
TEXT : ..lineBoreholeProfiles.txt

LEGEND
SUMMARY OF SYMBOLS

Appendix G (Borehole Photographs)



*Plate 1: Borehole **BH01** Box 1 of 3*



*Plate 2: Borehole **BH01** Box 2 of 3*



*Plate 3: Borehole **BH01** Box 3 of 3*



*Plate 4: Borehole **BH02** Box 1 of 2*



*Plate 5: Borehole **BH02** Box 2 of 2*

Appendix H (Laboratory Test Results)

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Civil Engineering Testing Laboratories

Client	:	MMAPHAKA TRADING SERVICES (C)			
Address	:	34 BLOCK D	**Client Reference**	:	
	:	MATOPANE	**Order No.**	:	Tshepo
	:	PRETORIA			
Attention	:		**Date Received**	:	26/06/2020
Facsimile	:	086 535 9658	**Date Tested**	:	26/06/2020 - 21/07/2020
E-mail	:	info@mmaphaka.co.za; mmaphaka.trading@	**Date Reported**	:	21/07/2020
Project	:	Alex Pipeline			
Project No.	:	2020-B-683	**Report Status**	:	Final
			Page	:	1 of 12

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Moisture Density Relationship	3.000	SANS 3001 GR30	S Pullen	8-10
pH of Soil *	3.000	TMH1 A20	B Mvubu	2-4
Conductivity of saturated soil paste *	3.000	TMH1 A21T	B Mvubu	2-4
Moisture Content as received	5.000	SANS 3001	B Mvubu	5-7
Atterberg Limits <0.425mm	5.000	SANS 3001 GR10	S Pullen	5-7, 11-12
Sieve Analysis 0.075mm	5.000	SANS 3001 GR1	S Pullen	5-7, 11-12
Hydrometer Analysis	5.000	SANS 3001 GR3	S Pullen	5-7

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

This report is completely confidential between the parties (Civilab and Civilab`s client) and shall not be disclosed to anybody else, unless agreed upon in writing or made publicly available by the client or required to make available by law.

Deviations in Test Methods:

Technical Signatory:	
Signature:	

**All results are authorized electronically by approved managers and/or technical signatories.

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Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	2 of 12

AGGREGATE TEST REPORT

Laboratory Number		2
Field Number		AP3
Client Reference		
Depth (m)		1.6-3.4
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete/Crushed		
Stabilizing Agent		

	% Passing		mm		Finess Modulus				
			mm		Clay Content		SANS 3001 GR3	%	4
			mm		Organic Impurities			Ref.	
			mm		Flakiness Index	Total		%	
			mm						
			mm						
			mm		Average Least Dimension	Manual		mm	
			mm			Machine			
			mm			Computation			
			mm		Aggregate Crushing Value	Dry		%	
			mm			Wet			
			mm			Eth. Glycol			
			mm		10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
			mm			Wet			
			mm			Eth. Glycol			
			mm			Wet/Dry Ratio		%	
			mm		Bulk Density	Loose		kg/m^3	
			mm			Compacted			
			mm		Water Absorption			%	
Sand Equivalent, Se									
pH				6.9					
Relative Density of Soils					Bulk Particle Density			kg/m^3	
Durability Mill Index						Aggregate			
Moisture Content			%		Apparent Particle Density			kg/m^3	
Compactibility Factor									
Conductivity			S.m^{-1}	0.018					
Total Water Soluble	Salts		%			Adjusted			
	Sulphates					Relative			
Soluble	Salts		%		LA Abrasion	1000 Revs		%	
	Sulphates					500 Revs			
Soundness	Fine		%		Riedel & Weber				
	Coarse				Akali Silica Reaction			%	
	Fractions		No.		Drying Shrinkage			%	
Methylene Blue Absorption					Wetting Expansion			%	
Soluble Deleterious Impurities			%		Fractured Faces			%	
Chloride Content			%		Coarse Sand Ratio			%	
Low Density Material			%		Shape: Voids			%	
Presence of Sugar					Shell Content			%	
Mill Abrasion					Durability	Ballast			
Treton Value					Eth. Glycol Durability on _ Stone	Concrete			
Vialit Adhesion @	5°C		%			Crushed			
	25°C		%			Seal			

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Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	3 of 12

AGGREGATE TEST REPORT

Laboratory Number		4
Field Number		AP7
Client Reference		
Depth (m)		0.2-4.0
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete/Crushed		
Stabilizing Agent		

	% Passing		mm		Finess Modulus				
			mm		Clay Content		SANS 3001 GR3	%	10
			mm		Organic Impurities			Ref.	
			mm		Flakiness Index	Total		%	
			mm						
			mm						
			mm		Average Least Dimension	Manual		mm	
			mm			Machine			
			mm			Computation			
			mm		Aggregate Crushing Value	Dry		%	
			mm			Wet			
			mm			Eth. Glycol			
			mm		10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
			mm			Wet			
			mm			Eth. Glycol			
			mm			Wet/Dry Ratio		%	
			mm		Bulk Density	Loose		kg/m^3	
			mm			Compacted			
			mm		Water Absorption			%	
Sand Equivalent, Se									
pH				5.6					
Relative Density of Soils					Bulk Particle Density			kg/m^3	
Durability Mill Index						Aggregate			
Moisture Content			%		Apparent Particle Density			kg/m^3	
Compactibility Factor									
Conductivity			$S.m^{-1}$	0.006					
Total Water Soluble	Salts		%			Adjusted			
	Sulphates					Relative			
Soluble	Salts		%		LA Abrasion	1000 Revs		%	
	Sulphates					500 Revs			
Soundness	Fine		%		Riedel & Weber				
	Coarse				Akali Silica Reaction			%	
	Fractions		No.		Drying Shrinkage			%	
Methylene Blue Absorption					Wetting Expansion			%	
Soluble Deleterious Impurities			%		Fractured Faces			%	
Chloride Content			%		Coarse Sand Ratio			%	
Low Density Material			%		Shape: Voids			%	
Presence of Sugar					Shell Content			%	
Mill Abrasion					Durability	Ballast			
Treton Value					Eth. Glycol Durability on _ Stone	Concrete			
Vialit Adhesion @	5°C		%			Crushed			
	25°C		%			Seal			

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Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	4 of 12

AGGREGATE TEST REPORT

Laboratory Number		5
Field Number		AP10
Client Reference		
Depth (m)		1.4-2.8
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete/Crushed		
Stabilizing Agent		

	% Passing		mm		Finess Modulus				
			mm		Clay Content		SANS 3001 GR3	%	27
			mm		Organic Impurities			Ref.	
			mm		Flakiness Index	Total		%	
			mm						
			mm						
			mm		Average Least Dimension	Manual		mm	
			mm			Machine			
			mm			Computation			
			mm		Aggregate Crushing Value	Dry		%	
			mm			Wet			
			mm			Eth. Glycol			
			mm		10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
			mm			Wet			
			mm			Eth. Glycol			
			mm			Wet/Dry Ratio		%	
			mm		Bulk Density	Loose		kg/m^3	
			mm			Compacted			
			mm		Water Absorption			%	
Sand Equivalent, Se									
pH				6.1					
Relative Density of Soils					Bulk Particle Density			kg/m^3	
Durability Mill Index						Aggregate			
Moisture Content			%		Apparent Particle Density			kg/m^3	
Compactibility Factor									
Conductivity			S.m^{-1}	0.02					
Total Water Soluble	Salts		%			Adjusted			
	Sulphates					Relative			
Soluble	Salts		%		LA Abrasion	1000 Revs		%	
	Sulphates					500 Revs			
Soundness	Fine		%		Riedel & Weber				
	Coarse				Akali Silica Reaction			%	
	Fractions		No.		Drying Shrinkage			%	
Methylene Blue Absorption					Wetting Expansion			%	
Soluble Deleterious Impurities			%		Fractured Faces			%	
Chloride Content			%		Coarse Sand Ratio			%	
Low Density Material			%		Shape: Voids			%	
Presence of Sugar					Shell Content			%	
Mill Abrasion					Durability	Ballast			
Treton Value					Eth. Glycol Durability on _ Stone	Concrete			
Vialit Adhesion @	5°C		%			Crushed			
	25°C		%			Seal			

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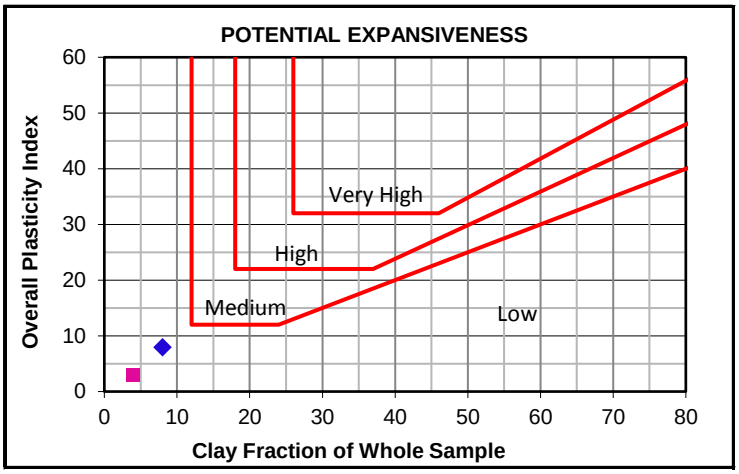
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Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	5 of 12

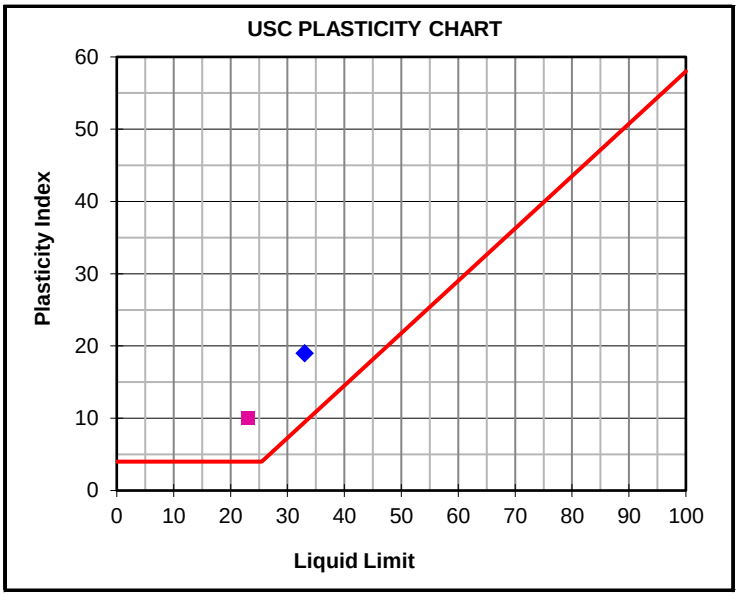
FOUNDATION INDICATOR

Laboratory Number		1 ◆	2 ■
Field Number		AP2	AP3
Client Reference			
Depth (m)		0.7-2.5	1.6-3.4
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			



Moisture Content & Relative Density			SANS 3001 GR30
Moisture Content (%)		16.6	6.6
Relative Density (S.G.)			

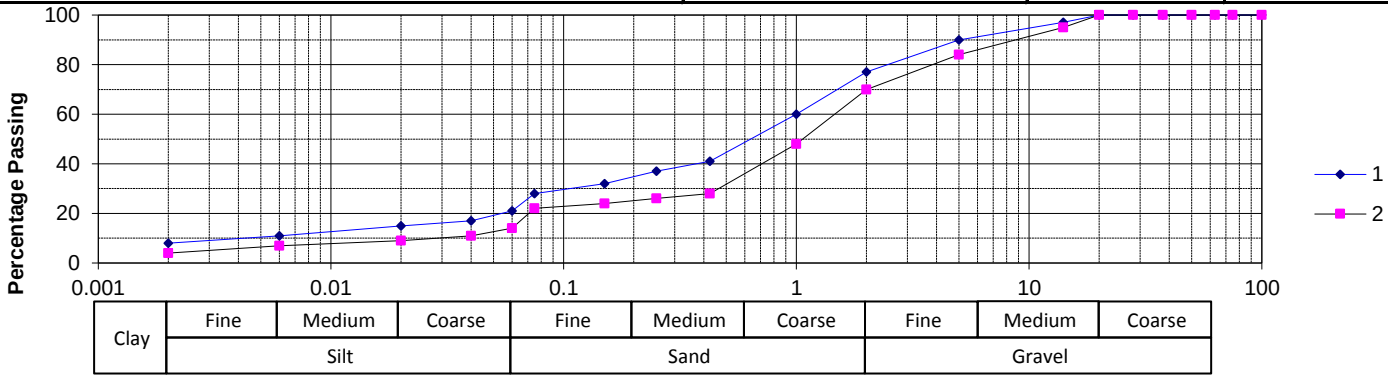
Sieve Analysis (Wet Prep)		SANS 3001 GR1	
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	97	95
	5 mm	90	84
	2 mm	77	70
	1 mm	60	48
	0.425 mm	41	28
	0.250 mm	37	26
	0.150 mm	32	24
	0.075 mm	28	22
Grading Modulus		1.54	1.80



Hydrometer Analysis		SANS 3001 GR3	
Percentage Passing	0.060 mm	21	14
	0.040 mm	17	11
	0.020 mm	15	9
	0.006 mm	11	7
	0.002 mm	8	4
Gravel	%	23	30
Sand	%	56	56
Silt	%	13	10
Clay	%	8	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		1 ◆	2 ■
Atterberg Limits -425µ		SANS 3001 GR10	
Liquid Limit	%	33	23
Plasticity Index	%	19	10
Linear Shrinkage	%	9.5	4.0
Overall PI	%	8	3
Classifications			
HRB (AASHTO)		A-2-6(1)	A-2-4(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa		0.0	0.0



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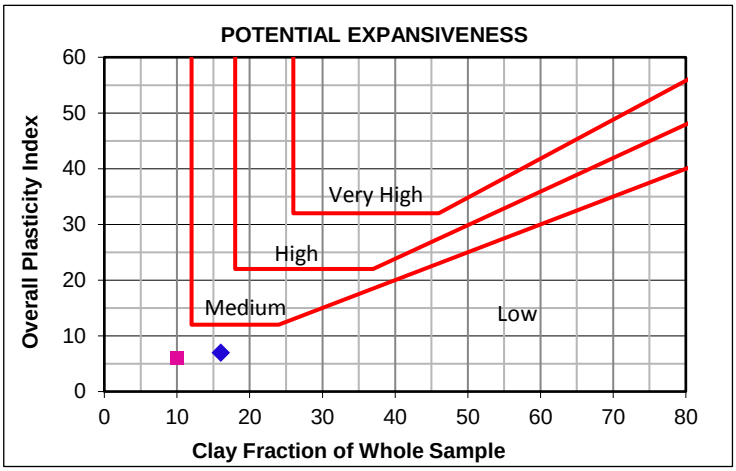
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Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	6 of 12

FOUNDATION INDICATOR

Laboratory Number		3 ◆	4 ■
Field Number		AP4	AP7
Client Reference			
Depth (m)		1.0-3.1	0.2-4.0
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

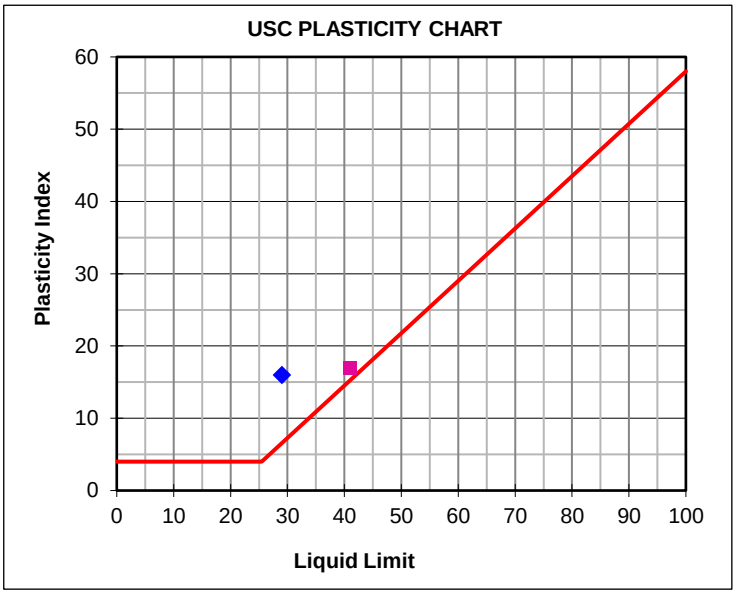


Moisture Content & Relative Density — SANS 3001 GR30

Moisture Content (%)	14.8	10.5
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) — SANS 3001 GR1

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	96
	2 mm	93	82
	1 mm	72	56
	0.425 mm	46	34
	0.250 mm	40	31
	0.150 mm	36	28
	0.075 mm	31	25
Grading Modulus		1.30	1.59



Hydrometer Analysis — SANS 3001 GR3

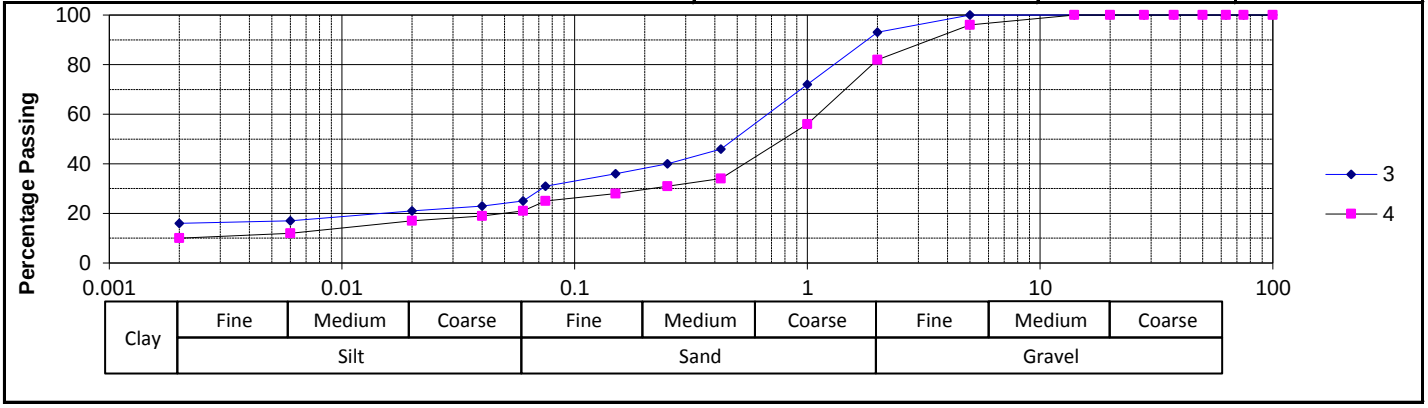
Percentage Passing	0.060 mm	25	21
	0.040 mm	23	19
	0.020 mm	21	17
	0.006 mm	17	12
	0.002 mm	16	10
Gravel	%	7	18
Sand	%	68	61
Silt	%	9	11
Clay	%	16	10

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		3 ◆	4 ■
Atterberg Limits -425µ		**SANS 3001 GR10**	
Liquid Limit	%	29	41
Plasticity Index	%	16	17
Linear Shrinkage	%	6.0	7.0
Overall PI	%	7	6

Classifications

HRB (AASHTO)	A-2-6(1)	A-2-7(1)
Unified (ASTM D2487)	SC	SC
Weston Swell @ 1 kPa	0.0	0.1



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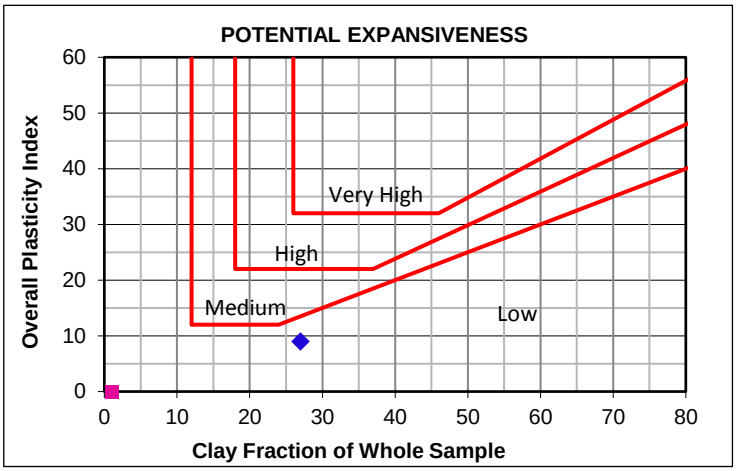
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Client	:	MMAPHAKA TRADING SERVICES (C)	Date Received:	26/06/2020
Project	:	Alex Pipeline	Date Reported:	15/07/2020
Project No	:	2020-B-683	Page No. :	7 of 12

FOUNDATION INDICATOR

Laboratory Number		5 ◆	■
Field Number		AP10	
Client Reference			
Depth (m)		1.4-2.8	
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

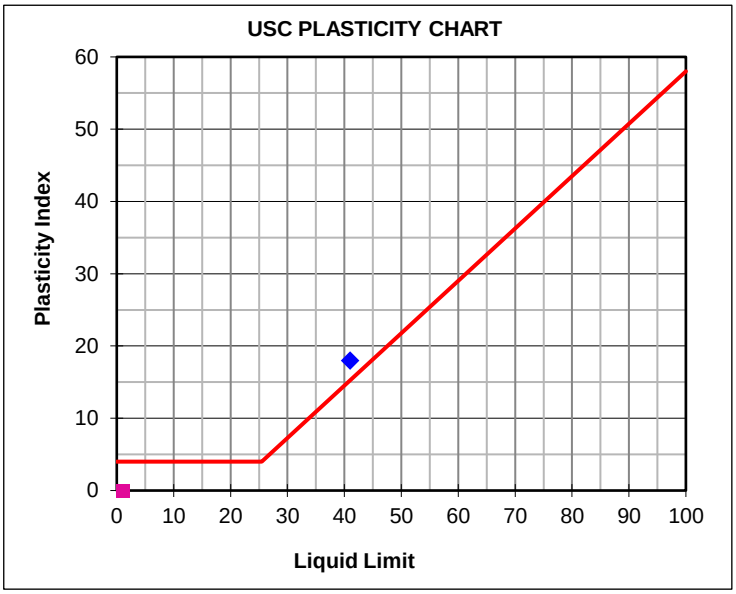


Moisture Content & Relative Density

Moisture Content (%)	10.1
Relative Density (S.G.)	

Sieve Analysis (Wet Prep) — **SANS 3001 GR1**

Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	100
	20 mm	100
	14 mm	98
	5 mm	97
	2 mm	82
	1 mm	68
	0.425 mm	51
	0.250 mm	49
	0.150 mm	45
	0.075 mm	42
Grading Modulus		1.25



Hydrometer Analysis — **SANS 3001 GR3**

Percentage Passing	0.060 mm	41
	0.040 mm	39
	0.020 mm	36
	0.006 mm	30
	0.002 mm	27
Gravel	%	18
Sand	%	41
Silt	%	14
Clay	%	27

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

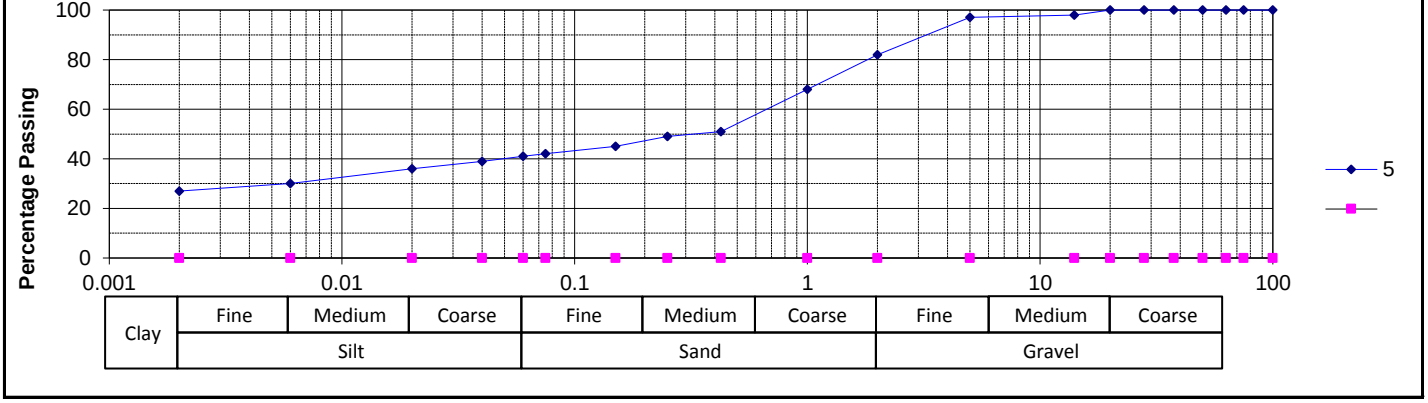
Laboratory Number	5 ◆	■

Atterberg Limits -425µ — **SANS 3001 GR10**

Liquid Limit	%	41	
Plasticity Index	%	18	
Linear Shrinkage	%	8.5	
Overall PI	%	9	

Classifications

HRB (AASHTO)	A-7-6(4)	
Unified (ASTM D2487)	SC	
Weston Swell @ 1 kPa	0.6	



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Client	:	MMAPHAKA TRADING SERVICES (C)	Date Received: 26/06/2020
Project	:	Alex Pipeline	Date Reported: 15/07/2020
Project No:		2020-B-683	Page No. : 8 of 12

MOISTURE DENSITY RELATIONSHIP

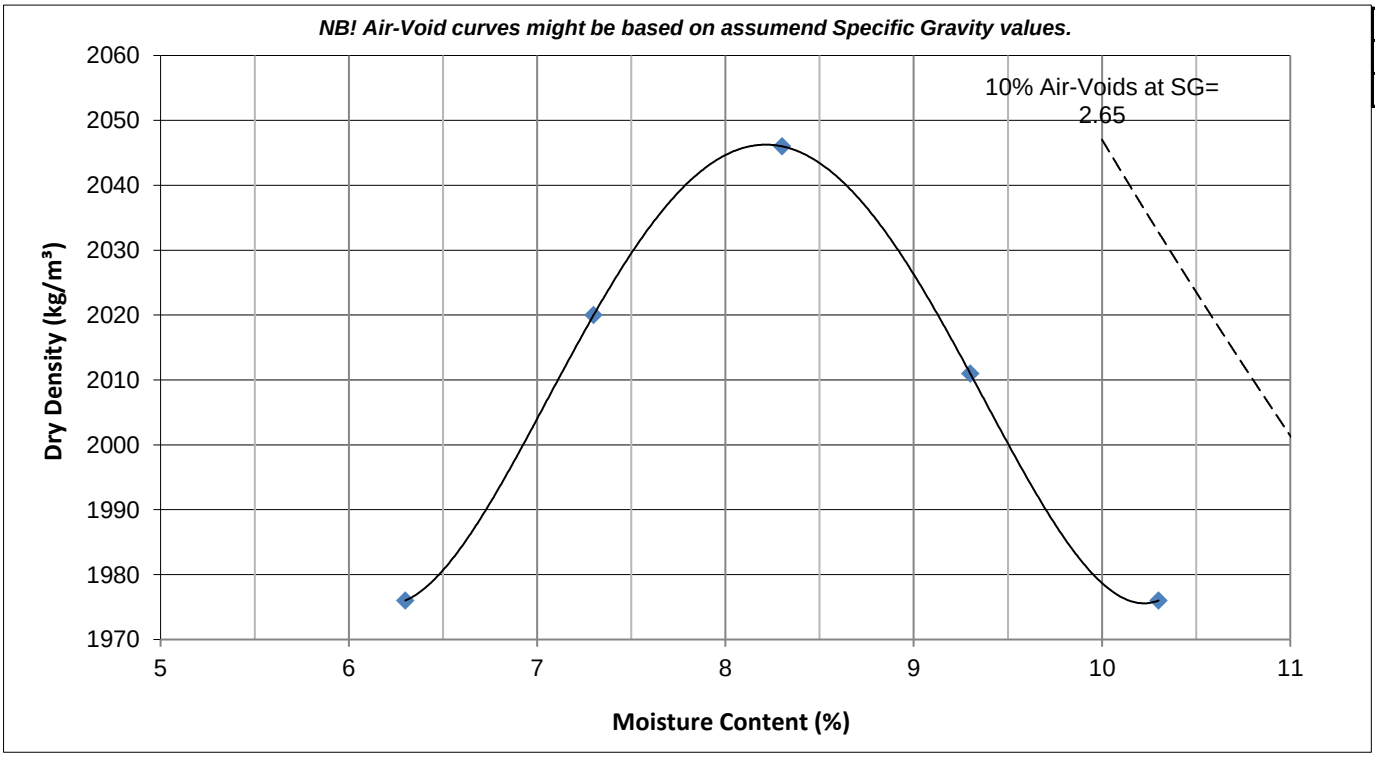
Laboratory Number		1
Field Number		AP2
Client Reference		
Depth (m)		0.7-2.5
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1976	2020	2046	2011	1976	
Moisture Content	%	6.3	7.3	8.3	9.3	10.3	

Max. Dry Density	kg/m³	2046
Optimum Moisture	%	8.2



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Project	:	Alex Pipeline	Date Reported: 15/07/2020
Project No:		2020-B-683	Page No. : 9 of 12

MOISTURE DENSITY RELATIONSHIP

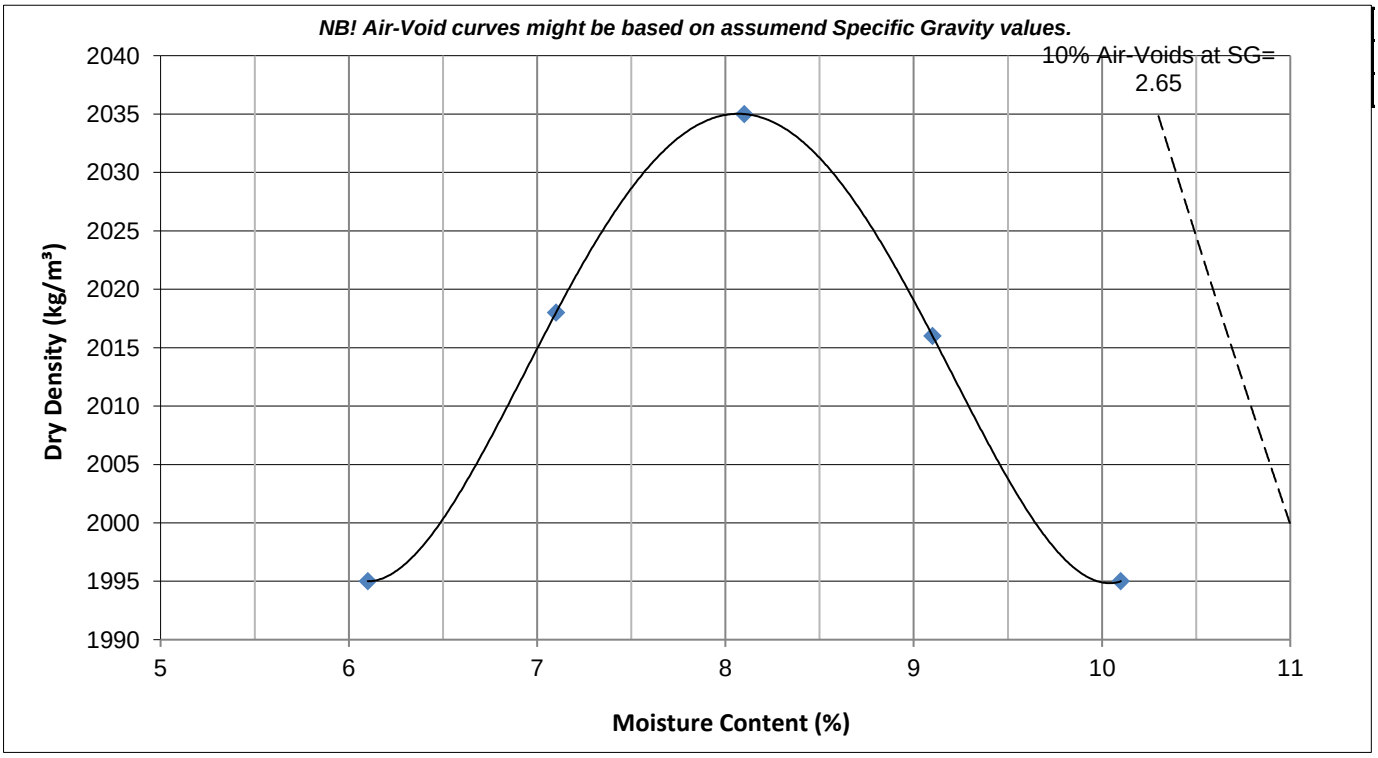
Laboratory Number		3
Field Number		AP4
Client Reference		
Depth (m)		1.0-3.1
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1995	2018	2035	2016	1995	
Moisture Content	%	6.1	7.1	8.1	9.1	10.1	

Max. Dry Density	kg/m³	2035
Optimum Moisture	%	8.1



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Project	:	Alex Pipeline	Date Reported: 15/07/2020
Project No:		2020-B-683	Page No. : 10 of 12

MOISTURE DENSITY RELATIONSHIP

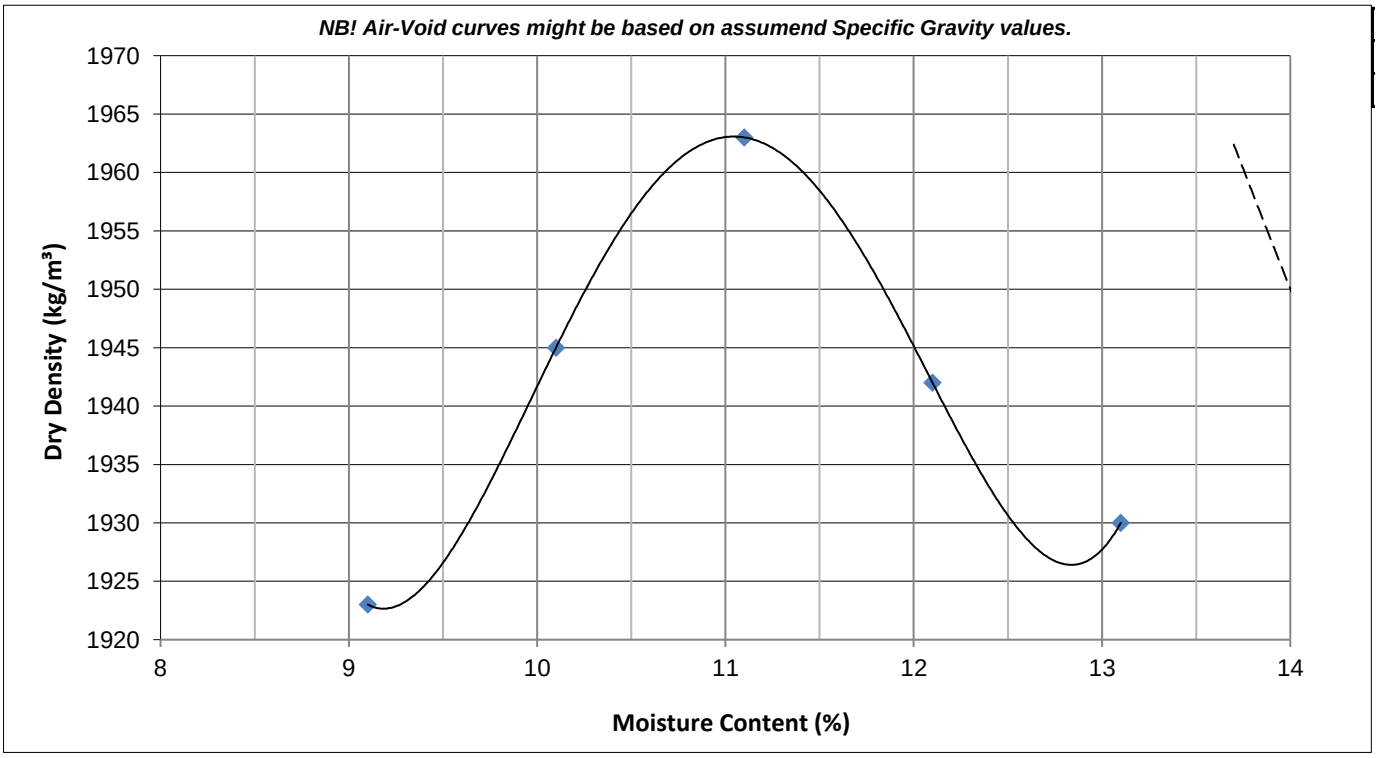
Laboratory Number		4
Field Number		AP7
Client Reference		
Depth (m)		0.2-4.0
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1923	1945	1963	1942	1930	
Moisture Content	%	9.1	10.1	11.1	12.1	13.1	

Max. Dry Density	kg/m³	1963
Optimum Moisture	%	11



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Project	:	Alex Pipeline	Date Reported	:	15/07/2020
Project No.	:	2020-B-683	Page No.	:	11 of 12

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		1 ◆	3 ■
Field Number		AP2	AP4
Client Reference			
Depth (m)		0.7-2.5	1.0-3.1
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) — **SANS 3001 GR1**

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	97	100
	5 mm	90	100
	2 mm	77	93
	1 mm	60	72
	0.425 mm	41	46
	0.250 mm	37	40
	0.150 mm	32	36
	0.075 mm	28	31
Grading Modulus		1.5	1.3

Soil Mortar Analysis

Coarse Sand	47	51
Coarse Fine Sand	6	6
Medium Fine Sand	6	5
Fine Fine Sand	5	5
Silt and Clay	37	33

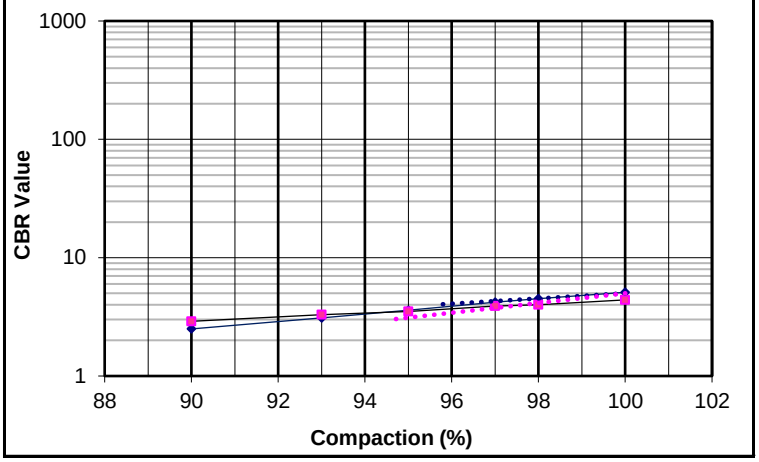
Atterberg Limits — SANS 3001 GR10

Liquid Limit (%)	33	29
Plasticity Index (%)	19	16
Linear Shrinkage (%)	9.5	6.0

Laboratory No.		1 ◆	3 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001 GR30**
MDD	kg/m³	2046	2035
OMC	%	8.2	8.1

California Bearing Ratio — **SANS 3001 GR40**

Compaction Data							
Moisture	%	8.3			8.1		
Dry Density	kg/m³	2058	1967	1865	2044	1933	1837
Compaction	%	100.0	95.6	90.6	100.0	94.6	89.9
Penetration Data							
CBR at	2.50 mm	5	4	3	5	3	3
	5.00 mm	6	5	3	6	4	3
	7.50 mm	7	5	3	7	4	3
Swell	%	0.7	0.7	0.9	0.6	0.6	0.7
Final Moisture (%)		11.6	12.9	15.4	10.9	12.9	17

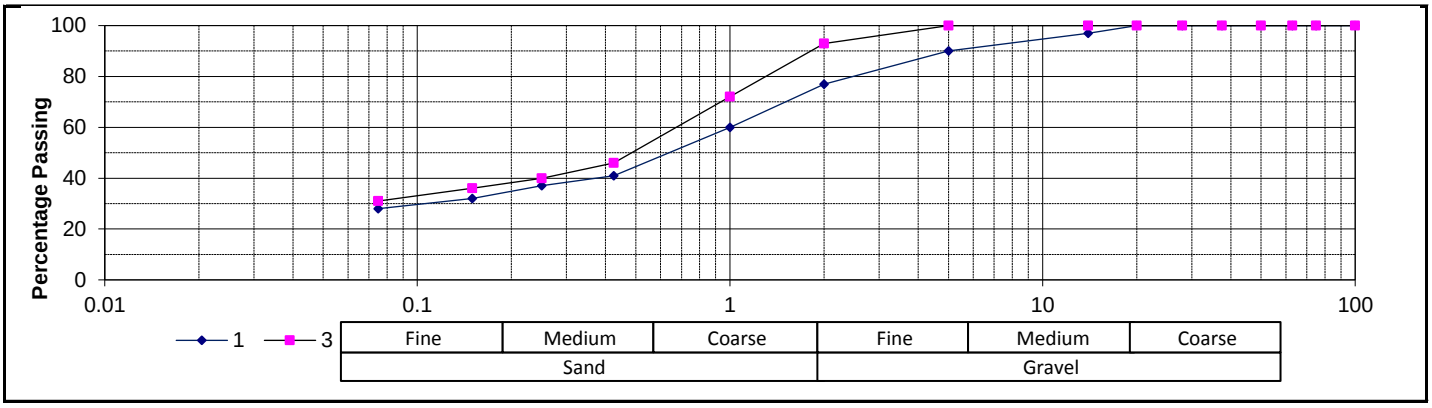


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	5	4
	@ 98%		5	4
	@ 97%		4	4
	@ 95%		4	4
	@ 93%		3	3
	@ 90%		3	3
	@ SANS3001 Midpoint		4	4

Classifications

HRB (AASHTO)	A-2-6(1)	A-2-6(1)
COLTO		
TRH14		



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Project	:	Alex Pipeline	Date Reported	:	15/07/2020
Project No.	:	2020-B-683	Page No.	:	12 of 12

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		4	
Field Number		AP7	
Client Reference			
Depth (m)		0.2-4.0	
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) — SANS 3001 GR1

Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	50 mm	100	
	37.5 mm	100	
	28 mm	100	
	20 mm	100	
	14 mm	100	
	5 mm	96	
	2 mm	82	
	1 mm	56	
	0.425 mm	34	
	0.250 mm	31	
	0.150 mm	28	
	0.075 mm	25	
Grading Modulus		1.6	

Soil Mortar Analysis

Coarse Sand	59	
Coarse Fine Sand	4	
Medium Fine Sand	4	
Fine Fine Sand	3	
Silt and Clay	31	

Atterberg Limits — SANS 3001 GR10

Liquid Limit (%)	41	
Plasticity Index (%)	17	
Linear Shrinkage (%)	7.0	

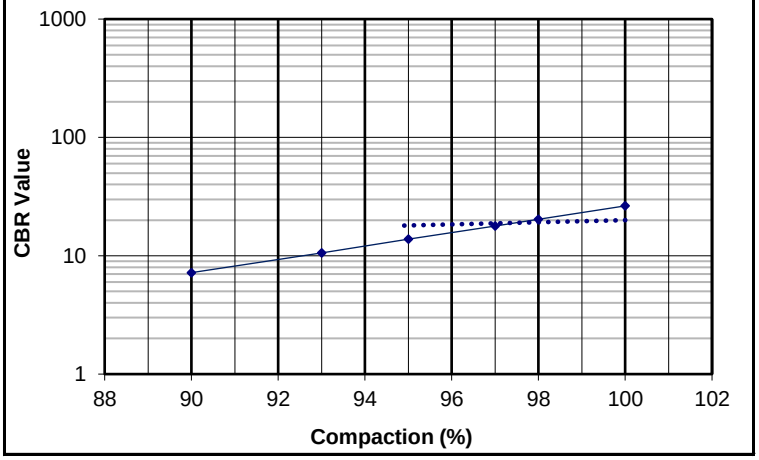
Laboratory No.		4	

Maximum Dry Density & Optimum Moisture Content — SANS 3001 GR30

MDD	kg/m³	1963	
OMC	%	11	

California Bearing Ratio — SANS 3001 GR40

Compaction Data							
Moisture	%	11.1					
Dry Density	kg/m³	1970	1869	1784			
Compaction	%	100.0	94.9	90.6			
Penetration Data							
CBR at	2.50 mm	20	18	8			
	5.00 mm	24	19	7			
	7.50 mm	31	19	7			
Swell	%	0.2	0.1	0.2			
Final Moisture (%)		13.5	14.2	16.6			

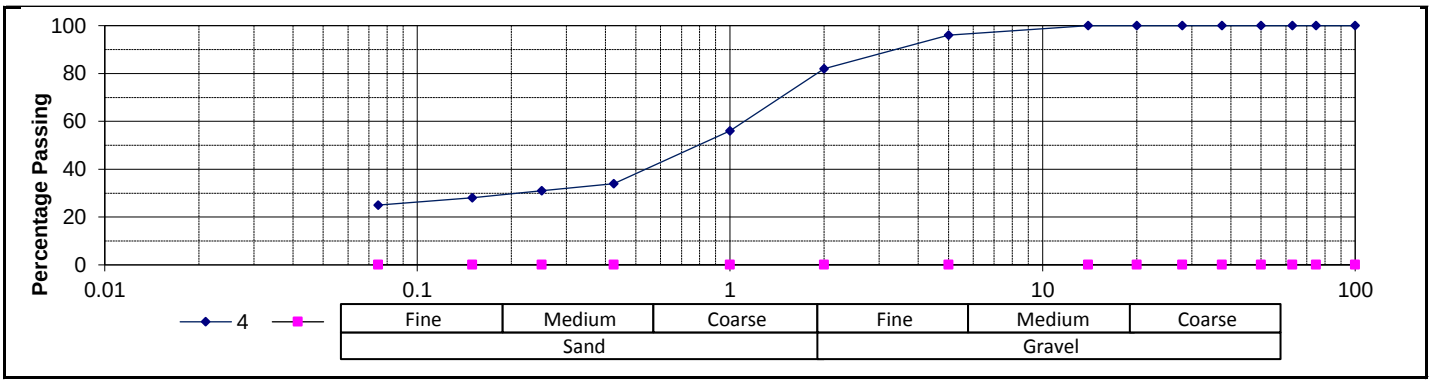


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	26	
	@ 98%		20	
	@ 97%		18	
	@ 95%		14	
	@ 93%		11	
	@ 90%		7	
	@ SANS3001 Midpoint		19	

Classifications

HRB (AASHTO)	A-2-7(1)	
COLTO		
TRH14	G9	



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COMPACTIBILITY FACTOR

Project : **Alex Pipeline**	
Project No. : 2020-B-683	Date : 7 JULY 2020

Lab. Sample Ref.	Field Sample Ref.	Depth (m)	Compaction Moisture Content %	Compactibility Factor
683-2	AP3	1.6-3.4	12.9	0.433
683-3	AP4	1.0-3.1	4.7	0.367
683-4	AP7	0.2-4.0	7.7	0.333
683-5	AP10	1.4-2.8	5.7	0.333

REMARKS:

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TEST REPORT

CIVILAB (PTY) LTD
P O BOX 82223
SOUTHDALE
SOUTH AFRICA

Attn:BONGI MVUBU

Report No.: 395279

Job/Sample No :	ML-2020-0829-004	**Date Received :**	14 Jul 2020
Sampling Date :	14 Jul 2020	**Analysis Completed Date :**	15 Jul 2020
Container Type :	Plastic Bottle		
Sample Temperature :	9.4 °C		
Description :	ALEX PIPE		
Sample Receipt Temperature :	Acceptable Condition		

CHEMICAL ANALYSIS Date Reported:15/07/2020

Test	Method	Units	Results
Electrical Conductivity @ 25°C	W044-27-O	MS/m	22.0
Total Suspended Solids, TSS *	A.P.H.A.2540D	mg/L	8
Sulphate	W044-28-O	mg/L	20.56

Tests marked with an (*) indicate that those tests are not SANAS Accredited and are not included in the SANAS Schedule of Accreditation

[1] o <10 / <1= Not detected / less than the lower detection limit of the test method, for the specified sample type / volume of sample tested

Analysis Conducted by: Emp. ID#: 44009

Reported by



Mulalo MHLANGA

Technical Signatory Water

T0040

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Ref. No. : ML-2020-26879
Issued at. : Johannesburg
Date : 21/07/2020
Contract No. : 11125840

Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts
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Certificate/Report

COMPANY NAME	:	CIVILAB (PTY) LTD
ADDRESS	:	P O BOX 82223 36/38 FOURTH STR SOUTHDALE 2135
		BOOYSENS RESERVE 2091
SUBJECT	:	ANALYSIS OF 3 SOIL SAMPLES
PROJECT REFERENCE	:	SOIL SAMPLES 14/07/2020
INSTRUCTED BY	:	BONGI MVUBU
ORDER NUMBER	:	ALEX PIPELINE
RECEIVED ON	:	14/07/2020
ANALYSIS COMPLETED	:	21/07/2020
DATE ANALYSED	:	14/7/2020 - 16/07/2020

BDL - Below Detection Limit

Denotes test method is outsourced

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Certificate/Report

Laboratory Number			E024589	E024590	E024591
Sampled Date					
Sample Marks			AP2(0.7-2.5)	AP3(1.6-3.4)	AP10(1.4-2.8)
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
ANALYSIS ON AN AS RECEIVED BASIS FOLLOWING 10% AQUEOUS EXTRACTION:					
Calcium Carbonate Saturated pH	(PCI 9,28)		8.75	8.92	9.22
pH Value @ 25°C	(SABS 11)		7.89	8.03	7.56
Conductivity mS/m @ 25°C	(APHA 2510B)		21	21	21
Total Dissolved Solids	(SABS 213)		142	116	92
Calcium,Ca			19.84	16.74	11.61
Calcium Hardness as CaCO3	(SABS 216)		50	42	29
Magnesium, Mg	(SABS 1071)		5.78	6.95	11.88
Free and Saline Ammonia as NH4	(SABS 217)		0.42	0.46	0.23
Total Alkalinity as CaCO3			56	67	33
Bicarbonate,HCO3			68	82	40
Carbonate, CO3			0	0	0
Chloride,Cl	(SABS 202)		10.56	10.56	8.78
Available Sulfate,SO4	(SABS 212)		22	22	45
Potential Sulfate, Sulfide, S	(SABS 1056)		<0.2	<0.2	<0.2
Total Sulfate Ion Content as SO4			22	22	45
Albuminoid Ammonia as N	(SABS 218)		<1	<1	<1
Total Ammonium Ion Content NH4			0.42	0.46	0.23
pH of Saturation pHs			8.30	8.30	8.80
Langelier Index (pH - pHs)			-0.50	-0.30	-1.20
Leaching Corrosion Sub. Index			1011	1027	1581
Spalling Corrosion Sub. Index			4.76	5.12	7.64
Final Aggressiveness Index			1015	1032	1589
Chloride Corrosion Sub. Index			2.11	2.11	1.76

Mulalo Mhlanga

BDL - Below Detection Limit

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Certificate/Report

Laboratory Number			E024589	E024590	E024591
Sampled Date					
Sample Marks			AP2(0.7-2.5)	AP3(1.6-3.4)	AP10(1.4-2.8)
Determinand	**Method References**	**Detection Limit**	**Result**	**Result**	**Result**
THE ANALYSIS WERE CARRIED OUT ON A DRIED MILLED SAMPLE					
Sulfate, SO4(%)	GRAVIMETRIC	0.01	<0.01	<0.01	<0.01

Mulalo Mhlanga

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Printed Date: 21/07/2020

Appendix I (Test Pits and Site Photographs)



Plate 1: View towards the south, note TLB excavating AP1



Plate 2: DPSH conducted adjacent to AP3

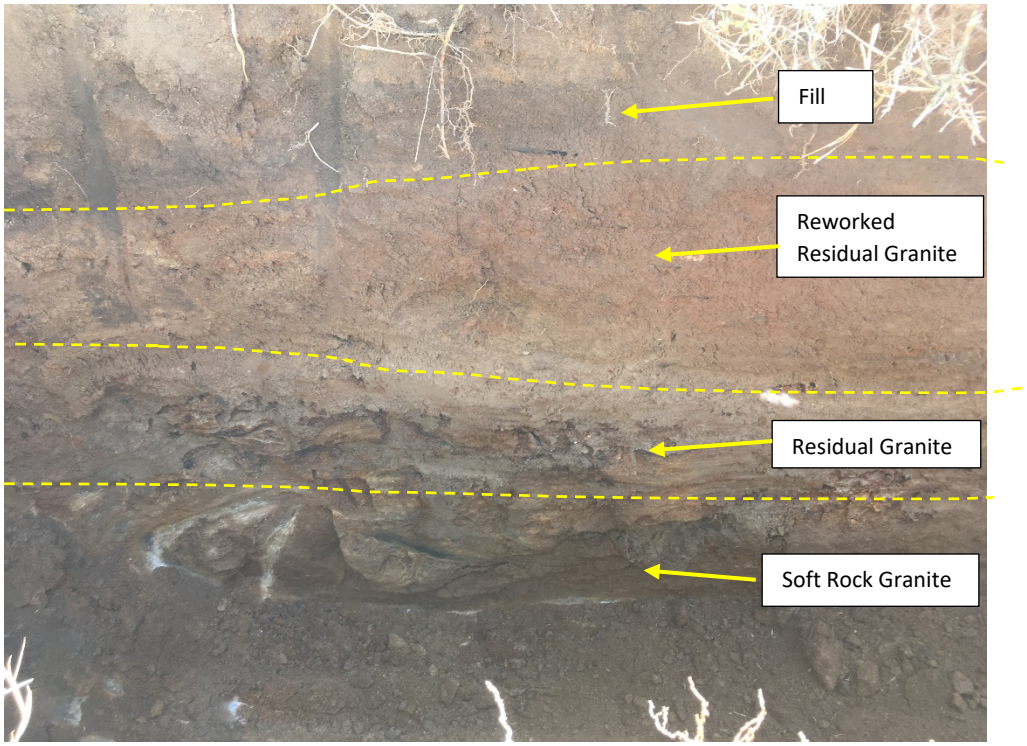


Plate 3: Typical soil profile as seen in AP1



Plate 4: Spoil from AP2



Plate 5: View towards the west from AP2

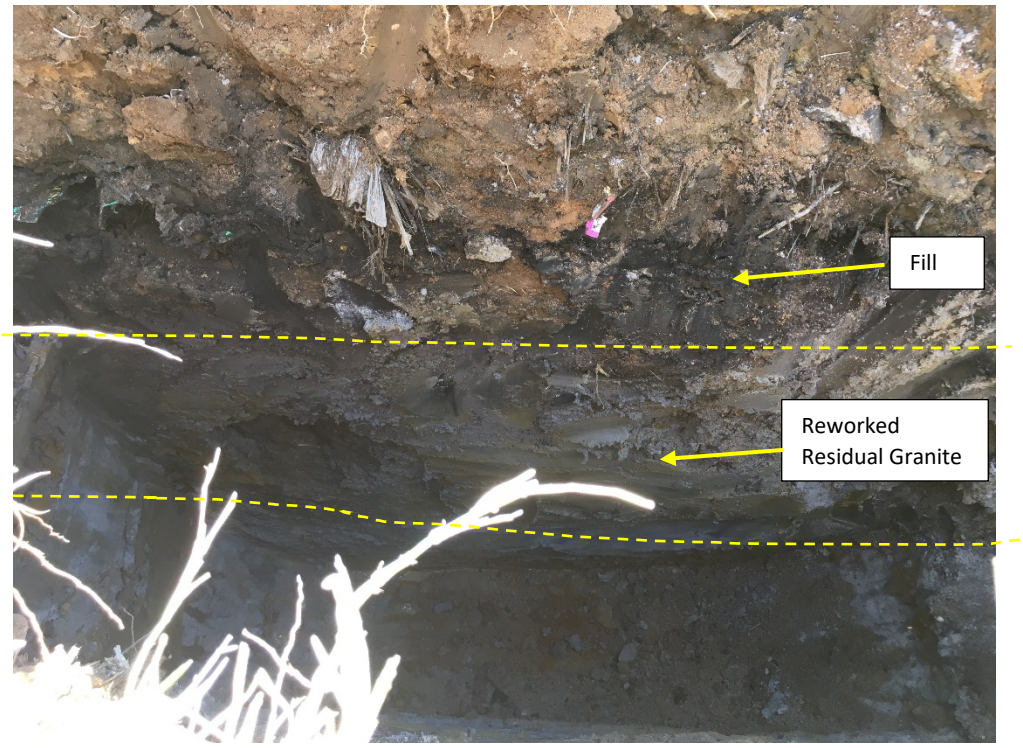


Plate 6: Typical soil profile as seen in AP4

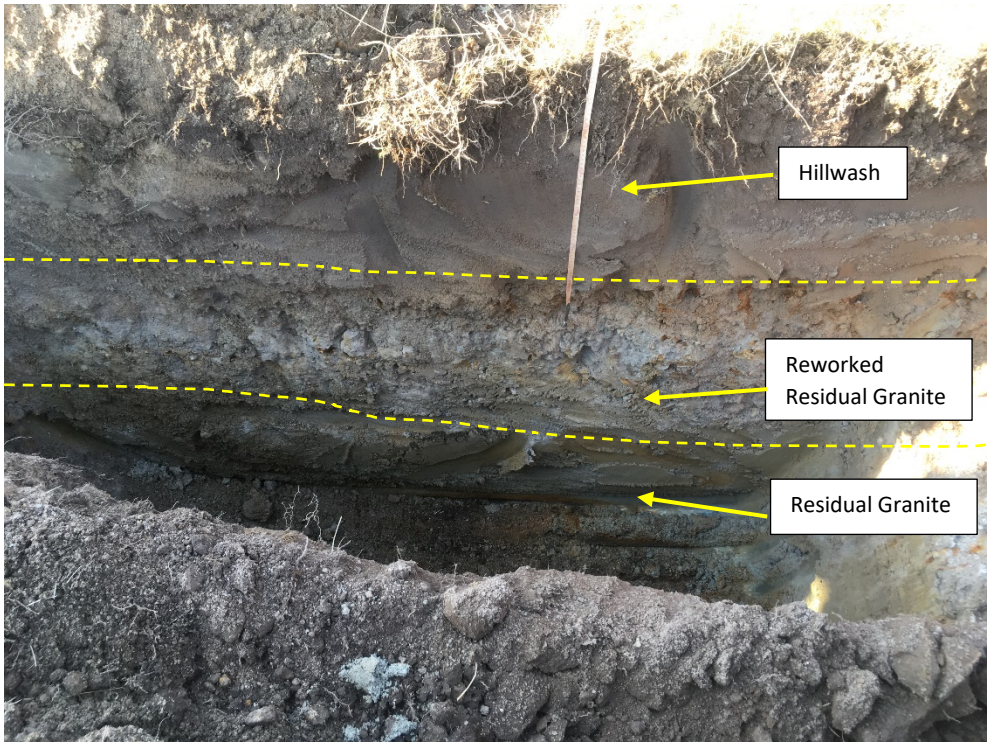


Plate 7: Typical soil profile as seen in AP6



Plate 8: View towards the north from near AP6poil from AP6



Plate 9: Spoil from AP7



Plate 10: View towards the west, note TLB excavating AP8



Plate 11: Typical soil profile as seen in AP9



Plate 12: View towards the west, note TLB excavating AP9



Plate 13: : Typical soil profile as seen in AP10



Plate 14: Spoil from AP 10